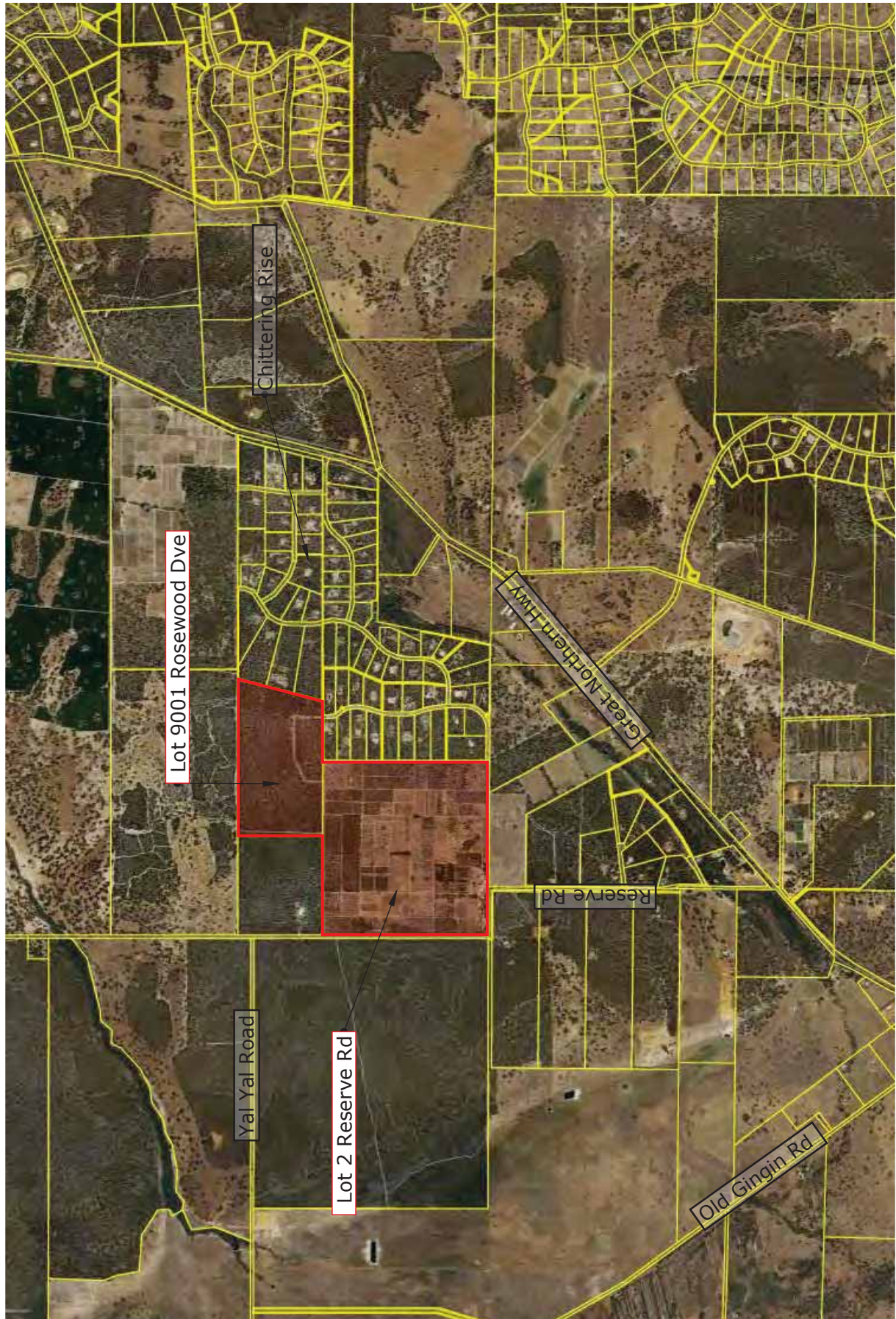




Development Services Attachments
Wednesday, 28 October 2015

REPORT NUMBER	REPORT TITLE AND ATTACHMENT DESCRIPTION	PAGE NUMBER(S)
9.1.3	Proposed Structure Plan: Lot 2 Reserve Road and Lot 9001 Rosewood Drive, Chittering* 1. Locality Plan 2. Applicant Letter 3. Proposed Structure Plan 4. Schedule of Submissions 5. Bushfire Management Plan 6. Traffic Impact Statement 7. Local Water Management Strategy 8. Consultation Plan 9. Development Plan report	1 - 297



Our Ref: 05/096 MW:dd
Your Ref: A3300; A11548; 18/03/004
MRWA Ref: 01/706-06

2 October 2015

Attention: Brendan Jeans, Senior Planning Officer

Chief Executive Officer
Shire of Chittering
PO Box 70
BINDOON WA 6502

via email: chatter@chittering.wa.gov.au

Dear Sir

STRUCTURE PLAN – LOT 2 RESERVE ROAD AND LOT 9001 ROSEWOOD DRIVE, CHITTERING

We refer to the Minutes of the Council Meeting held on 15 July 2015, for Council Resolution 080715 in relation to the Structure Plan for Lot 2 Reserve Road and Lot 9001 Rosewood Drive, Chittering. The Minutes deferred final consideration of the Structure Plan until the applicant provided information.

On behalf of our client Riverside Investments (WA) No. 2 Pty Ltd, Taylor Burrell Barnett (TBB) in collaboration with the project team members 360 Environmental, Riley Consulting and ICS Group, is pleased to confirm the lodgement of the following information:

- a. Amended Bushfire Management Plan as specified by the Shire's Community Emergency Services Manager – provided by email by ICS Group to the Shire of Chittering on 10 August 2015 [ICS Group 29-07-15.pdf].
- b. A Traffic Impact Statement as required by MRWA – provided by email by TBB on behalf of Riley Consulting to the Shire of Chittering and MRWA on 26 August and 21 September 2015 [843 V3 Reserve Rd Traffic Report 03-09-2015.pdf];
- c. A Local Water Management Strategy – provided by email by 360 Environmental to the Department of Water and by TBB to the Shire of Chittering on 22 September 2015 [1250BC Chittering Site LWMS.pdf]; and
- d. Minor Amendments to the Structure Plan – in emails dated 18 and 21 September 2015, the Shire requested the Structure Plan be amended to remove building envelopes from lots zoned Residential R2, and the removal of Permissible Land Uses from the Notes on the Structure Plan.

We refer back to the modifications to the Structure Plan that were submitted under cover of a letter dated 22 May 2015. Overall, those modifications submitted in May aimed to address biodiversity, fire management and lot layout issues raised during discussions with the Shire and other stakeholders. We understand that those modifications have been supported by the Shire.

In summary, and based on the discussions with the Shire undertaken in September 2015, the commentary below is provided in support for the subsequent minor modifications that have been made in the context of the Shire's requests and the gazettal of the *Planning and Development (Local Planning Schemes) Regulations 2015*.

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**Residential R2 Lots – removal of building envelopes and inclusion of building exclusion area**

The Shire has requested that the Structure Plan omit building envelopes from the Residential R2 lots. Given the relatively cleared nature of Lot 2 Reserve Road, the Shire has advised it is more supportive of building exclusion areas.

The Structure Plan has been modified per the Shire's requests to omit building envelopes for the Residential R2 lots. The Notation 4 has been updated to refer to building envelopes for the Rural Conservation lots.

In addition, a building exclusion area is introduced that is 60m in width from the eastern lot boundary of Lot 2 Reserve Drive, affording additional setbacks to development of the existing Lots 888-895 and 898 Rosewood Drive. This 60m width was the general extent to which indicative building envelopes were shown previously.

The Structure Plan continues to apply minimum setbacks for Residential R2 lots as per the R-Codes, being 20m to the primary street, 10m to the secondary street and 10m to other/rear boundaries. In this respect, the boundary setbacks under the R-Codes would create the 'building envelope' for development to occur within.

Permitted Uses

Based on the release of the *Structure Plan Framework*, we understand that the structure plan cannot stipulate land use permissibility. As a result, Notation 13 regarding 'permitted uses' has been removed.

Conclusion

In relation to the Council Resolution, we advise that all items have been addressed as follows:

- a. The Bushfire Management Plan has been accepted by the Shire of Chittering;
- b. The Traffic Impact Statement has been reviewed by MRWA and they have advised the Shire of Chittering of no objection on 22 September 2015;
- c. The Department of Water has received the LWMS; and
- d. The modifications to the Structure Plan have been made in response to the Shire's requests.

We respectfully request the Shire to consider the enclosed Structure Plan for the October Council Meeting for recommending approval of the proposed structure plan by the WAPC.

Should you have any questions regarding this submission please do not hesitate to contact the undersigned or Michael Willcock of this office on (08) 9382 2911 or via email michael@tbbplanning.com.au.

Yours faithfully
TAYLOR BURRELL BARNETT

SAMANTHA THOMPSON
DIRECTOR

CC: Stephen Seward – 3rd Wave Capital

Submitter	Submission comments	Applicant response comments	Officer comments
Main Roads WA	<p>MRWA objects to the proposed scheme amendment on the basis that the intersection of Reserve Road and Great Northern Highway is not suitable for the proposed increase in traffic. MRWA recommends that the proponent engage a suitably qualified consultant to prepare a Traffic Impact Statement (TIS) that investigates the impact of the proposal on the road network in particular the upgrades required at the Reserve Road/Great Northern Highway intersection.</p> <p>As you are aware, MRWA is currently completing a planning study for upgrades to the Great Northern Highway between Muchea and Wubin. It is recommended that the proponent's traffic consultant liaise with the Project team undertaking the planning study to ensure any proposed upgrades do not conflict.</p>	<p>Approved Development Plans are in place for both sites. A Development Plan was endorsed for Lot 2 Reserve Road on 17 December 2007. Approval for a Development Plan for Lot 9001 was granted by the WAPC in June 2009.</p> <p>The Western Australian Planning Commission has approved a subdivision application for 110 lots over Lot 2 Reserve Road (subdivision approval is still active) and a subdivision application for 45 lots over Lot 9001 Rosewood Drive (subdivision approval is still active). The active subdivisions allow for the creation of 155 lots and a commensurate increase in traffic. In comparison, the modified Development Plan proposes a yield of 244 lots, an increase of 89 lots overall.</p> <p>The requirement for Traffic Impact Statements is not identified for the existing subdivision approvals or Development Plans. The applicant is happy to work with MRWA on investigating impacts on the road network and further assessment of the Reserve Road intersection at Great Northern Highway can be undertaken.</p> <p>Suggest that as a condition of the Development Plan, any subdivision application shall be supplemented with a Traffic Impact Statement to consult with MRWA to identify what, if any, upgrades may be required at the intersection of Great Northern Highway and Reserve Road.</p>	<p>It is acknowledged that a Traffic Impact Statement will be required of the Applicant for required upgrades and suitability of Reserve Road and the intersection with Great Northern Highway. It is considered this should be addressed prior to a Development Plan being endorsed. This is reflected in the report and Officer's Recommendation.</p> <p>Noted as per comment above.</p>
Department of Fire and Emergency Services	<p>Please be advised that DFES has no comment regarding this matter at this stage. The Shire of Chittering are the Authority regarding fire protection matters in this instance and as such would be expected to apply a condition requiring compliance with DFES and the WAPC Planning for Bush Fire Protection Guidelines Edition 2 - May 2010 (These Guidelines replace DC 3.7 Fire Planning and Planning for Bush Fire Protection, which were released by the WAPC and DFES in December 2001) and clause 6 of the State Planning Policy 3.4 Natural Hazards and Disasters (SPP 3.4).</p>	<p>Noted. The applicant's fire consultant aims to comply with both the existing Planning for Bush Fire Protection Guidelines (Edition 2, FESA & WAPC May 2010) and the Planning for Bushfire Risk Management Guidelines (WAPC & DoP, Draft May 2014). The solution for bushfire risk management is also based on compliance with the Australian Standard for the Construction of buildings in bushfire-prone areas AS3959.</p>	<p>Noted. The proposed rezoning and Development Plan is to be assessed in accordance with the relevant state policies. The Fire Management Plan was referred internally to the Shire of Chittering's Community Emergency Services Manager, who has provided feedback that modifications are required to be made to the Fire Management Plan prior to the final approval of the Development Plan.</p>
Department of Water	<p>A Local Water Management Strategy (LWMS) should be compiled for the subject site. The LWMS should contain a level of information that reflects the site constraints and risk to water resources and a commitment to prepare an Urban Water Management Plan at subdivision. The principles identified in the LWMS should be consistent with the Better Urban Water Management *WAPC, 2008) document, Livable Neighborhoods (WAPC, 2008) document, the Stormwater Management Manual for Western Australia (DoW 2004-2007) and the Interim: Developing a Local Water Management Strategy (DoW 2008).</p>	<p>The Development Plan outlines water supply, storm water drainage, water quality control and groundwater resources management within the submitted report to the Shire of Chittering. These report sections respond to the site constraints and risk to water resources. This level of detail was initially provided with the Development Plan.</p> <p>At the time of subdivision the Shire of Chittering may recommend a condition, as applicable, requiring the preparation and/or implementation of an Urban Water Management Plan.</p>	<p>The Officer's Recommendation requests a LWMS to be prepared prior to the Development Plan being considered. It is considered critical to the design of the Development Plan that a informed LWMS is prepared, detailing catchments areas, stormwater retention, diversion which will guide future stormwater design at the subdivision stage.</p>
DPaW	<p>The proposed Scheme Amendment and Development Plan is located within an area of native vegetation that is in good condition. The department is supportive of measures to retain native vegetation in the proposed development plan and is supportive of a conservation covenant as proposed for the larger conservation lot on Lot 9001. Parks and Wildlife also supports the development provisions to protect the Rural Conservation Zone as detailed in Part 5, section 5.8 of the Shire of Chittering Town Planning Scheme No. 6, however the department hasn't had the opportunity to view the Fire Management Plan (FMP).</p> <p>If the event that the FMP doesn't adequately address the issue of potential dieback spread through the construction of firebreaks, Parks and Wildlife recommends that all material and machinery used to construct fire breaks surrounding the Conservation Lot is dieback free. Further consideration should be given to a preference for compacted limestone to be used as a base, particularly the fire break that is adjacent to the dwellings on the southern boundary of the conservation lot.</p>	<p>The applicant has liaised with the Department of Parks and Wildlife in relation to the inclusion of the proposed Conservation Lot within DPaW's Nature Conservation Covenant Program. DPaW has no objections and are supportive of the Conservation Lot.</p> <p>As a result of negotiations with DPaW, the Fire Management Plan provides guidance on clearing of the building envelopes on the Conservation Lot. The firebreaks for the Conservation Lot were also reduced from 6m to 3m to the northern and western boundaries. This has support from DPaW.</p> <p>DPaW's advice is noted. Phytophthora cinnamomi (dieback) was not identified in environmental studies performed within the development area. The Department of Conservation and Land Management ((CALM) now the DPaW) Best Practice for the Management of Phytophthora cinnamomi ' will be adhered to should dieback be seen as a risk in the development area.</p>	<p>Support for conservation development noted.</p> <p>Concern of dieback noted. Dieback Management Plan can be imposed prior to subdivision as a condition consistent with Clause 5.8.1(f) of Town Planning Scheme No 6. The Fire Management Plan has been referred to DPaW for further comment which will be included in the schedule of submissions presented to Council with the amended Development Plan.</p>

Submitter	Submission comments	Applicant response comments	Officer comments
	<p>The proponent should be advised that the clearing of native vegetation that will occur as a result of this proposal may cause a loss of habitat for Carnaby's cockatoo (<i>Calyptorhynchus latirostris</i>), listed as Endangered under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). The proponent may therefore have notification responsibilities under the EPBC Act. The proponent may therefore have notification responsibilities under the EPBC Act. The proponent should contact the Federal Department of the Environment for further information on these responsibilities, (if required) prior to further planning stages.</p>	<p>DPaW's advice is noted. At the time of writing the Black Cockatoo Habitat Assessment was in the process of being finalised. The impacts to these species will be assessed through the EPBC referral process. This information has been provided to the Shire.</p>	<p>Noted. An EMP is requested to be imposed as a provision on the Development Plan to identify and protect appropriate habitat.</p>
Ellen Brockman Integrated Catchment Group Inc.	<p>This proposed scheme amendment and development plan has been reviewed previously by the Ellen Brockman Integrated Catchment Group in collaboration with the Chittering Landcare Group. The overall objections to the plan were stated in a letter dated 12th March 2015.</p> <p>To date, the updated development plan and environmental plan have not been sighted for this development and as such we highly recommend that this amendment and development plan does not receive approval from the Shire Council until these documents have been completed, submitted and approved.</p> <p>Recommendations:</p>	<p>The previous submission from the Ellen Brockman Integrated Catchment Group has been reviewed by the project team and the issues raised have been initially addressed in documentation provided with the Development Plan. Clarifications were provided on many of the issues raised. Commitments were made in relation to conducting further assessments, particularly in relation to Black Cockatoos.</p> <p>The updated Development Plan and associated information is submitted to the Shire of Chittering for assessment and determination. Documentation on the environmental attributes of the site has been provided with the planning documentation. It is considered that no additional environmental plans are required to gain the necessary planning approvals.</p>	<p>Noted. As mentioned above, the requirement of an EMP & Management Plan specific to the management & protection of the Carnaby will be implemented on the Development Plan and a condition of subdivision approval.</p> <p>All documentation was provided to agencies and made available to the public during the advertising process.</p>
	<p>Since the Development Plan was submitted the proponent has performed a site specific assessment of the habitat value of the site in accordance with a commitment made in previous correspondence to the Shire. At the time of writing the Black Cockatoo Habitat Assessment was in the process of being finalised. Referrals under the EPBC Act are a separate process to the Shire's consideration of the Scheme Amendment and Development Plan.</p> <p>Some trees on Lot 9001 have been identified to be potential breeding trees (as defined by federal guidelines) due to their size however none of these trees were found to contain suitable breeding hollows for Carnaby's Black Cockatoo. Breeding for Carnaby's Black Cockatoos primarily occurs in the Wheatbelt (Johnstone & Storr 1998). Due to the lack of hollow bearing trees within the site and the fact that Carnaby's Black Cockatoos primarily breed in the Wheatbelt, it is concluded that Lot 9001 is not currently a breeding site for Carnaby's Black Cockatoos. Lot 9001 is known to contain foraging species utilised by Carnaby's Black Cockatoos, however no feeding evidence in the form of chewed nuts or cones was recorded during the habitat assessment.</p>	<p>A 20 ha Conservation Lot will be created as part of the development that will be covenanted for conservation. This will retain habitat to be utilised by fauna, and will retain a linkage to surrounding habitat. The Rural Conservation Lots will retain as much vegetation as possible, with each lot having a maximum building envelope of 2,000m². It must be noted that clearing for the purposes of bushfire management (including fire service access routes, firebreaks and separation of vegetation from houses) is to achieve a balance between bushfire management requirements and environmental protection was considered in the design for the Development Plan.</p>	<p>As above.</p> <p>Noted. EMP & Carnaby Plan required as above.</p>
<p>1. Lot 9002 is an entirely bush block apart from a roadway cleared before approval was given for the development and contains a considerable number of "significant trees" for hollow nesting birds and animals, in particular, the nationally protected Carnaby's White-tailed Black Cockatoos. The area would also be feeding habitat for these birds. The significant trees need to be documented and mapped.</p> <p>2. An Environmental Plan for Lot 9001, at the very least, needs to be completed and approved by Council before the scheme amendment is considered. This is required to ensure that protection of important natural habitat areas occurs and environmentally sensitive development takes place.</p>	<p>Since the development plan was submitted the proponent has performed a site specific assessment of the habitat value of the site in accordance with a commitment made in previous correspondence to the Shire. At the time of writing the Black Cockatoo Habitat Assessment was in the process of being finalised. A vegetation retention plan has been prepared and submitted with the updated Development Plan, showing indicative areas of vegetation retention outside of building envelopes, roads and bushfire protection areas. An Environmental Plan is not required in light of previous documentation being prepared.</p>	<p>It is considered that the lot layout and envelope locations satisfies that enough vegetation will be retained and protected to allow this rezoning to progress. Further EMPs will be required at subdivision stage.</p>	

Submitter	Submission comments	Applicant response comments	Officer comments
	3. A comprehensive flora and fauna survey (Level 2 at least) needs to be undertaken for 9001 Rosewood Drive, and a report submitted.	The biological surveys undertaken for the Development Area were accepted by the Environmental Protection Authority (EPA). The EPA did however request that the proponent consider its responsibilities regarding matters of National Environmental Significance (MNES) under the Environment Protection and Biological Conservation Act 1999 (EPBC Act), with particular attention given to the Black Cockatoos. Since the Development Plan was submitted the proponent has performed a site specific assessment of the habitat value of the site in accordance with a commitment made in previous correspondence to the Shire.	Noted. The Applicant has undertaken and submitted flora and fauna surveys for Lot 2 and Lot 9001 with the application, it is considered that this level of detail is sufficient for the Scheme Amendment to be adopted by Council, further more detailed environmental studies will be required at the subdivision stage.
	3. A comprehensive flora and fauna survey (Level 2 at least) needs to be undertaken for 9001 Rosewood Drive, and a report submitted.	The proponent's consultants, 360 Environmental, also undertook a gap analysis to determine if any of the flora species identified are now listed as 'Priority' by the Department of Parks and Wildlife or as 'Threatened' under the Wildlife Conservation Act 1950 or EPBC Act. None of the flora species identified are currently considered to be of conservation significance. Further work has determined that based on the habitat availability and known records of Threatened fauna species, the development area is only likely to contain suitable habitat for one Threatened fauna species the Carnaby's Black Cockatoos. At the time of writing the Black Cockatoo Habitat Assessment was in the process of being finalised. The impacts to these species will be assessed through the EPBC referral process. This information has been provided to the Shire.	
	4. The Shire needs to request a referral in accordance with the EPBC Act for the threatened species (Carnaby's White-tailed Black Cockatoo).	The proponent is aware of the EPBC referral process and this is a matter that is separate of the Shire's consideration of the Scheme Amendment and Development Plan.	Noted.
	5. The lot sizes in 9001 need to reflect the environmental qualities of the site. The lot sizes indicated in Lot 9001 are too small and would require total clearance to comply with the Bush Fires Act, thus the loss of habitat trees and understorey. It is recommended that the lot sizes be similar to the adjoining special rural subdivision or considered as rural retreat (minimum 10Ha lots). This will allow for better protection of the vegetation and complement the properties in the adjoining subdivision. Alternatively, the Lot 9001 should be completely protected for its biodiversity values, particularly since the POS of lot 2 is not 10% of the lot size.	The large Lot sizes proposed for the development, particularly within Lot 9001, have been designed in a way to retain as much vegetation as possible and to reflect the natural landscape that the site forms part of. The studies performed to date have not identified environmental characteristics that warrant larger lot sizes. A 20 ha Conservation Lot will be created as part of the development that will be covenanted for conservation. This will retain habitat to be utilised by fauna and will retain a linkage to surrounding habitat.	The Rural Conservation zone promotes cluster type development to avoid fragmentation of remnant vegetation and biodiversity corridors. Required clearing for bush fire protection is to be further assessed subject to a fuel load assessment in the Officer's Recommendation.
	6. The SPP Policy for Bush Fire Protection has not been finalised and adopted and it would be advisable for the Shire Council to wait until those guidelines are adopted as this may require changes to occur in the DA and the fire management plan.	The design of the proposed development addresses vegetation management to meet the requirements of the Shire of Chiltering Firebreak Notice and the Australian Standard for the Construction of buildings in bushfire-prone areas AS3959. The design of the road network proposed for the development of Lot 2 and Lot 9001 meets the requirements of both the existing Planning for Bush Fire Protection Guidelines (Edition 2, FESA & WAPC May 2010) and the Planning for Bushfire Risk Management Guidelines (WAPC & DOP, Draft May 2014).	The Shire will assess the proposal in accordance with the current SPP and take into account the draft SPP relating to bush fire protection and management. All future development on this site will be subject to an approved Fire Management Plan which will indicate hazard levels for the landowners to build to. As the amended SPP for Bushfire protection & DFES associated mapping was due to originally be released in May and has now been pushed back to September, without confirmation that the requirements will be anymore onerous to the existing requirements in current state documentation it is considered unreasonable to hold up this development going through on the basis that a new document may be released in September 2015.
	7. Any vegetation in entry statements and roadside reserves needs to be endemic species. The planting of large trees (eg Eucalyptus rudis) as they will grow very large and Acacia species which seed prolifically and are short lived is not recommended as it will become a maintenance issue for the Shire.	The Landscape Masterplan prepared for the proposed development was included in the updated Development Plan. The entry to Lot 2 from Reserve Road proposes strong formerly planted rows of native wildflowers with specimens transplanted from the site. These rows of flowers can be used by future and surrounding residents for cut specimens or purely for their seasonal striking colour and a reminder of the site's recent history. Road reserves will be planted with a mixture of local Banksia and Eucalyptus trees as well as shrubs and groundcovers.	Noted. Should the development be supported, it is expected a detailed Landscape Management Plan would be required to be submitted and approved at the subdivision stage.
	8. The road reserves in Lot 2 need to be offset. Narrow road reserve for utilities that can be maintained by mowing and a wider reserve on the opposite side that can be revegetated to create corridors linking the POS and the remnant vegetation and act as a swale.	The proposed within the design are 20 metres in width and are proposed to be sealed. These road reserve widths are consistent with Rosewood Drive, Ghost Gum Drive and Sugar Gum Drive. Reserve Road along the western boundary to Lot 2, is currently 20m wide. Through the Development Plan, the landowner will be ceding 10m of land from the western boundary, to result in a road reserve width of 30m for Reserve Road. All road reserves will be drained with rural standard open drains and drainage swales designed in accordance with water sensitive design principles.	As the development Plan is proposing Residential R2 lot sizes, this subdivision will be treated as a residential subdivision not a rural subdivision. The requirements for this subdivision would be consistent with the residential standards specified in the IPWEA subdivision guidelines. A Local Water Management Strategy will be required to be formalised prior to the Development Plan being presented to Council for consideration. At the subdivision stage a detailed stormwater design will be required to be submitted along with detailed engineering plans to residential standards.

Submitter	Submission comments	Applicant response comments	Officer comments
	<p>9. Any fencing of lots in Lot 9001 needs to allow for fauna movement (kangaroo gates or 4 line single strand fencing) between the estates and other properties or no fencing allowed on Lot 9001 except around the building envelope.</p> <p>Retention basins and drainage of needs to be done using Water Sensitive Urban Design. Swales and retention basins are to be appropriately vegetated. This was not stated in the previous documents.</p> <p>We recommend that the Shire Council not approve this scheme amendment at this time until the issues stated have been adequately dealt with and accepted by the Shire.</p> <p>As a nearby landowner, my objections to this are:</p> <p>1. The blocks should be the same size as Chittering Rise Estate as the developer is just trying to squeeze as many lots in as they can. These should coincide with roughly the same as in our estate.</p> <p>2. There will be no bush left by the time fire management is applied.</p>	<p>If fencing is required it is proposed to be to a rural standard, i.e. post and wire, which would permit the movement of fauna.</p> <p>The development road easements for both Lots 2 and 9001 are proposed to make the most of the lineal corridor open space by offsetting a non-kerbed rural styled pavement. A one-way cross fall on the road aims to follow the natural fall of the land to an enclosed swale system. These lineal swales will embody Water Sensitive Urban Design (WSUD) principles and act as a rain gardens infiltrating water run-off close to source. The swale is to be planted with endemic plant species between residential crossovers. Residential crossovers will join the swales through a simple culvert and pipe system, to be terminated by another crossover as required.</p> <p>It is considered that the updated Development Plan and associated documentation adequately addresses the queries from the Ellen Brookman Integrated Catchment Group Inc.</p>	<p>Noted. It is recommended no fencing be constructed or permitted outside of the building envelope areas to retain fauna movement as much as possible.</p> <p>Noted. A detailed Stormwater Management Plan would be required at the subdivision stage to address, mostly, the road drainage design. The Officer's Recommendation requests a Local Water Management Strategy to be prepared to reference best practice water sensitive design for the Development Plan. In addition to this as specified above, this is a residential subdivision therefore, the likes of curbing roads will be required.</p> <p>Noted. The Shire considers the proposed zones to be acceptable and a better outcome for the site. The Shire acknowledges issues raised should be dealt with prior to the Development Plan being considered.</p> <p>Objection noted.</p> <p>The development is supported with the provision of a reticulated potable water supply. This allows for smaller lot sizes and hence the proposal to rezone to Residential R2. Chittering Rise estate is not serviced with a reticulated water supply and therefore is limited to Rural Residential development, hence the 2ha lot sizes. The Development Plan indicates a variety of lot sizes to help integrate this development with surrounding developments.</p>
Public A		<p>Through discussions with Shire Officers and the Department of Planning, there was an expressed desire for development density to be increased given:</p> <ul style="list-style-type: none"> its close proximity to Muchea Employment Node and need to deliver living options for workers nearby; the need to deliver a potable water supply scheme capable of supplying the Muchea employment Node and the district in general; the desire to deliver 20ha of land for conservation purposes consistent with the Shire's Local Biodiversity Strategy. <p>The proposed development design and fire management plan allow for the following vegetation to be retained:</p> <ul style="list-style-type: none"> Most of the native vegetation is on the large conservation lot. The exceptions are the 3m wide firebreaks along the northern (already cleared) and western boundary of this lot, the 1m which will be added to the fire services access route along the eastern boundary and part of the southern boundary of this lot, and around the proposed building as well as driveway to the building. Clusters of native vegetation which form landscape corridors across the proposed Rural Conservation lots on Lot 9001. These clusters can be up to 2500m² in size, provided that a separation distance a minimum of 20m is maintained between clusters and between houses and clusters. Clusters of vegetation up to 2500m² can be retained on the proposed lots within Lot 2. These clusters can also be up to 2500m² in size, provided that a separation distance a minimum of 20m is maintained between clusters and between houses and clusters. 	<p>Extent of clearing for fire protection is noted. The Officer's Recommendation requesting a fuel load assessment should provide the information to make an assessment of the extent of clearing/modification to vegetation. As this is a joint scheme amendment to rezone the sites to residential R2 and Rural Conservation vegetation retention is considered a priority of this development, the Bushfire Management Plan will be guided by the Biodiversity Strategy in relation to appropriate areas for retention & clearing.</p>
	<p>3. There will be more traffic in the area as there is no other access road other than Reserve and Sugar Gum roads. This will be bedlam should we have a fire. There is a need for more in and out of these areas.</p>	<p>Noting the existing approvals allow for 155 new lots into this area, and the fact that this proposal only proposes an additional 89:</p> <ul style="list-style-type: none"> The existing subdivision to the east of the proposed development of Lot 2 and Lot 9001 currently only has one access point – Sugar Gum Drive. This does not meet the requirements for access listed in the previous and the current Planning for Bush Fire Protection Guidelines (FESA & WAPC 2001 & Edition 2, FESA & WAPC May 2010). Both guidelines state that two different access routes should be available to the public. The road network in the proposed development on Lot 2 and Lot 9001 will connect the road network in the existing special rural subdivision to Reserve Road. This will provide two access points to Great Northern Highway for residents in the existing special rural subdivision as well as for residents in the proposed development. The design of the road network proposed for the development of Lot 2 and Lot 9001 meets the requirements of both the existing Planning for Bush Fire Protection Guidelines (Edition 2, FESA & WAPC May 2010) and the Planning for Bushfire Risk Management Guidelines (WAPC & DoP Draft May 2014.) <p>Notes:</p> <ul style="list-style-type: none"> In order to reduce the risk to residents, DFES recommends that residents leave well before a bushfire impacts on an area, rather than during the time a bushfire impacts on an area. Provided that this advice is followed, the relocation of residents can be undertaken in a controlled manner. 	<p>The Bushfire Management Plan guided by State Government requirements ultimately determines whether a subdivision is designed appropriately to reduce any possible risk to life. This development, as required by the Bush Fire Guidelines, proposes multiple access options which have been assessed by the Shire of Chittering's Community Emergency Services Manager.</p>



Submitter	Submission comments	Applicant response comments	Officer comments
		<ul style="list-style-type: none"> Houses in the proposed development are required to be constructed to comply with the Australian Standard for the Construction of buildings in bushfire-prone areas AS3959. This would allow residents to shelter in their homes during the passage of a wildfire, reducing the need to evacuate the area late, when a bushfire is impacting on the area. 	
	4. The Great Northern Highway is already very busy with this many homes to be built it will be adding to the build-up of traffic already. The highway is terrible between Brand and Sugar Gum Drive.	As per the MRWA submission, a study is being undertaken for upgrades to the Great Northern Highway between Muchea and Wubin. The Great Northern Highway is a regional road and will be supplemented by the future Perth-Darwin Highway, which is located to the west of the subject land. The future highway is likely to divert traffic volumes from using Great Northern Highway and will increase the regional road capacity. It will be important to work with MRWA to ensure access to Great Northern Highway is maintained and safe access is provided at the two locations.	Noted. Access to the highway shall require an approved design through Main Roads WA. The Officer's Recommendation requests a Traffic Impact Statement is to be undertaken prior to the Development Plan being considered.
	5. There will be the need for extra services that are already working to capacity.	Consistent with the existing subdivision approval, infrastructure will be provided as follows: <ul style="list-style-type: none"> The applicant proposes to provide a reticulated water supply to the development, the future Muchea Employment Node and surrounding district. On-site effluent disposal systems are proposed for each household. These systems will treat effluent water to meet the Australian Drinking Water Guidelines. Stormwater and drainage will be managed effectively within the Development area with localised infiltration and site storage and recharge into existing aquifers. Preliminary information from Western Power indicates there is sufficient capacity to service the development with underground power. Preliminary information from Telstra indicates there is sufficient capacity to service the development with telecommunication services. Gas supply is not available and is not anticipated to be provided. 	Should the need for upgrade to existing services be required it would be at the cost of the developer. This will be determined at the subdivision stage, however, it should be noted that a water supply, underground power upgrade and designation of public open space would be provided if this subdivision is approved.
	6. Our native bush will be destroyed, especially the birdlife and marsupials and any other snakes, lizards etc that live in the area.	A 20 ha Conservation Lot will be created as part of the development that will be covenanted for conservation. This will retain habitat to be utilised by fauna, and will retain a linkage to surrounding habitat. The Rural Conservation Lots will retain as much vegetation as possible, with each lot having a maximum building envelope of 2,000m ² . It must be noted that clearing for the purposes of bushfire management (including fire service access routes, firebreaks and separation of vegetation from houses) is to achieve a balance between bushfire management requirements and environmental protection. This was considered in the design for the Development Plan.	Noted. The proposed Rural Conservation zone provides a better opportunity to protect vegetation and associated habitat through conservation covenants. The current Rural Residential approval would result in greater impact. Environmental Management Plans would make a condition of subdivision approval.
	7. People will bring in there cats and they do plenty of damage to the birdlife and the small animals. There are feral cats here now and they are known predator to the wildlife.	It is considered that the control of cats issue is more appropriately addressed at the local government level.	Cats are controlled by the Cat Act 2011 and relevant local law.
	8. The Banksia's in this area are a protected species, there are many more wildflowers here surely they should be protected not cleared.	The proponent's consultants, 360 Environmental, undertook a gap analysis to determine if any of the flora species, including the Banksias, identified are now listed as 'Priority' by the Department of Parks and Wildlife or as 'Threatened' under the Wildlife Conservation Act 1950 or EPBC Act. None of the flora species identified are currently considered to be of conservation significance.	Noted Applicant's response. Retention of vegetation for the objective of the Rural Conservation has been considered in the report.
	9. If scheme water is supplied will we in this estate have to pay for it to pass our property? don't think we should as we had to pay for a large rainwater tank to supply water. 10. This will bring crime to the area and the added bonus of hooligans racing around doing burnouts.	The proposed water supply will be made available to the broader community to access. The cost associated with this work will be largely dependent on the location of the property(s) relative to the infrastructure. Increasing the residential population of an area isn't necessarily going to result in an increase in crime in the area. In fact, increasing the residential population has the potential to provide increased passive surveillance through the presence of residential population and therefore deter and discourage unsavoury behavior in a locality. For the period January-May 2015 the following Crime Statistics are available from WA Police: Chittering – 3 crimes; Muchea – 2 crimes; Bindoon – 6 crimes. Crime statistics from WA Police for between 1999 and 2015 indicate: Chittering – 93 crimes; Muchea – 282 crimes; Bindoon – 278 crimes. It is noted that Chittering crime statistics are lower than for Muchea and Bindoon. The Development Plan does not propose fencing requirements for neighboring landholdings that are outside of the Development Plan area.	The Applicant is not proposing the reticulated potable water supply beyond this development area at this time and is not part of the Shire's consideration. Comment noted, however, there is no direct correlation between this proposed development and an increase in crime rate.
	11. I don't want to fence my property as I enjoy the lifestyle, natural bushland and kangaroos, Wallaby's that frequent this beautiful land. 12. What infrastructure is in place for this extra subdivision and future subdivision?	The Development Plan does not propose fencing requirements for neighboring landholdings that are outside of the Development Plan area. Infrastructure is discussed within Section 6 of the Development Plan Report. The proponent will be responsible for servicing the development.	Noted. The Applicant proposes the provision of a reticulated potable water supply as well as other essential services such as phone and power. The development also proposes the provision of Public Open Space with community infrastructure.

Submitter	Submission comments	Applicant response comments	Officer comments
	13. Further more why do we need a satellite town in this area? What future employment is set in place for population of this development?	It is recognised that the Muchea Employment Nodes should be supported by a local workforce. Population growth within the Shire is seen as an important contributory towards ensuring available jobs are taken up by residents. The development provides a close living option for the future Muchea workforce.	The proposed development is not considered to be a 'satellite town'. The development is for low density residential subdivision due to availability of reticulated potable water. The Muchea Employment Node is a regional strategic industrial development site which is considered to provide employment opportunities. Furthermore the Shire's proximity to the Perth metropolitan area results in many residents maintaining their work arrangements outside of the Shire.
	I think these blocks are far too small for this subdivision and hopefully the Shire of Chittering will take into account the submissions sent to them from this Estate.	The Development Plan addresses the relevant aims of the Local Planning Strategy, and approaches the development of the land for a mix of lot sizes that are reflective of the land capabilities as well as the feasibility and viability for the provision of necessary infrastructure such as reticulated water supply.	Noted. All submissions are noted and considered.
Public B	We wish to register our objection to part 1 of the proposed scheme amendment regarding the rezoning of Lot 2 Reserve Road from Rural Residential to Residential R2.	Noted.	Objection noted.
	Shire of Chittering Town Planning Scheme No 6 Local Planning Policy No 32 Development Plans (herein LPP No 32) 5.6 C) iii) states that where the amendment proposes to increase the number of lots the attitude of existing nearby landowners and residents must be taken into account.	The submitted Development Plan and Report has addressed the requirements of LPP 32 and in particular section 5.6 c) iii). In considering the proposal, the Shire has advertised the proposal to surrounding residents. As part of its consideration, submissions received are interrogated by the Shire to determine if issues are addressed or if further modifications to the proposal are required.	The Shire advertised the proposed Development Plan and rezoning to all residents of Chittering R2 estate by letter. Whilst it is understood there are concerns regarding the intensification of this site, it is considered that this site and surrounding land is capable of sustaining this intensification, in addition the provision of reticulated water is considered to be a positive contribution to the Shire of Chittering which is currently very under serviced.
	It is noted that the applicant is happy to work with the Shire and local community to address issues as they arise. In this regard, modifications addressing issues raised by the Chittering Landcare Group were submitted to the Shire on behalf of the applicant, on 22 May 2015 (within the advertising period). This resulted in modifications to the Development Plan, and a subsequent reduction in lot yield.	Noted.	Noted. However, it is considered that this proposed Development Plan is appropriate for the Shire of Chittering and surrounding subdivisions.
	The rezoning of this previously approved subdivision to R2 is not in keeping with rural amenity of surrounding subdivisions, nor indeed that of the Shire of Chittering in general.	Through discussions with Shire Officers and the Department of Planning, there was an expressed desire for development density to be increased given: <ul style="list-style-type: none"> its close proximity to Muchea Employment Node and need to deliver living options for workers nearby the need to deliver a potable water supply scheme capable of supplying the Muchea employment Node and the district in general the desire to deliver 20ha of land for conservation purposes consistent with the Shire's Local Biodiversity Strategy Noting the existing approvals allow for 155 new lots into this area, and this proposal only proposes an additional 89 lots.	The proposal for Residential R2 development on Lot 2 is not considered to detriment the rural amenity or character of the Shire. Currently Lot 2 is vastly cleared of remnant vegetation and the current approval on Lot 2 is for Rural Residential lots of 1ha. The Shire of Chittering is currently reviewing its existing Local Planning Strategy to ensure it accurately reflects the needs of the Shire of Chittering.
	Access to the currently approved subdivision of Lot 2 Reserve Road and Lot 9001 Rosewood Drive is via Rosewood Drive, Ghostgum Ridge and Sugargum Drives or via Reserve Road. These roads currently provide access to a combined total of 92 properties. The currently approved subdivision providing for 155 new lots will significantly increase the vehicle movements along these roadways. To allow a residential development of R2 scale on Lot 2 Reserve Road will further increase the demands on these roads as they would be providing access for a further 91 properties above the already very large increase. This situation is not acceptable to residents and owners who brought properties in quiet rural and rural residential streets.	Access to the proposed development is taken from Reserve Road, whilst providing road connectivity to the eastern rural residential lots via Rosewood Drive. It is anticipated, however, that Reserve Road would cater for the majority of vehicle trips. As such, traffic through existing rural residential subdivisions will be lessened, with vehicle trips being made via Reserve Road.	The Reserve Road area has been identified for Rural Residential type development in the Local Planning Strategy for some time. It is believed the increase in use of the local roads can be addressed through required upgrades.
	Further to this 5.6 C) v) of LPP No 32 states that the development plan should address the additional motor traffic generated by the increased population and at 5.6 D) ii) 'In considering amendment to a development plan that increases the number of proposed lots the council may request the applicant to remedy any identified deficiency in relation to road...resulting from the needs of the increased population, prior to approval of the amended Development plan'. Reserve Road is clearly in need of upgrade if this	The Development Plan results in an overall increase of 89 lots in comparison to the current subdivision approvals for Lot 2 Reserve Road and Lot 9001 Rosewood Drive. The current approved Development Plan has been approved by the Shire of Chittering and Western Australian Planning Commission. The modified Development Plan for both lots is for 244 lots, an increase of 89 lots overall. It is considered a further 89 lots would not have a significant impact on the road capacity of Reserve Road.	The Officer's Recommendation requests the Applicant undertake the necessary studies required by Main Roads WA for the purpose of assessing the Development Plan.

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	<p>amendment is to be approved as the first approximate 1km of sealed roadway from Great Northern Highway towards the proposed subdivision has sections in need of repair and the second approximate 1km is gravel road and therefore not suitable for this largely increased volume of traffic.</p>	<p>Reserve Road, along the western boundary to Lot 2, is currently 20m wide. Through the Development Plan, the landowner will be ceding 10m of land from the western boundary, to result in a road reserve width of 30m for Reserve Road.</p> <p>In addition, requirements to upgrade Reserve Road will be negotiated and agreed with the Shire.</p>	
	<p>LPS 2001-2015 already has provision for the creation of a new town site (Future Urban Node) and as referenced in the Shire of Chittering Economic Development Strategy 2015-2025 will provide accommodation and other infrastructure requirements for the increased workforce needs of the Muchea Employment Node. This location on the western side of Great Northern Highway is much better suited to higher density residential development as it will be directly accessed from Great Northern Highway to the east and the planned Perth-Darwin highway to the west, thus not affecting current owners and residents in rural properties and rural residential subdivisions.</p>	<p>Through discussions with Shire Officers and the Department of Planning, there was an expressed desire for development density to be increased in this location, building on the existing community in addition to other locations identified within the Shire.</p>	<p>The Applicant is not proposing to replace the 'Chittering new town'. The proposal to rezone to a higher density has been determined on the basis of the availability of reticulated potable water supply. The result of residential development in close proximity to the 'new town site' would likely result in more demand of such a development. Furthermore the construction of reticulated water supply provides greater opportunities of various developments in the Shire which is currently restricted by lack of available water. As mentioned above the Local Planning Strategy is currently being reviewed as it is due to expire this year.</p>
	<p>LPS 2001-2015 indicates that the development of this new town should be deferred 'until such time as Bindoon achieves a high level of development', yet this development plan seeks to increase the number of lots (246) available in Reserve Road/Rosewood Drive development to within a similar number of lots (291 -Local Planning Policy No. 1) as provided by the Bindoon Country Club Estate.</p>	<p>The consideration of modifications to the Development Plan was in context to the Townsite of Muchea and the future Muchea Employment Node. There are advantages in providing additional residential population within reasonable commuting distance from the future Muchea Employment Node.</p>	<p>Noted. As mentioned above this proposal is not for 'new town' and is simply seeking approval for a higher density residential development with the provision of reticulated water supply. Additional intensification of land can only occur if services are made available.</p>
	<p>We feel it is not necessary to provide for higher density residential areas above that of a rural residential zoning within the Shire of Chittering, with the exception of the existing Bindoon townsite area or the Future Urban Node.</p>	<p>Noted.</p>	<p>Noted. The proposed rezoning is to be considered by Council.</p>
	<p>The Shire of Chittering should be developed according to local planning policy.</p>	<p>The Development Plan has been prepared having regard to the Shire's local planning framework.</p>	<p>Noted. All development and decision making is guided by policy in the Shire.</p>
	<p>In reference to part 2, 3 and 4 of the proposed Amendment 55 we have no objections as this is in keeping with local planning strategies and will increase amenity of the Shire of Chittering.</p>	<p>Noted.</p>	<p>Noted.</p>
Public C	<p>We, as residents of Chittering Rise strongly object to this proposed Scheme Amendment and offer the following comments and concerns in support to this objection:</p> <p>1. This proposed amendment and the new estate is completely incompatible with the area and especially Chittering Rise. Chittering Rise consists of approximately 71 sizable bush block lots with a number of caveats on clearance and land use dedicated to the preservation of native fauna and flora. What is proposed and its connection directly to the rear of Chittering Rise is more akin to an urban development in comparison to the Chittering Rise estate. Note Chittering Rise is now zoned Rural Residential because of the size of the properties and will have a GRV rating. These new properties will adversely impact on the GRV values of Chittering Rise properties. What will be the rating of this urban development?</p>	<p>The subdivisional design considers and responds to the physical and environmental sensitivities of the land. Smaller lots are proposed over Lot 2 Reserve Road due to it being cleared of remnant vegetation (former use as a plant nursery). Larger lots are proposed adjacent the existing rural residential lots to the east to provide increased vegetation retention buffers where possible. All dwellings on rural residential lots to the east are generally centrally located within their properties to enhance buffering to the Lot 2 development.</p> <p>The Shire will be responsible for determining rates for the development area. With regards to land values, these are not a material planning consideration. Other factors have a bearing on the land value of a property that cannot be controlled by local government and are outside of the planning system (i.e. regulatory changes to home ownership or development requirements, changes in interest rates, changes in unemployment (or job growth/cuts in the local economy), shifts in the housing market, general demand/supply for housing etc.).</p> <p>Access to the proposed development is taken from Reserve Road, whilst providing road connectivity to the eastern rural residential lots via Rosewood Drive. It is anticipated, however, that Reserve Road would cater for the majority of vehicle trips. As such, traffic through existing rural residential subdivisions will be lessened, with vehicle trips being made via Reserve Road.</p> <p>Rosewood Drive has always been proposed to be extended under the existing approvals to create 155 lots. This new proposal seeks to increase the lot yield by 89 lots only.</p> <p>Importantly, connections between Rosewood Drive and Reserve Road are considered essential to enhance public safety with respect to fire management requirements and ensure two access and egress points to Great Northern Highway for the area.</p>	<p>Objection noted.</p> <p>Lot 2 is predominantly cleared with existing wildflower plantings from the previous business venture. It is not considered increasing density on Lot 2 is incompatible. The development of Lot 9001 is to retain and protect the conservation values of the site and provide a better outcome than currently approved. Your concerns regarding rating are noted, however do not make part of the planning decision process.</p>
	<p>2. This proposed amendment and estate will definitely increase traffic to and through Chittering Rise to the detriment of Chittering Rise's amenity and the safety of the estates children, fauna and environment. At the present Chittering Rise, with about 71 lots, enjoys being a "no throughway" area where only local traffic comes into or goes out of the estate via Sugar Gum Drive to Great Northern Highway. To connect both ends of Rosewood Drive to this new estate with its proposed 246 lots will more than quadruple traffic and all its associated impacts on the amenity, lifestyle and safety of Chittering Rise residents. This connection will result in and will encourage of course through traffic especially with any road works and the upcoming works to Great Northern Highway.</p>		<p>The roads of Chittering Rise were designed for future connection with Lot 2 and Lot 9001. The use of the roads would increase as a result of this development being approved and developed, however the interconnectivity of roads would improve for the benefit of residents. As detailed above a Traffic Impact Statement will be required prior to the Development Plan being presented to Council for consideration.</p>

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	3. Further, it will also increase the size of vehicles and the speed of this additional now through traffic to the detriment of Chittering Rise residents including local children. Already we experience excessive speeds of some existing residents and the odd hoon and criminal activity so to compound it with the connection to the additional traffic and through traffic is going to add to this safety issue, increase opportunities for crime and antisocial behaviors.	The issues regarding vehicles exceeding local speed limits and vehicle-related behavior are a police matter. The applicant will consult with the Shire at detailed road design to identify what traffic management techniques can be implemented to address these concerns.	Road infringements are not a consideration of this proposal. The RAV rating for the proposed roads would be the same as Chittering Rise and therefore not result in larger vehicles.
	4. This additional traffic is going to considerably add to the level of noise impacting the amenity at Chittering Rise. As you are aware there are already major issues at Chittering Rise with the sole trucking business still running their trucks along Chittering Rise roads. Also there are existing issues with trail and quad bike riders using the strategic fire breaks and sometimes our roads as their private speedways. This proposed estate will increase the number of truck throughput, trail and quad bike abuse of the Chittering Rise road and firebreak system and their incidents within Chittering Rise.	The issues relating to a local trucking business are not relevant to the proposed Development Plan. The management of unauthorised vehicles on the existing 'strategic firebreaks' in the special rural subdivision to the east of Lot 2 and Lot 9001 is beyond the control of the proponent.	It would be expected most traffic would travel via Reserve Road due to most trips predominantly being south of the site. The increase in noise on the road due to higher use is not a consideration due to the substantial road widths and setback to dwellings. The unauthorised use of the strategic fire breaks are a compliance matter and options to improve this issue will be assessed.
	5. The plan does not show any speed mitigation whatsoever. This should and has to be a major requirement.	Traffic management is not typically documented at the Development Plan phase and will be addressed through the detailed design phase of the project. The proposed road network is considered to cater for a 50km/h local speed environment.	The Engineering design drawings are submitted and dealt with at subdivision stage. The application is for proposed rezoning and Development Plan approval.
	6. This new estate while connecting to Reserve Road and then to Great Northern Highway has a number of internal roads proposed in this new estate but with its double connection to Rosewood Drive this bulk of new traffic will be forced to then funnel down to a single road (Sugar Gum Drive) to exit through Chittering Rise to Great Northern Highway. To have an easily accessible connection to Chittering Rise is going to exacerbate all of these issues above and will become a major safety issue especially at the Chittering Rise entry at Sugar Gum Drive and Great Northern Highway. As the Highway is a major traffic and truck route north and south it will only be a matter of time before this increased traffic entering and exiting causes a major accident. Chittering Rise roads and this entry intersection point was not made or designed to be a major thoroughfare or that intersection at the Highway to handle that amount of additional traffic. Note also Chittering Rise has a number of young children and during the morning and afternoon is a school bus route.	Access to the proposed development is taken from Reserve Road, whilst providing road connectivity to the Great Northern Highway (east) via Rosewood Drive. This route to Great Northern Highway is somewhat circuitous and therefore less likely to be utilised over the more direct Reserve Road connection. As such, it is anticipated that Reserve Road would cater for the majority of vehicle trips.	Mentioned previously, the Shire believes that traffic from the proposed development would travel mostly via Reserve Road. Chittering Rise was designed with future connection to adjoining developments. The Traffic Impact Statement, requested in the Officer's Recommendation, is designed to assess and address this concern.
	7. This proposed estate is also going to have a detrimental impact on the local fauna, flora and environment. The sheer addition of (at 3 persons per lot estimate) could increase the population by nearly 1000 with all its associated environmental pressures. Add the through traffic to this equation will mean that the local fauna will be decimated.	The 20ha Conservation Lot and proposed east-west landscape corridors will retain habitat to be utilised by fauna and will retain linkages to surrounding habitat. Revegetation of local native species will also occur within the development, for example within the road reserves, in the lots and in the public open space. It has been determined that services are available, or will be provided by the proponent such as reticulated water supply, and are capable for the proposed development.	The proposed Development Plan aims to retain a 20ha portion of existing vegetation on Lot 9001 and reduce the impact on the site with clustered development. This will assist in the protection of local fauna habitat. Additional environmental management plans would be required at subdivision stage.
	8. As with some of the other estate developments if developed there will be a large number of properties undeveloped for a long time and even more so with the current down turn in the WA economy. This will mean that these roads will become a draw card for hoon activity which you would be very aware is an ongoing issue in and around Chittering and Bullsbrook. There is simply no good reason for this development to occur or proceed as there are already a glut of these type of properties in the Chittering Shire, vacant, on the market and/or undeveloped.	The staging of development will be determined by the proponents and guided by market conditions and demand. Road construction generally will occur as staging of development progresses and lots are sold. The issues regarding vehicles exceeding local speed limits and vehicle-related behavior are a police matter.	Market demand is not a planning consideration. Generally a developer will stage a development based on sale of those lots.
	9. This estate, if developed will of course reduce existing owners' properties values especially for those, like us, in Chittering Rise.	Refer to comments to point 1 of this submission.	Property values are not a planning consideration and are subject to various matters beyond the planning framework.
	10. Lot 9001 is currently native bushland. To partly turn this into these 40 small allotments will effectively mean the clearing of this native bushland. This is against current Shire and State Government environmental native bush clearance policies. The proposed public open space is currently a cleared block and far too small for the number of likely residents.	The proposed Development Plan redesign for Lot 9001 Rosewood Drive results in a reduction in the number of lots from the approved Development Plan, from 45 lots to 35 lots and one 20ha Conservation Lot, which is a significantly improved conservation outcome for the community.	The extent of clearing of the Rural Conservation lots is to be further assessed for consideration of the Development Plan. The rezoning from Rural Residential to Residential R2 requires the provision of Public Open Space in accordance with State Policy.

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	<p>11. It is noted that the proposed estate will allow for in the Conservation Zone for Bed and Breakfast and Home Businesses and in the Residential R2 allow for the establishment of Home Businesses, Accommodation, Cottage Industry and Public Utility again all completely incompatible with Chittering Rise as rural residential/bush blocks. As this sets a precedent for this type of zoning and activities mix there will be pressure on the Shire to allow these activities to be undertaken elsewhere including Chittering Rise. These activities by themselves will also increase the through traffic and non-residential traffic.</p> <p>12. There is no buffer zone between this proposed estate and Chittering Rise. These lots directly about Chittering Rise and are very small compared to Chittering Rise lots which will encourage negative activities and pursuits off their respective small lots in this estate. If it is to have any Shire support then the developer should allow for a buffer zone and appropriate containment fencing to restrain traffic, and anti-social behavior from impacting Chittering Rise. Also if supported the Shire should insist on speed mitigation infrastructures throughout. NB: This will increase the need for and add to the cost of the Shire's Ranger Services to manage and police this area if developed. It will also be a further drain on the Shire's resource at every level.</p>	<p>As part of the proposed development a 20 ha Conservation Lot will be created that will be covenanted for conservation. This will retain habitat to be utilised by fauna and will retain a linkage to surrounding habitat. The large Lot sizes proposed for the development, particularly within Lot 9001, have been designed in a way to retain as much vegetation as possible and to reflect the natural landscape that the site forms part of. Revegetation of local native species will also occur within the development, for example within the road reserves, in the lots and in the public open space.</p> <p>The lots within Chittering Rise are zoned 'Rural Residential' under the Shire's Scheme. The land uses referred to (Ancillary Accommodation, Bed and Breakfast, Home Business, Industry – Cottage and Public Utility) are all land uses listed in the Zoning Table as 'D' discretionary or 'A' discretionary uses subject to advertising, within the 'Rural Residential' zone.</p> <p>Landowners in areas zoned 'Rural Residential', such as the Chittering Rise area, already have the ability to apply for planning approval for any of these uses with the Shire of Chittering, as such this approach is consistent with the land uses possible within Chittering Rise.</p> <p>There is no requirement to have a buffer between residential land uses. The buffer requirements for the potable water supply system will be contained within that lot, and do not have an impact on nearby landholdings. No other land uses would be proposed within the Development Plan area that would require a buffer.</p> <p>Firebreaks and Fire Service Access Routes are provided where required, in accordance with the Fire Management Plan.</p> <p>Development or use of land may have impacts on the amenity of the area, which is a material planning consideration (pursuant to clause 10.2 of the Scheme). Amenity may be considered in a variety of ways and the planning system aims to maintain or improve the amenity of the locality, from a site specific to a regional extent. Amenity issues include (but not exhaustive):</p> <ul style="list-style-type: none"> – Sunlight access into the development and neighboring development; – Overshadowing and loss of outlook (but not loss of views); – Overlooking and loss of privacy; – Noise or disturbance, including from hours of operation different to neighbouring uses; – Odours; – Loss or effect on trees and vegetation, including conservation or biodiversity values. <p>In assessing applications for planning approval, the Shire would have regard to matters of amenity. The Development Plan seeks to address these matters, as far as possible through the placement of building envelopes, vegetation retention areas, road access etc.</p> <p>Issues mentioned in this summary are addressed in the preceding responses.</p>	<p>The land uses are controlled by the Shire's Town Planning Scheme and are simply reflected on the proposed Development Plan.</p> <p>Buffers are not required between residential developments. The containments of residential development from one another is not considered practical or reasonable on planning grounds.</p> <p>Objection and reasons noted.</p>
Public D	<p>We therefore strongly recommend the Shire does not support this proposed amendment and development.</p> <p>We oppose the proposed rezoning of Lot 2 Reserve Road, Chittering from 'Rural Residential' to 'Residential R2'.</p>	<p>Approved Development Plans are in place for both sites. A Development Plan was endorsed for Lot 2 Reserve Road on 17 December 2007. A Development Plan for Lot 9001 was granted by the WAPC in June 2009. These approvals predate the submitter's purchase date of "5 years ago".</p>	<p>Objection to rezoning and Development Plan noted. Lot 2 and Lot 9001 are zoned Rural Residential and have existing subdivision approvals. Lot 9001 lot yield has not altered significantly however it is sighted a proposed road reserve would adjoin a strategic firebreak which adjoins Lot 888.</p>

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	<p>We also oppose the Development Plan proposing a total of 246 lots ranging from 5,000m2 with the provision of reticulated potable water supply. Reasons for our opposition are:</p> <p>1. We purchased within Chittering Rise for the rural setting and wildlife. We reside at Lot 888 Rosewood Drive. Surrounded by other 2 hectare or larger properties and strategic fire breaks on one side and to the rear. After contact with the council (verbally) we were told there were no planned subdivisions to either the side, or back of the lot. After purchasing and building our house we found there was a proposed plan in place with 5 lots to be at the side of our property. However, the rears of these lots were to be towards our side fence and would not significantly effect our property. Now, under this proposal we are to have a 2 road frontage and 5 houses facing towards our property. This will destroy the rural setting we purchased merely 5 years ago.</p>	<p>It is not a requirement under the Planning and Development Act 2005 that subdivision applications be advertised by the Western Australian Planning Commission or local governments, nor the determinations of subdivisions be made public. However, subdivision approvals currently apply to Lot 2 Reserve Road and Lot 9001 Rosewood Drive. Subdivision approvals for Lot 2 Reserve Road date back to 2007, with the current subdivision approval dated December 2011. The current subdivision approval for Lot 9001 Rosewood Drive is dated from June 2009.</p> <p>It should be noted, with the exception of road interface along the northern boundary of Lot 888, the number of lots and size of the lots interfacing with Lot 888 is generally consistent with the current approvals. Five lots are approved on the subdivision plan along the northern boundary, the Development Plan now proposes four lots. Two lots interfacing on the western boundary are proposed under both the approved subdivision plan (2009) and the proposed Development Plan (2015).</p> <p>It should be noted the Vegetation Retention Areas to the fronts of the properties will also provide a degree of screening between new houses and the existing house on Lot 888. Shared crossovers proposed along the new road along the northern boundary aim to maximise vegetation retention and buffering to Lot 888, and reduce the number of access points.</p>  	
	<p>Our house is located to the side of the property and we will not have any privacy as a result of the second road proposed up the side of our property and 5 houses facing into our property. We have already moved the location of our building envelope to allow for our future plans to build another shed. This location of the road will not allow us to build another shed as planned.</p>	<p>Above: L: Subdivision Approval excerpt (June 2009); R: proposed Development Plan (May 2015).</p> <p>The proposed road will be wholly contained (and subsequently ceded from) Lot 9001 Rosewood Drive. Clearing of the Fire Service Access Route will be undertaken in accordance with the requirements of the Fire Management Plan. The proposals on Lot 2 and 9001 should not impact the owner's ability to build a shed within Lot 888.</p> <p>An intention of the Development Plan is to retain clusters of vegetation on proposed lots and require shared crossovers to maximise vegetation retention along the lots proposed within Lot 9001, which will contribute towards the screening of new houses within building envelopes.</p>	Noted concern of adjoining road.
	<p>We strongly oppose the location of a new road to the side of our property.</p>	<p>See comments above.</p> <p>In addition, the road location along the northern boundary of Lot 888 has been selected to:</p> <ul style="list-style-type: none">– Minimise further clearing by utilising existing cleared land;– Address fire management concerns raised by the Shire and existing Chittering Rise residence to ensure a second and direct egress point to Reserve Road along the northern boundary of Lot 2.	Noted.

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	<p>2. The increase in traffic will place our children and those walking/running within Chittering Rise Estate at risk. Children currently living within Chittering Rise regularly ride on the roads - in particular along Ghostgum Ridge and Sugar Gum Drive. They correctly ride on the road, however, due to bends on the roads it is difficult to see a child who is not riding right on the edge. Increased traffic will increase the risk significantly of one of our children being seriously hurt. Similarly, those walking and running must do so on the road. There are no established footpaths throughout the area with the road being the only safe place to walk. Increased traffic will increase the risk of injury to those walking or the dogs they may be walking.</p> <p>3. The roads within the area (including Great Northern Highway) are not sufficient to support the increased traffic of approximately 500 extra cars a day. Entering Great Northern Highway from Reserve Road is currently difficult with limited vision of oncoming traffic. Increasing the vehicles using this intersection will increase the risk of serious accidents. The roads throughout Chittering Rise Estate itself contain many crests and blind corners.</p> <p>4. A development of this size will clear a large amount of the habitat for the wildlife in this area. Loss of the habitat will put strain on those areas still maintained as native bush including our own lot. Loss of wildlife will not only occur within the areas cleared but also in surrounding areas (such as our property already established within Chittering Rise). We have been careful to maintain the majority of our property as native bush allowing the birds, kangaroos, bobtails, echidnas, snakes etc a safe and undisturbed area together with neighboring properties (including the proposed development site). Allowing 246 lots of a smaller size will inevitably destroy the native habitat to a much greater extent than larger properties (i.e. 2 hectare or greater) as required under the rural residential zoning.</p> <p>For example, we regularly have a mob of 10 to 15 kangaroos on our property. A road next to our property and smaller properties will destroy the habitat for these kangaroos as well as place them at risk of being hit.</p> <p>Increased traffic will also place the wildlife at risk. Most residents currently travel at a speed and with alertness sufficient to prevent wildlife and animals being hit. Additional traffic will increase the number of injured wildlife within the area.</p> <p>5. Chittering Rise currently has an issue with dogs roaming the area. 246 additional lots will increase the severity of this issue. I have lost count of the number of times dogs having been roaming the road and our property.</p> <p>6. Small lots of merely 5,000m² and a total of 246 lots do not fit within the rural setting of the area.</p> <p>7. The water supply we rely on includes both rain water tanks and the use of bore water for garden use. Should this water be used and abused by 246 lots new households, this water supply will not be able to be maintained to both the quality and depth it currently is. This needs to be considered and addressed ensuring the current residents are not effected by excessive use of bore water.</p> <p>In addition to this, we do not wish to be forced to use the reticulated potable water proposed for the development. We are a neighbouring property and do not wish this to be forced upon us. We are currently highly self sufficient within our household and do not wish this to be restricted.</p> <p>8. Strategic fire breaks are in place for use by emergency vehicles. The fire breaks are currently being misused by many for recreational activities such as riding of quad bikes, motor bikes and even as roads at all hours of the day and</p>	<p>The proposed internal roads will incorporate road design measures to the specifications and satisfaction of the Shire. The proposed design includes interconnected road networks with 20m wide road reserves, and roads are proposed to be sealed. Appropriate road reserve widths and sealed roads will be important to maintain a safe street network, as well as to allow for shared use by pedestrians, cyclists and motorists.</p> <p>Through detailed road design, the applicant will work with the Shire to ensure traffic calming is incorporated into the road network, and where appropriate, to limit vehicle speeds.</p> <p>Refer to comments for the MRWA submission, regarding Great Northern Highway and the existing intersection with Reserve Road.</p> <p>The proposed Development Plan redesign for Lot 9001 Rosewood Drive results in a reduction in the number of lots from the approved Development Plan, from 45 lots to 35 lots and one 20ha Conservation Lot, which is a significantly improved conservation outcome for the community.</p> <p>As part of the proposed development a 20 ha Conservation Lot will be created that will be covenanted for conservation. This will retain habitat to be utilised by fauna and will retain a linkage to surrounding habitat. The large lot sizes proposed for the development, particularly within Lot 9001, have been designed in a way to retain as much vegetation as possible and to reflect the natural landscape that the site forms part of. Revegetation of local native species will also occur within the development, for example within the road reserves, in the lots and in the public open space.</p> <p>The applicant can work with the Shire to identify what road design considerations can be incorporated, as appropriate.</p> <p>The proposed internal roads will incorporate road design measures to the specifications and satisfaction of the Shire. The majority of internal roads will be designed to be generally straight, which will assist in providing sufficient sightlines for motorists to see pedestrians and cyclists, as well as to identify and avoid wildlife.</p> <p>The Shire's rangers are responsible where appropriate to impound dogs, issue warning and infringement notices on offending dog owners, investigate dog attacks and any other matters under the Dog Act 1976.</p> <p>Through discussions with Shire Officers and the Department of Planning, there was an expressed desire for development density to be increased in this location, building on the existing community in addition to other locations identified within the Shire.</p> <p>The proponent has appropriate Water Licences to extract ground water for the proposed development. In addition to extract ground water for use within the future Muchea Employment Noted and surround area. Groundwater extraction is metered and monitored by the Department of Water.</p> <p>The Development Plan does not propose reticulated water connections to existing dwellings within the Rural Residential subdivision to the east. This water will be available to the existing community but not mandated.</p> <p>– The management of unauthorised vehicles on the existing 'strategic firebreaks' in the special rural subdivision to the east of Lot 2 and Lot 9001 is beyond the control of the proponent.</p>	<p>The informal shared use of the roads is acknowledged. Effective use of pedestrian signage and traffic calming would be required for the road design at the subdivision stage however the Development Plan is assessed in line with Liveable Neighbourhoods which considers these issues. The Traffic Impact Statement required will also determine if the proposed road networks are appropriate for this area.</p> <p>The use, design and upgrade of local roads would be required at the subdivision stage. The intersection of Reserve Road with Great Northern Highway would be subject to Main Roads WA approval which has been requested in the Officer's Recommendation prior to the Development Plan being considered.</p> <p>Noted. The proposed Rural Conservation zone and design of Lot 9001 greatly improves on the retention of existing vegetation from what is currently approved for Rural Residential.</p> <p>The retention of vegetation and habitat of local fauna by design will assist in this issue and reduce fauna fatalities.</p> <p>The Shire acknowledges increase in traffic increases risk of fauna injury/fatalities however the proposed rezoning and Development Plan design provides for retention of vegetation and habitat land to reduce the movement of fauna over roads.</p> <p>The Dog Act 1976 deals with the control of dogs.</p> <p>The rezoning of Lot 9001 provides opportunity for greater protection of vegetation, assisting with maintaining the rural setting. Lot 2 is not considered to have environmental assets and the rural character of the property as a wildflower farm is proposed to be maintained as indicated in the Landscape Master Plan. 5000m² lots are still 10x the size of the average residential lot in other areas.</p> <p>The bore required to extract groundwater for potable water supply is much deeper than domestic bores. The property has an existing Water Licence to extract an allocation of water.</p> <p>The application does not propose the reticulated water supply beyond the subject area.</p> <p>This is an ongoing compliance matter, however, it is considered that this comment is too subjective to be considered as part of this proposal.</p>

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	<p>night (this is not just locals to the area, but also from out of area). The council has not provided a solution to date for the activities and have not even fixed damaged or removed gates. A development of 246 small lots in a rural setting will increase the abuse of the strategic fire breaks. The dust and the damage to the fire breaks will greatly increase.</p>	<ul style="list-style-type: none"> Primary access for fire appliances to the proposed development and within the proposed development of Lot 2 and Lot 9001 is based on the public road network. Three relatively short easements for fire service access routes ('strategic firebreaks') are shown on the draft development plan for Lot 2 and Lot 9001. These fire service access routes are designed to provide access for fire appliances between the proposed new road network and the existing 'strategic firebreaks' which were established for the special rural subdivision to the east of Lot 2 and Lot 9001. The three easements for fire service access routes are located on private properties. Gates will be installed where these fire access routes connect to a road or to the existing 'strategic firebreaks'. Gates can be locked, provided that fire crews have a key to these locks. This is usually achieved by installing locks which can be opened by a common key held by brigades and the Shire of Chittering. This allows owners to control unauthorised vehicles on the three fire service access routes shown on the draft development plan. <p>Note:</p> <ul style="list-style-type: none"> The developer could, in partnership with the Shire of Chittering, repair existing gates or install new gates to restrict access on the existing 'strategic firebreaks' in the special rural subdivision along the eastern boundaries of Lot 2 and Lot 9001. 	
	<p>Issues that need to be addressed more fully prior to considering any development at this location include:</p> <p>9. Bus stops do not appear to have been incorporated into this plan. The current Chittering Rise bus stop is not adequate for the current residents of Chittering Rise Estate. Too many children currently attempt to board buses between 8:00am and 8:12am making it unsafe. Increasing the students within the area without adequate bus stops will increase the danger of our children.</p>	<p>The applicant can undertake consultation with the Public Transport Authority and Shire of Chittering for the provision of bus stops as part of detailed subdivision design and staging of the development.</p>	Noted.
	<p>10. Buses servicing our local schools are already full. Even with an extra bus put on to take Bullsbrook College children to school, the bus is full. At last contact with the driver of the Bullsbrook bus, there were 62 enrolled students on a 56 seat bus causing younger students to be seated 3 to a seat. In addition, new students are not able to get on the bus. A development of this size will lead to extreme pressure on bus services. Students in Bindoon are already at a disadvantage trying to get on a bus to Bullsbrook College as they are classed as complimentary even though Bullsbrook may be the most appropriate school for them to attend.</p>	<p>The School Bus Services branch of the Public Transport Authority manages orange schools buses around the State. The PTA reviews school bus routes to maximise service delivery and efficiencies. It is understood a review was conducted in Bindoon, Gingin, Lower Chittering, Muchea and Bullsbrook in 2008 and new services commissioned in June 2009 (http://www.pta.wa.gov.au/Portals/0/annualreports/2008/school-bus-services.html). Through consultation with the PTA, the review of services commensurate with the staging of development over Lot 2 Reserve Road and Lot 9001 Rosewood Drive may result in future service reviews.</p>	Residential development demand generally results in increased services for schools etc. Approval of developments are forwarded to state agencies like PTA for their strategic planning.
	<p>11. Consider information provided to residents established within the area as to future development. Placement of a road next to an established house where advice was provided by Council that no developments were planning is unfair and will cause a great loss of privacy. The advice was relied upon for various things including placement of our home and future plans for sheds and gardens.</p>	<p>The applicant is unaware of what advice has been provided by the Shire to the landowner regarding future developments. Note that Development Plans for Lot 2 Reserve Road and Lot 9001 Rosewood Drive were approved in 2007 and 2009 respectively. This modified Development Plan sought to increase the extent of remnant vegetation to be retained within a 20ha Conservation Lot; which has resulted modifications to lot layouts, lot yields and the internal street network to achieve the objectives of the design.</p>	Mentioned in previous comment. Lot 2 and 9001 have been subject to approved Development Plans and subdivision since 2007. The change in design and impact neighbouring properties is noted.
	<p>12. Crime has been of concern within the area with rural items being the most targeted items. How will increased crime be effectively managed with a development of this size?</p>	<p>Crime can be alleviated to some extent by having more people living within an area. With additional real or perceived passive surveillance within a local community, there can be a decrease in opportunistic crime.</p>	There are no 'design out crime' principles in rural areas or low density residential development such as what is proposed. However greater number of residences can be perceived as providing greater passive surveillance which can minimise criminal activity.
	<p>Maintaining a Rural Residential zoning, requiring a minimum of 2 hectare properties and reducing the number of lots would have many advantages for the area including:</p>	<p>The proposed Development Plan redesign for Lot 9001 Rosewood Drive results in a reduction in the number of lots from the approved Development Plan, from 45 lots to 35 lots and one 20ha Conservation Lot, which is a significantly improved conservation outcome for the community. An increased yield has been proposed over Lot 2 Reserve Road where substantial clearing has already occurred due to the previous activities on the site.</p>	The application to rezone to Residential R2 and Rural Conservation from Rural Residential is due to the availability to reticulate a potable water supply and the opportunity under the Scheme to increase the density.
	<p>Maintaining the rural setting of the area.</p>	<p>Additional vegetation is able to be retained on Lot 9001 through the modified Development Plan, which proposes 35 Rural Conservation lots and the creation of a 20 ha Conservation Lot. This is considered to be an improvement on the current approved Development Plan, which was approved for 45 lots and no Conservation Lot.</p>	The proposed Rural Conservation zoning for Lot 9001 is considered to be the appropriate zone in the Scheme for biodiversity value vegetated sites.

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	Reducing the risk to wildlife from harm.	Creation of the 20ha conservation lot in addition to the redesign of Lot 9001 which now proposes east-west landscape corridors whereby vegetation clusters would assist in facilitating the movement of fauna. These landscape corridors have been designed to minimise the number of road crossings.	Same comment as above.
	Protecting a larger portion of the habitat for the wildlife.	A 20 ha Conservation Lot will be created that will be covenanted for conservation. Refer comments to Point 4 above.	Noted. In comparison to the current Rural Residential approval on Lot 9001, the proposed zone and Development Plan provide for greater protection.
	Reducing the traffic and risk to our children enjoying the advantages of living within a rural setting.	Refer previous comments regarding designing an appropriate street network.	Appropriate road speeds would be considered at subdivision stage.
	Reducing the strain on the underground water supply.	The metering and monitoring of groundwater extraction is undertaken by the Applicant and reported to the Department of Water.	Noted. It is the Shire's understanding a Water License for a significant allocation already exists and therefore no additional unplanned strain would be required.
	Reduce the impact of established residents including those residing in Chittering Rise Estate and along Reserve Road.	The modified Development Plan aims to enhance the amenity of the locality and aims to minimise impacts upon the amenity of neighbouring lots. The Development Plan will result in a fire management plan that is consistent with the current requirements. The refinement of the design seeks to increase vegetation retention on Lot 9001. The characteristics and land capability of Lot 2 Reserve Drive can support an increase lot yield.	It is considered the access options to Reserve Road and the conservation zoning of Lot 9001 reduce the impact on Chittering Rise. The establishment of dwellings in the vicinity is identified in the Local Planning Strategy and is consistent with the residential development of the area, albeit a higher density due to availability of reticulated potable water.
Public E	1. Fire Management Plan - Current Fire Management Plan (Bushfires Act 1954) states that all properties which do not exceed 2.0 hectares are not required to have boundary firebreaks but pursue fire hazard minimization. Fire hazard controls would not be attainable for the 27 properties which surround the far western boundary of those persons currently owning property on Rosewood Drive and adjacent.	<ul style="list-style-type: none"> The Shire of Chittering Firebreak Notice for 2014-15 states that on lots which are less than 2 hectares, boundary firebreaks are not required, and that these lots should meet the requirements listed under General Fire Hazard Reduction. The design of the proposed development addresses vegetation management to meet the requirements of the Shire of Chittering Firebreak Notice and the Australian Standard for the Construction of buildings in bushfire-prone areas AS3959. The development design requires that a minimum of 20m separation is maintained between buildings and clusters of vegetation and between clusters of vegetation. Furthermore, clusters of vegetation should not exceed 2500m² in size. 	The Applicant has proposed connecting strategic firebreaks and roads with Chittering Rise to improve fire access. It is not understood how this impacts adjoining lots. Development of Lot 2 and Lot 9001 would provide better fire management and reduce the risk to Chittering Rise.
	Each property owner on Rosewood drive would be required to maintain their required firebreak clearing with their allotted two or three neighbours on condition that there were no boundary fences installed and that Rosewood Drive property owners had proper and easy exit points from their own property in case of a fire emergency.	Refer comments above and below.	Noted. The proposed lots on Lot 2 adjacent to the western boundary of Chittering Rise are split by a Public Access Way (PAW) which is Crown land managed by the Shire of Chittering for the purposes of emergency access.
	The current fire plan outlines the requirements of the residents of Rosewood Drive but exempts their neighbours. The likelihood of fire hazard build up in the adjoining neighbours' property would increase with the implementation of property fencing and also the reduction of suitable escape paths.	<ul style="list-style-type: none"> Fencing does not change the 'likelihood of fire hazard build up ... on adjoining ... properties'. The design of the proposed development addresses vegetation management to meet the requirements of the Shire of Chittering Firebreak Notice and the Australian Standard for the Construction of buildings in bushfire-prone areas AS3959. The development design requires that a minimum of 20m separation is maintained between buildings and clusters of vegetation and between clusters of vegetation. Furthermore, clusters of vegetation should not exceed 2500m² in size. It is generally not recommended that residents exit the area via firebreaks. 	All landowners would require to comply with an applicable Fire Management Plan and Shire Bush Fire Notice. The proposal would be subject to AS 3959 for design of dwellings in bush fire prone areas.
	1.1 Road Safety Management Plan - A Road Safety management plan is critical for the Fire Management Plan issue when reviewing accessible and easy exit points for the proposed residents of the planned housing estate.	<ul style="list-style-type: none"> The existing subdivision to the east of the proposed development of Lot 2 and Lot 9001 currently only has one access point – Sugar Gum Drive. This does not meet the requirements for access listed in the previous and the current Planning for Bush Fire Protection Guidelines (FESA & WAPC 2001 & Edition 2, FESA & WAPC May 2010). Both guidelines state that two different access routes should be available to the public. The road network in the proposed development on Lot 2 and Lot 9001 will connect the road network in the existing special rural subdivision to Reserve Road. This will provide two access points to Great Northern Highway for residents in the existing special rural subdivision as well as for residents in the proposed development. These two access points are more than 4km apart. 	The proposed development and BMP meet the Planning for Bush Fire Guidelines in providing multiple exits. Furthermore the development would provide Chittering Rise with a second exit.
	Currently Rosewood Drive has no exit to Great Northern Highway other than the exit point of Sugar Gum Drive. Currently the vehicular strain on Sugar Gum Drive in the event of a fire emergency as of today would require that all occupants of the Chittering Rise estate MUST exit through Sugar Gum Drive. There is currently no other alternative route to get out onto Great Northern Highway in a southerly direction to escape if there was a fire in the locality.	<ul style="list-style-type: none"> The design of the road network proposed for the development of Lot 2 and Lot 9001 meets the requirements of both the existing Planning for Bush Fire Protection Guidelines (Edition 2, FESA & WAPC May 2010) and the Planning for Bushfire Risk Management Guidelines (WAPC & DoP, Draft May 2014). 	As per comment above. Chittering Rise currently only has one exit which is east to Great Northern Highway. The development proposes connection to Reserve Road to the west, in turn improving emergency access/egress.

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	<p>The proposed plan allows for the building of 246 homes which may contain 2 vehicles each. In the event of an emergency, and in its worst case scenario, an exodus of 492 vehicles from that estate, and approximately 152 vehicles from the Chittering Rise Estate attempting to exit on Great Northern Highway from only two exit points:</p> <p>Reserve Road, which is currently a T junction on an obstructed straight (at the bottom of a dipped road) and is also used by the current residents of Reserve Road and its spurred streets.</p> <p>Sugar Gum Drive, which is at the bottom of a steep incline hill and is regularly held up due to the current increase in road traffic on Great Northern Highway.</p> <p>This is unacceptable and dangerous.</p> <p>1.2 Use of Easements and Maintenance - The proposed plan shows a 6.0 metre reserve which divides the current Chittering Rise properties from the proposed planned subdivision. This marked reserve is CURRENTLY not 6 metres and has been unmanaged for some time. Due to the lack of appropriate gravelling and maintenance on this particular reserve it would be extremely dangerous to utilise this as an acceptable escape route for the proposed development.</p>	<p>– In order to reduce the risk to residents, DFES recommends that residents leave well before a bushfire impacts on an area, rather than during the time a bushfire impacts on an area. Provided that this advice is followed, the relocation of residents can be undertaken in a controlled manner.</p> <p>– Houses in the proposed development are required to be constructed to comply with the Australian Standard for the Construction of buildings in bushfire-prone areas AS3959. This would allow residents to shelter in their houses during the passage of a wildfire, reducing the need to evacuate the area late, when a bushfire is already impacting on the area.</p> <p>– Reserve Road will be upgraded as part of the proposed development.</p> <p>See comments above.</p> <p>See comments above.</p> <p>– Fire service access routes are located in the reserves along the eastern boundaries of Lot 2 and Lot 9001.</p> <p>– Fire service access routes are generally not designed to provide an escape route for residents.</p> <p>– The public roads shown on the draft development plan provide adequate access and egress to and from the proposed development.</p> <p>– The proposed road network meets the requirements listed in the existing Planning for Bush Fire Protection Guidelines (Edition 2, FESA & WAPC May 2010) and the draft Planning for Bushfire Risk Management Guidelines (WAPC & DoP, Draft May 2014).</p> <p>Notes:</p> <p>– It is acknowledged that parts of the existing fire service access route ('strategic firebreak') located in the 6m wide reserve along the eastern boundary of Lot 2 are not adequately maintained. This is outside the control of the proponent.</p> <p>– The developer could, in partnership with the Shire of Chittering, upgrade the existing fire service access route located in the 6m wide reserve located along the eastern boundary of Lot 2.</p> <p>– The proposed development was designed to minimise the need for fire access routes. Instead, primary access for fire appliances to the proposed development and within the proposed development of Lot 2 and Lot 9001 is based on the public road network. This provides a better outcome.</p> <p>– Three relatively short easements for fire service access routes ('strategic firebreaks') are shown on the draft development plan for Lot 2 and Lot 9001. These fire service access routes are designed to provide access for fire appliances between the proposed new road network and the existing fire service access routes ('strategic firebreaks'), which are located in a reserve along the eastern boundaries of Lot 2 and Lot 9001 and on easements on two properties located on Rosewood Drive.</p> <p>– The above approach meets the requirements of the Shire of Chittering Firebreak Notice, the Shire of Chittering Local Planning Policy No 21, as well as the existing Planning for Bush Fire Protection Guidelines (Edition 2, FESA & WAPC May 2010) and the draft Planning for Bushfire Risk Management Guidelines (WAPC & DoP, Draft May 2014).</p> <p>– Fencing does not impact on the 'maintenance of the proposed extension of the easement(s)'. – 'Privacy measures' will also not impact on the easements, as gates will be installed where the fire access routes connect to a road or to the existing fire service access routes ('strategic firebreaks') located in the reserve.</p> <p>– These gates can be locked, provided that fire crews have a key to these locks. This is usually achieved by installing locks which can be opened by a common key held by brigades and the Shire of Chittering. This allows owners to control unauthorised vehicles on the three fire service access routes shown on the draft development plan.</p>	<p>As above. The proposed development complies with the Planning for Bush Fire Guidelines in providing two access/egress points and would result in Chittering Rise complying to this requirement.</p> <p>The TIS required prior to the consideration of the Development Plan will address the suitability of Reserve Road.</p> <p>As comment above.</p> <p>The TIS will determine if access is not safe and measure required to improve safety.</p> <p>The proposed Emergency Access Ways comply with the Planning for Bush Fire Guidelines.</p>
	<p>Access to these easements shows a proposal that they be followed through to the new estate in three main access areas directly from Rosewood Drive properties and the far northern end of Ghost Gum Ridge properties. This allows a fire easement for only five of the 246 proposed properties. This further reduces the capacity for firefighting to be carried out safely and within the fire regulation guidelines. Maintenance of the proposed extension of the easement would also rely on the lack of fencing and privacy measures by the proposed purchasers of the land.</p>	<p>– The proposed road network allows for multiple access options in addition to the proposed Emergency Access Ways which are proposed to integrate with Chittering Rise. Emergency Access Ways should only be used for emergency access and therefore privacy is not an issue.</p>	<p>The proposed road network allows for multiple access options in addition to the proposed Emergency Access Ways which are proposed to integrate with Chittering Rise. Emergency Access Ways should only be used for emergency access and therefore privacy is not an issue.</p>

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		<ul style="list-style-type: none"> Each property owner within the proposed development along the eastern boundary of Lot 2 and along the extension of Rosewood Drive will be required to maintain a 10m wide area of low fuel around the perimeter of the property. This low fuel area will generally be a grassed area. During the 'bushfire season' grass must be maintained low by slashing. This approach minimises erosion in the light sandy soils, which in turn improves access for fire appliances to the rear of properties. 	
	All Easements and access routes currently listed in the proposed plan impinge on the properties of Rosewood Drive and Ghost Gum Ridge. The current easements are the responsibility of the owners whose property they fall on.	<ul style="list-style-type: none"> The three easements for the fire service access routes shown on Lot 2 and Lot 9001 do not impinge on the properties on Rosewood Drive and Ghost Gum Ridge. These easements are on private properties located within Lot 2 and Lot 9001. Owners of these three properties will be responsible for the maintenance of these fire service access routes. These fire service access routes provide access for fire appliances between the proposed new road network and the existing fire service access routes ('strategic firebreaks') along the eastern boundaries of Lot 2 and Lot 9001. It is proposed to install below-ground fire hydrants along roads within the proposed development. Fire appliances can access these fire hydrants via the road network and no special access points are required. The water supply infrastructure will include a back-up system to ensure that water will be available during a power failure. <p>Notes:</p> <ul style="list-style-type: none"> In areas where water is supplied via Water Corporation's water mains, it is generally recommended that homeowners in bushfire-prone areas maintain a back-up water supply in case of low water pressure or when the mains water supply fails. The same advice applies to residents in the proposed development. The feasibility of including access for fire appliances at the water supply infrastructure in the south-western corner of Lot 2 will be explored. Further information on this will become available as the design for the water supply infrastructure is developed further. 	The easements and access routes don't impinge on residents of Chittering Rise. The fire access routes connect with existing to provide through connection and improve emergency access for all landowners.
	1.3 Fire Hydrants and Firefighting Systems - The proposed plan to build 246 dwellings shows no access point for fire hydrants or firefighting systems. In the event that the water supply fails in this subdivision, there is no accessibility of any other water supply other than that currently required to be held by the owners/residents of the Chittering Rise Estate. The natural environment of the area is considered a high fire risk area due to the natural vegetation. Medium density housing in this particular area and environment is a high fire risk.	<ul style="list-style-type: none"> Indicative building envelopes are shown for each lot on the Development Plan, which are limited in size to 2,000m². This is consistent with the Shire's requirements. 	Developments with reticulate water require hydrants in accordance with Water Corporation standards which complies with the Planning for Bush Fire Guidelines. The Shire would request landowners maintain water tanks for fire emergency purposes and this will be a recommendation in the Development Plan and BMP.
	2. Environmental Impact - As per the current Shire of Chittering website details the scope for Rural residential subdivisions will have a Development Plan which indicates specific environmental conditions pertaining to each specific subdivision. Generally, the following requirements must be adhered to within Rural Residential zoned land: Maximum clearing area on each site is 2,000m ² .		The Town Planning Scheme limits clearing for building purposes to a maximum 2000sq m, with fire protection etc. falling outside of this limit. Any limit to this would be superseded by the Town Planning Scheme requirements.
	Maintenance of land, watercourses and natural drainage lines is the responsibility of property owners.	The subject land does not have any watercourses or drainage lines. Stormwater drainage will be managed within the Development Plan area.	Noted.
	Development(s) to be undertaken in a manner which minimises the impact on the natural environment.	As part of the proposed development a 20 ha Conservation Lot will be created that will be covenanted for conservation. This will retain habitat to be utilised by fauna and will retain a linkage to surrounding habitat. The large lot sizes proposed for the development, particularly within Lot 9001, have been designed in a way to retain as much vegetation as possible and to reflect the natural landscape that the site forms part of. Revegetation of local native species will also occur within the development within the road reserves, in the Lots and in the public open space.	Noted. The Rural Conservation zone and Development Plan design improves minimising the impact on the natural environment.
	Stocking of Rural Residential properties requires Planning Approval in accordance with Council Policy.	The proposed Development Plan does not permit keeping of livestock.	Noted. The proposed Development Plan does not permit the stocking of grazing animals.
	Appropriate Effluent Disposal Systems will need to be installed subject to approval from Council's Environmental Health Officer.	The proposed Development Plan requires the provision of Aerobic Treatment Units (ATUs) with nutrient retention capability for the disposal of waste.	Noted.
	Chittering Rise Estate as their properties are listed as Rural Residential. The residents also enjoy an enormous range of native flora and fauna and have specific instructions outlining the maintenance of that ecosystem to protect the current environment and its biodiversity. Cats and Dogs are to be tagged and controlled. No horses or cloven hooved animals are permitted, chickens are not permitted.	The future residents of the Development Plan area will be subject to the requirements of the Development Plan, the Shire's Local Planning Scheme, the Shire's local laws and other applicable legislation.	The requirements imposed on Chittering Rise is consistent with the Town Planning Scheme. The proposed development of Lot 9001 would be subject to greater controls due to the Rural Conservation objectives and restrictions. Keeping of cats and dogs are controlled by the relevant Acts and Regulations. The keeping of livestock is proposed not to be permitted on the Development Plan due to conservation values and small lot sizes.
	The current proposal listed as residential has no such restrictions. The capacity for animals to be released into the current environment is high. The proposed subdivision would have a vastly negative impact on the environment currently enjoyed and maintained by the residents of the Chittering Rise Estate and its surrounding neighbours.	Notation 1.6 on the Development Plan prevents keeping of livestock.	Included in comment above. The Development Plan sets out a number of provisions which control the use and development of the subject lots. The control of cats and dogs is managed under the relevant Acts and local laws.

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	<p>Accessibility of the bushland by kangaroos, ring tailed wallabies, black cockatoos, blue and red wrens, blue tongue lizards, race horse lizards, geckos, frogs and an abundance of insect varieties critical to the maintenance of the current and future ecosystem of the area would be destroyed.</p> <p>Creating a subdivision that contains the current proposed 246 lots significantly reduces the native habitat of these animals and their capacity to sustain themselves. Foraging land is reduced, natural breeding environments are reduced and whole miniature ecosystems which are currently critical for the survival of the ecosystem in the Chittering Rise Estate and surrounding areas will be lost.</p> <p>There is no attempt at minimization of harm or consideration of the current environment. An allotment of 2.7423 ha in the centre of a suburban subdivision is inadequate to sustain these animals and their natural environment as it is listed as a public space.</p> <p>A further allotment of 36 houses under rural conservation in the far northern corner of the development effectively pushes the native flora and fauna into a corner and closes off their natural living areas.</p> <p>Natural watercourses would be diverted and the water table significantly interrupted and affected by the huge volumes of water required to sustain a subdivision with a high volume of housing planned. There is no notation of where rainwater run-off will be diverted to in the event of flooding on the roads.</p> <p>2.1 Waste Disposal Impact - Due to the high volume of housing proposed the increased waste disposal requirements would also increase. Current use of the Muchea and Bindoon tip sites are increasing with the influx of new owners in rural residential properties which exceed 2.0 hectares. Such a high volume of housing and subsequent waste would overload current disposal sites and increase the capacity for fly tipping and illegal dumping onto private property to occur.</p> <p>A further increase of 246 houses in one contained area creates a further strain on the tip sites, increases the chances of fly tipping and the volume of waste would be unsustainable for the shires current tip capacities.</p> <p>3. Neighbourhood cohesion - The proposed plan is based on medium density housing in a metropolitan suburb of a city. The current estates positioned around the proposed plan are generally rural residential properties comprising of land parcels approximately 2.0 hectares an above to ensure that the estates retain a rural outlook.</p> <p>The lack of design of larger blocks to accommodate that rural outlook and subsequent parcelling of land into half acre blocks to maximise development directly impacts on the neighbourhood of the adjoining estates.</p> <p>The opportunity to have a parcel of land in a rural setting will be directly impacted by the building of three to five houses directly behind the owners of any person on Rosewood Drive. With the inclusion of vast lines of fencing will be offensive and a fire risk to anyone who owns property on Rosewood Drive and the broader Chittering Rise Estate owners/residents.</p> <p>The alternative of no fencing does not encourage a safe neighbourhood environment where at any time the current owners of Rosewood Drive and further into Chittering Rise face the possibility of trespassers and noise pollution/light pollution being a regular occurrence.</p> <p>Any suburban lighting would detract from the natural environment currently required to be maintained by the Surrounding estates.</p>	<p>As part of the redesign of the Development Plan, the design includes a 20ha Conservation Lot and east-west landscape corridors through Lot 9001. This is considered to be an improvement on the current subdivision approval.</p> <p>As part of the proposed development a 20 ha Conservation Lot will be created that will be covenanted for conservation. This will retain habitat to be utilised by fauna and will retain a linkage to surrounding habitat. The large lot sizes proposed for the development, particularly within Lot 9001, have been designed in a way to retain as much vegetation as possible and to reflect the natural landscape that the site forms part of. Revegetation of local native species will also occur within the development within the road reserves, in the Lots and in the public open space.</p> <p>As part of the redesign of the Development Plan over Lot 9001 Rosewood Drive, the yield has been reduced from 45 lots (and no Conservation lot) to 35 lots (and one 20ha Conservation Lot). It is noted that Lot 2 Reserve Road is cleared of remnant vegetation (previous use as a plant nursery).</p> <p>The subject land does not contain any watercourses. The Development Plan report elaborates that stormwater drainage will be managed within the Development Plan area. Notation 10 of the Development Plan states that the maintenance of drainage swales on private property is the responsibility of the owner/occupier of the respective lot.</p> <p>The Shire's landfill and recycling facilities will be utilised by residents for waste management. The Shire issues tip passes with the Shire rates notices. The Shire's rangers can issue fines to littering offenders under the Litter Act.</p> <p>The R2 is a 'low density' code according to the Residential Design Codes. The Rural Conservation lot sizes range from 0.8871 to 1.1952ha in area, which are close to the minimum lot size of 1 ha for Rural Residential lots under the Shire's Scheme.</p> <p>The three easements for the fire service access routes shown on Lot 2 and Lot 9001 do not impinge on the properties on Rosewood Drive and Ghost Gum Ridge.</p> <ul style="list-style-type: none"> Fencing does not create 'a fire risk'. Fencing, if required, is proposed to be to a rural standard, (i.e. post and wire). This type of fencing does not influence noise or light emissions between landholdings. The three easements for the fire service access routes shown on Lot 2 and Lot 9001 do not impinge on the properties on Rosewood Drive and Ghost Gum Ridge. These easements are on private properties located within Lot 2 and Lot 9001. Owners of these properties will be responsible for the maintenance of these fire service access routes. Street lighting, if required, would be provided to the specifications and satisfaction of the Shire of Chittering and can be determined at detailed design. 	<p>The Shire acknowledges the impact on the remnant vegetation and habitat however the current proposal greatly reduces this impact from the existing approval of Rural Residential subdivision.</p> <p>As per comment above. In relation to the Public Open Space, this 2.7 hectare site is proposed for community uses and not for conservation or rehabilitation purposes. The proposed POS is not 10% however the development of the POS with community infrastructure by the developer meets the requirements of DC 2.3 and principles of POS in residential areas. Furthermore the POS is consistent with Liveable Neighbourhoods.</p> <p>Noted. The proposed Rural Conservation zone is considered to provide a better and appropriate design outcome for Lot 9001 in comparison to the existing Rural Residential subdivision approved on the site. Furthermore the compliance of the biodiversity targets can be met with the proposed development.</p> <p>There are no known watercourses over the subject site. A stormwater management plan would be required for subdivision to address these issues and the Shire has requested a Local Water Management Strategy be undertaken prior to the Development Plan being considered to ensure these issues have been noted and addressed accordingly.</p> <p>The additional lots would be serviced by the Shire's rubbish collection program and access to the Shire's landfill facility provided as is currently done. Illegal dumping would be a compliance matter. It is considered road design is appropriate to allow for truck maneuverability.</p> <p>The minimum lot size for Residential R2 is 5,000sq m, labelled as the lowest density in the Residential Design Codes. Medium density subdivisions range in lot size from approximately 800m2 to 260m2. The Applicant has provided a Landscape Master Plan with an objective to improve the landscape of Lot 2 with road verge planting and development of the POS.</p> <p>The Landscape Plan can assist in enhancing the rural character of Lot 2 which would reduce the bulk of dwelling structures. In addition to this the Development Plan can designate exclusion zones for building for relevant reasons.</p> <p>Trespassing is a police matter and not a planning consideration.</p> <p>Concern noted. Street lighting will be required for safety purposes.</p>

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	The capacity for the encroachment of neighbours on each other is high due to the density of the plan proposed.	<ul style="list-style-type: none"> The use of building envelopes will ensure that development on each lot is contained. 	Development of lots would meet the requirement of the Town Planning Scheme, approved Development Plan, Local Planning Policies and Residential Design Codes. The Residential R2 coding is considered low density.
	There is no neighbourhood cohesion or any respect considered for the current land owners and their rights to enjoy their property as originally prescribed, as a rural residential area.	The Development Plan will not impact the current landowners' ability to enjoy their own properties. The inclusion of public open space aims to provide amenity and can act as a social hub for the proposed development. The design of the public open space and the infrastructure included within the open space will be agreed in consultation with the Shire and will look to serve the local community, including Chittering Rise residents.	The proposed Development Plan includes road and fire emergency linkages. The development would not impact on landowners in Chittering Rise using their land for their own enjoyment.
	4. Police, Ambulance and Doctors Services - With the current ONLY Police Service being Gingen Police Station servicing this area, as well as Volunteer Fire Fighting and Ambulance Services working hard to protect and serve our current residents of the area, it would create an enormous strain on these services.	<ul style="list-style-type: none"> The capacity of emergency services is a State government issue and not a material planning consideration. The public roads shown on the draft development plan provide adequate access and egress to and from the proposed development. The proposed road network meets the requirements listed in the existing Planning for Bush Fire Protection Guidelines (Edition 2, FESA & WAPC May 2010) and the draft Planning for Bushfire Risk Management Guidelines (WAPC & DoP, Draft May 2014). 	Provision and funding of emergency services is considered a State government matter. The Shire of Chittering is a peri urban Shire, which due to its location is receiving enormous growth pressure, property and orderly planning through the requirement of development plans actually allow the State Government time to appropriately plan for increase in population numbers.
	5. Employment - The lack of employment in the local area suggests that the proposed planned housing would benefit only those who were employed in areas outside the shire. This creates a strain on the current road systems, which are now heaving with residents who are already leaving the shire on a daily basis to work in metropolitan areas. The huge volume of residents in the proposed plan would significantly increase the road traffic and in no way shows any other form of income or new business to the shire other than rates.	<ul style="list-style-type: none"> A limited range of land uses are available within the Residential R2 and Rural Conservation zones, which can provide for small-scale home-based employment opportunities. Telecommunications services can enable for internet-based business to be undertaken from any location. The Shire recognises the need for additional residential population due to the establishment of the Muchea Employment Node immediately south of the subject site, which is currently remote from a workforce population. 	Most residents in the residential developments in the southern half of the Shire commute to work in the metropolitan area due to close proximity. This is a common demand for residents who wish to live in a rural area but be within close driving distance to suburban facilities. The Shire cannot control this personal choice but increase in residential development would likely create demand for local employment opportunities. Intensification around the Muchea Employment Node will allow for a wider range of property options for residents wanting to move closer to areas of employment, it is considered this proposal supports this.
	6. School Bus Access and transportation issues - Current School bus services are insufficient in the Chittering Rise Estate with approximately known families unable to access the bus service system. A proposed plan of this size, with the known number of homes being calculated at 246 would require a dedicated bus service. There is no proposal for a bus service on the plan. There is no proposed dedicated child bus stop. Access to this proposed subdivision would create increased traffic in areas currently enjoyed by local traffic only.	See previous comments regarding school bus services.	Addressed earlier in Schedule.
	There is currently no public transport system available to any person in the Chittering Rise estate or in fact, any other outlying estate in the Shire of Chittering area.	Noted. The provision of a public transport system is a State government issue.	Noted. The Shire in general has very limited public transport available. Residential development provides greater demand for the possibility of implementing these services in the future.
	Although there is scope for a proposal for a new development, my concern is the size of the blocks. If the block sizes were of similar or larger size to those blocks in surrounding estates and followed the same basic protocols currently required to be followed by surrounding estates, it would be more appropriate.	Noted.	Noted.
	The strain on our current services in our shire, as well as the escalating traffic on Great Northern Highway only puts more pressure on the current owners/residents.	<ul style="list-style-type: none"> The applicant proposes to provide a reticulated water supply to the development, the future Muchea Employment Node and will also be available to the surrounding community. The development helps to support the landowner's ability to provide a reticulated water supply. On-site effluent disposal systems are proposed for each household. These systems will treat effluent water to meet the Australian Drinking Water Guidelines. Stormwater and drainage will be managed effectively within the Development area with localised infiltration and site storage and recharge into existing aquifers. Preliminary information from Western Power indicates there is sufficient capacity to service the development with underground power. Preliminary information from Telstra indicates there is sufficient capacity to service the development with telecommunication services. Gas supply is not available and is not anticipated to be provided. 	Noted. The surrounding estates are zoned Rural Residential and require a larger minimum lot size of 2 hectares than in the Residential R2 and Rural Conservation zones. Lot 2 is largely cleared from remnant vegetation and therefore smaller lots would not have an environmental impact.
	An estate comprising of a further 246 houses in the middle of a rural residential area is not acceptable and not viable. We reside at 258 Rosewood Drive, Chittering (Lot 896) and strongly oppose the above proposal.	Noted.	Noted. The proposed development would result in an increase of services provided including an additional access option to Reserve Road, upgrades to road infrastructure, power, telecommunication etc.
Public F	The viability of a proposal is not a planning consideration.	Noted.	Noted.

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	<p>Sugar Gum Drive, Ghost Gum Ridge and Rosewood Drive would become the main access roads for the proposed 246 lots. Currently these unit roads only service the local residents and are in a poor condition with barely any maintenance being undertaken by the Shire of Chittering.</p>	<ul style="list-style-type: none"> Reserve Road, along the western boundary to Lot 2, is currently 20m wide. Through the Development Plan, the applicant will be ceding 10m of land from the western boundary, to result in a road reserve width of 30m for Reserve Road. The applicant will consult with the Shire and MRWA regarding upgrade requirements for Reserve Road and the intersection to Great Northern Highway. The road network in the proposed development on Lot 2 and Lot 9001 will connect the road network in the existing special rural subdivision to Reserve Road. This will provide two access points to Great Northern Hwy for residents in the existing special rural subdivision as well as for residents in the proposed development. The design of the road network proposed for the development of Lot 2 and Lot 9001 meets the requirements of both the existing Planning for Bush Fire Protection Guidelines (Edition 2, FESA & WAPC May 2010) and the Planning for Bushfire Risk Management Guidelines (WAPC & DoP, Draft May 2014). Access to the proposed development is taken from Reserve Road, whilst providing road connectivity to Great Northern Highway to the east via Rosewood Drive. This route to Great Northern highways is somewhat circuitous and therefore less likely to be utilised over the more direct Reserve Road connection. It is anticipated, however, that Reserve Road would cater for the majority of vehicle trips. 	<p>It is considered Reserve Road would be utilised more than roads within Chittering Rise estate to access Great Northern Highway. Lot 2 abuts Reserve Road and the access to the highway, as well as majority of traffic heading south, makes Reserve Road a more suitable route.</p>
	<p>The community of Chittering Rise are pedestrians on these roads – many can be seen going for a daily walk, regularly taking their dogs for a walk, children riding to the bus stop etc - bear in mind these roads generally have vegetation up to the edge of the road with street lighting, no kerbs or footpaths so visibility can at times be affected. The increase in traffic could impact on the safety of all residents.</p> <p>Emergency Evacuation Points – in the event of a bushfire emergency the only exit points would be Rosewood Drive or Reserve Road which is currently an unsealed road. Evacuation of another 246 households through one sealed exit could prove to be hazardous.</p>	<p>The proposed internal roads will incorporate road design measures to the specifications and satisfaction of the Shire. The majority of internal roads are designed to be predominately straight, which will assist in providing sufficient sightlines for motorists to see pedestrians and cyclists, as well as to identify and avoid wildlife.</p> <ul style="list-style-type: none"> The existing special rural subdivision to the east of the proposed development of Lot 2 and Lot 9001 currently only has one access point – Sugar Gum Drive. This does not meet the requirements for access listed in the previous and the current Planning for Bush Fire Protection Guidelines (FESA & WAPC 2001 & Edition 2, FESA & WAPC May 2010). Both guidelines state that two different access routes should be available to the subdivision. The road network in the proposed development on Lot 2 and Lot 9001 will connect the road network in the existing special rural subdivision to Reserve Road. This will provide two access points to Great Northern Highway for residents in the existing special rural subdivision as well as for residents in the proposed development. The design of the road network proposed for the development of Lot 2 and Lot 9001 meets the requirements of both the existing Planning for Bush Fire Protection Guidelines (Edition 2, FESA & WAPC May 2010) and the Planning for Bushfire Risk Management Guidelines (WAPC & DoP, Draft May 2014.) <p>Notes:</p> <ul style="list-style-type: none"> In order to reduce the risk to residents, DFES recommends that residents leave well before a bushfire impacts on an area, rather than during the time a bushfire impacts on an area. Provided that this advice is followed, the relocation of residents can be undertaken in a controlled manner. Houses in the proposed development are required to be constructed to comply with the Australian Standard for the Construction of buildings in bushfire-prone areas AS3959. This would allow residents to shelter in their houses during the passage of a wildfire, reducing the need to evacuate the area late, when a bushfire is already impacting on the area. Reserve Road will be upgraded as part of the proposed development. 	<p>Noted. It should be noted that footpaths will be required to be developed as part of this proposal in accordance with livable neighbourhoods requirements. The remainder of the Shire has a Footpath Plan?? Which details areas which require footpaths & when they will be implemented.</p> <p>The proposal would require the upgrade of Reserve Road and would result in an additional emergency route for the subject development and Chittering Rise residents.</p>
<p>Lot sizes and Property Values:</p> <p>The proposed lot sizes are significantly smaller than the existing development. In general terms people looking at moving to a semi rural location are seeking lots of a similar size to the existing Chittering Rise development.</p>		<p>The variety of lot sizes proposed within the Development Plan has been informed by various sources and has regard to ensuring provision of a variety of lot sizes to complement the existing product available in and around the area, and also gives consideration to future demand and changes in lifestyle trends along with affordability. Consideration will be given to the construction and staged release of land within the development having regard to a variety of factors including those expressed within these submissions.</p>	<p>The market demand is not a planning consideration however it is considered the smaller lots with reticulated water supply provide for property not currently available in the Shire. Further to this the proposed zone permits the smaller lot sizes.</p>

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	There is a similar development in Muchea that has numerous lots that have not been purchased and other developments in Bulbin Brook & Bindoon. A local Bullsbrook real estate agent we have spoken to has expressed concern at the number of small lot developments in and around this area and the relatively small uptake of these lots. This leads to Lot prices decreasing which would ultimately affect our property value.	With regards to land values, these are not a material planning consideration. Other factors have a bearing on the land value of a property that cannot be controlled by local government and are outside of the planning system (i.e. regulatory changes to home ownership or development requirements, changes in interest rates, changes in unemployment (or job growth/cuts in the local economy), shifts in the housing market, general demand/supply for housing, etc.)	Property value and purchase of lots is not a planning consideration. The Applicant has advised market driven staging would occur to ensure take up of lots.
	The current Chittering Rise development has many undeveloped lots currently for sale that have been on the market for significant periods of time. The lots either side of us have been up for sale for at least 2 years – if these haven't sold who is going to want to buy 246 smaller lots squeezed into a new development?	The success of land sales is not a material planning consideration. Refer also comments provided above, regarding variety of lot sizes, affordability and staged land releases.	As per comment above. The Applicant has advised appropriate staging of development would alleviate unsold lots.
	Services and Facilities: If this development goes ahead there would only be 1 x Public Open Space area in the whole of Chittering Rise. We also currently have the Chittering Rise Rest Area which consists of an unmaintained unsealed road leading to an open area that has become a refuse dumping ground.	Earlier Development Plan concepts proposed the creation of the 20ha conservation lot for public open space; however this was not supported by the Shire. The area of public open space is proposed centrally within the development to optimise its proximity to surrounding 'Residential R2' lots. Given the vegetation to be retained on sites, and the variety of larger lot sizes, it is considered that this public open space will supplement the amenity enjoyed by residents. The public open space is proposed to be relicultured and partly landscaped, in consultation with the Shire, for the enjoyment of the local community.	The Applicant proposes to develop the POS and will provide community facilities currently not available. The proposed POS is compliant with DC 2.3 and Liveable Neighbourhoods.
	We have constantly had issues with Telstra regarding internet access and internet speed since we moved here over 5 years ago. There is 1 Telstra Junction Box located on Sugar Gum Drive - we have logged a number of complaints regarding internet problems only to receive the response that Telstra will not do any form of upgrade due to the eventual roll out of the NBN. What will happen if there is 246 new households trying to access this already overloaded exchange?	Preliminary information from Telstra indicates there is sufficient capacity to service the development with telecommunication services.	Noted Applicant's response.
	Local Wildlife and Habitat: A development such as the one proposed could be devastating to the abundant wildlife that co-exists in our local area. Much of their local habitat will be destroyed and animals such as Kangaroos will become "boxed in" between Reserve Road and Great Northern Highway. This will be a danger to the animals as well as the traffic.	Clearing would be undertaken in a way that will allow fauna to move towards surrounding habitat to the west and north-west. As part of the proposed development a 20 ha Conservation Lot will be created that will be covenanted for conservation. This will retain habitat to be utilised by fauna and will retain a linkage to surrounding habitat. The large Lot sizes proposed for the development, particularly within Lot 9001, have been designed in a way to retain as much vegetation as possible and to reflect the natural landscape that the site forms part of. Revegetation of local native species will also occur within the development, for example within the road reserves, in lots and in the public open space.	The proposed Rural Conservation zone for Lot 9001 is considered appropriate to respond to the biodiversity and conservation values. The current Rural Residential approval on Lot 9001 would result in greater impact.
	We have Tawny Frogmouth Owls that live in the trees on our property. Regularly we see a pair that nest and return with their chicks and take up residence until the young leave the nest when the cycle begins again.	Noted. Tawny Frogmouths are found throughout Australia. They are not listed as a 'Priority' species by the Department of Parks and Wildlife or as a 'Threatened' species under the Wildlife Conservation Act 1950 or EPBC Act. Therefore the clearing of habitat for the proposed development is unlikely to impact on this species survival.	Noted Applicant's response as per The Flora and Fauna study.
	There is a number of bobtail goannas that walk across our driveway and through the gardens. Have a drink and make their way back to the bush and come back the next day. We see them so regularly in the summer that we recognise them from their size and markings.	Noted. Bobtail goannas are not listed as a 'Priority' species by the Department of Parks and Wildlife or as a 'Threatened' species under the Wildlife Conservation Act 1950 or EPBC Act. Therefore the clearing of habitat for the proposed development is unlikely to impact on this species survival. The bobtail goannas will be able to utilise the habitat retained in individual lots as well as within the Conservation Lot.	It is acknowledged the vegetation on Lot 9001 is habitat to a number of wildlife.
	Black Carnaby Cockatoos and Red Tail Cockatoos fly over shrieking to each other and land in the Banksia trees that run through our property. We don't approach them but they happily sit and have a look around as they feed on the foliage.	Noted. Further work has determined that based on the habitat availability and known records of Threatened fauna species, the development area is only likely to contain suitable habitat for one Threatened fauna species, the Carnaby's Black Cockatoo. At the time of writing the Black Cockatoo Habitat Assessment was in the process of being finalised. The impacts to these species will be assessed through the EPBC referral process. This information has been provided to the Shire.	Noted. The Shire recommends an Environmental Management Plan be prepared to ensure habitat for Carnaby's Black Cockatoo is protected. Further to this the Rural Conservation zone protects vegetation and clearing is limited through conservation covenants. This is not required/controlled in the Chittering Rise Rural Residential development and therefore is considered to provide the best opportunity for protection of habitat.
	Mobs of Kangaroos travel through our block generally at dawn and dusk and graze on the natural bush.	Noted. None of the species of kangaroos in Western Australia are listed as a 'Priority' species by the Department of Parks and Wildlife or as a 'Threatened' species under the Wildlife Conservation Act 1950 or EPBC Act. Therefore the clearing of habitat for the proposed development is unlikely to impact on this species survival. Kangaroos will be able to utilise the habitat retained in individual lots as well as within the Conservation Lot.	Noted.

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	<p>Echidnas have also been seen on our driveway near the road.</p> <p>We also hear Moaning Frogs, Motorbike Frogs, Pink & Grey Galahs, Ringneck Parrots, Red Breasted and Blue Breasted Wagtails, Kookaburras and many more.</p> <p>There are many other things that will impact on the Chittering Rise area if this development proceeds such as schooling, school buses, day care facilities, water sources (especially for the Emergency Services), waste services to name just a few. We urge the Shire of Chittering to refuse this development application.</p>	<p>Noted. The Short-beaked Echidna is not listed as a 'Priority' species by the Department of Parks and Wildlife or as a 'Threatened' species under the Wildlife Conservation Act 1950 or EPBC Act. They are distributed throughout most of Australia in a variety of habitats. Therefore the clearing of habitat for the proposed development is unlikely to impact on this species survival.</p>	Noted.
		<p>Noted. As none of these species are listed as a 'Priority' species by the Department of Parks and Wildlife or as a 'Threatened' species under the Wildlife Conservation Act 1950 or EPBC Act it is unlikely that clearing of habitat for the proposed development will impact on the survival on these species. These species will be able to utilise the habitat retained in individual lots as well as within the Conservation Lot.</p> <ul style="list-style-type: none"> Given the existing approval supports the creation of 155 lots, this proposal seeks only to introduce a further 89 lots. The impact of an additional 89 lots is manageable and unlikely to negatively impact the existing communities use of these services all of which can accommodate the increased demand generated by a further 89 lots. Education facilities within a 20km radius include Gingin District High School (Primary-Yr10), Bindoon Primary School and Immaculate Heart College (Private, Kindergarten-Yr6). Toodyay District High School (Primary-Yr10) is located 45km east of the subject site. School bus services are monitored and provided by the PTA. Health facilities located within a 20km radius at Gingin Medical Centre, Bindoon Medical Centre and Bullsbrook Family Medical Centre. Local conveniences are provided at the Muchea IGA X-Press (within 10km from the site), Bullsbrook IGA, Bindoon IGA and Gingin IGA X-Press. The applicant proposes to provide a reticulated water supply to the development, the future Muchea Employment Node and surrounding existing community. The Shire's waste facilities will be available to residents for landfill and recycling. 	<p>It is considered residential development would assist in improving the services in that location. The proposed development would provide availability of reticulated potable water supply, improve emergency access, reduce the fire risk to Chittering Rise residents adjoining Lot 9001 and put pressure on the demand for educational services in the area.</p>
Public G	<p>We oppose the proposed rezoning of Lot 2 Reserve Road Chittering from 'Rural Residential' to 'Residential R2'.</p> <p>We also oppose the Development Plan proposing a total of 246 lots ranging from 5,000m2 with the provision of reticulated potable water supply.</p> <p>Reasons for our opposition are:</p> <p>1. We purchased within Chittering Rise for the rural setting and wildlife. We reside at Lot 888 Rosewood Drive. Surrounded by other 2 hectare or larger properties and strategic fire breaks on one side and to the rear. After contact with the council (verbally) we were told there were no planned subdivisions to either the side or back of the lot. After purchasing and building our house we found there was a proposed plan in place with 5 lots to be at the side of our property. However, the rears of these lots were to be towards our side fence and would not significantly effect our property. Now, under this proposal we are to have a 2 road frontage and 5 houses facing towards our property. This will destroy the rural setting we purchased merely 5 years ago.</p> <p>Our house is located to the side of the property and we will not have any privacy as a result of the second road proposed up the side of our property and 5 houses facing into our property. We have already moved the location of our building envelope to allow for our future plans to build another shed. This location of the road will not allow us to build another shed as planned.</p> <p>We strongly oppose the location of a new road to the side of our property.</p>	<p>Comments as per responses to 'Public D' submission. Both submissions are duplicates submitted by two landowners.</p>	As per Applicant response.

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	<p>2. The increase in traffic will place our children and those walking/running within Chittering Rise Estate at risk. Children currently living within Chittering Rise regularly ride on the roads – in particular along Ghostgum Ridge and Sugar Gum Drive. They correctly ride on the road, however, due to bends on the roads it is difficult to see a child who is not riding right on the edge. Increased traffic will increase the risk significantly of one of our children being seriously hurt. Similarly, those walking and running must do so on the road. There are no established footpaths throughout the area with the road being the only safe place to walk. Increased traffic will increase the risk of injury to those walking or the dogs they may be walking.</p> <p>3. The roads within the area (including the Great Northern Highway) are not sufficient to support the increased traffic of approximately 500 extra cars a day. Entering Great Northern Highway from Reserve Road is currently difficult with limited vision of oncoming traffic. Increasing the vehicles using this intersection will increase the risk of serious accidents. The roads throughout Chittering Rise Estate itself contain many crests and blind corners.</p> <p>4. A development of this size will clear a large amount of the habitat for the wildlife in this area. Loss of the habitat will put strain on those areas still maintained as native bush including our own Lot. Loss of wildlife will not only occur within the areas cleared but also in surrounding areas (such as our property already established within Chittering Rise). We have been careful to maintain the majority of our property as native bush allowing the birds, kangaroos, bobtails, echidnas, snakes etc a safe and undisturbed area together with neighbouring properties (including the proposed development site). Allowing 246 lots of a much smaller size will inevitably destroy the native habitat to a much greater extent than larger properties (ie 2 hectare or greater) as required under the rural residential zoning.</p> <p>For example, we regularly have a mob of 10 to 15 kangaroos on our property. A road next to our property and smaller properties will destroy the habitat for these kangaroos as well as place them at risk of being hit.</p> <p>Increased traffic will also place the wildlife at risk. Most residents currently travel at a speed and with alertness sufficient to prevent wildlife and animals being hit. Additional traffic will increase the number of injured wildlife within the area.</p> <p>5. Chittering Rise currently has an issue with dogs roaming the area. 246 additional lots will increase the severity of this issue. I have lost count of the number of times dogs having been roaming the road and our property.</p> <p>6. Small lots of merely 5,000m2 and a total of 246 lots do not fit within the rural setting of the area.</p> <p>7. The water supply we rely on includes both rain water tanks and the use of bore water for garden use. Should this water be used and abused by 246 new households, this water supply will not be able to be maintained to both the quality and depth it currently is. This needs to be considered and addressed ensuring current residents are not effected by excessive use of bore water.</p> <p>In addition to this, we do not wish to be forced to use the reticulated potable water proposed for the development. We are a neighbouring property and do not wish this to be forced upon us. We are currently highly self sufficient within our household and do not wish this to be restricted.</p> <p>Issues that need to be addressed more fully prior to considering any development at this location include:</p> <p>8. Bus stops do not appear to have been incorporated into the plan. The current Chittering Rise bus stop is not adequate for the current residents of Chittering Rise Estate. Too many children currently attempt to board buses between 8:00am and 8:12am making it unsafe. Increasing the students within the area without adequate bus stops will increase the danger for our children.</p>		

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	<p>9. Buses servicing our local schools are already full. Even with an extra bus put on to take Bullsbrook College children to school, the bus is full. At last contact with the driver of the Bullsbrook bus, there were 62 enrolled students on a 56 seat bus causing younger students to be seated 3 to a seat. In addition, new students are not able to get on the bus. A development of this size will lead to extreme pressure on bus services. Students in Bindoon are already at a disadvantage trying to get on a bus to Bullsbrook College as they are classed as complimentary even though Bullsbrook may be the most appropriate school for them to attend.</p> <p>10. Consider information provided to residents established within the area as to future developments. Placement of a road next to an established house where advice was provided by Council that no developments were planning is unfair and will cause a great loss of privacy. The advise was relied upon for various things including placement of our home and future plans for sheds and gardens.</p> <p>11. Crime has been of concern within the area with rural items being the most targeted items. How will increased crime be effectively managed with a development of this size?</p> <p>Maintaining a Rural Residential zoning, requiring a minimum of 2 hectare properties and reducing the number of lots would have many advantages for the area including:</p> <ul style="list-style-type: none"> - Maintaining the rural setting of the area; - Reducing the risk to wildlife from harm; - Protecting a larger portion of the habitat for the wildlife; - Reducing the traffic and risk to our children enjoying the advantages of living within a rural setting; - Reducing the strain on the underground water supply; - Chittering Rise Estate and along Reserve Road. 		
Public H	<p>My reason for making a submission regarding the proposed development is due to being a concerned local resident.</p> <p>Please see my attached resume (Appendix 1) for details of my expertise and specialist knowledge in the area of habitat conservation and education including substantial experience working with native fauna.</p> <p>The Local Biodiversity Strategy mentions that 'In 2050 the Shire of Chittering will have retained at least 20,000 hectares of its remaining 22,421 of Local Natural Areas (NLAs) and formally protected at least 6,328 hectares within these areas. In 2010 only 30% of the original (pre-European) extent of native vegetation remained within the Shire of Chittering.'</p> <p>Noting that only 30% of (pre-European) NLAs were remaining within the Shire in 2010 I would like to know the current percentage of retention within the Shire 5 years later. With other developments such as Chittering Springs in bush land areas, one would assume that percentage is lower now.</p>	<p>Appendix 1 is not provided to the applicant to view.</p> <p>As part of the proposed development a 20 ha Conservation Lot will be created that will be covenanted for conservation. This will retain habitat to be utilised by fauna and will retain a linkage to surrounding habitat. The large lot sizes proposed for the development particularly within Lot 9001, have been designed in a way to retain as much vegetation as possible and to reflect the natural landscape that the site forms part of. Revegetation of local native species will also occur within the development, for example within the road reserves, in the lots and in the public open space.</p> <p>The latest statistics show that in 2013 the Shepherd et al. 2001 Vegetation Association known to occur within the development area (1027) had 59.01% of its pre-European extent remaining in the Swan Coastal Plain IBRA region and 58.98% of its pre-European extent remaining in the Dandaragan Plateau IBRA Sub-Region (Government of Western Australia 2013). 17.63% of the pre-European extent of the Dandaragan Plateau IBRA Sub-Region is protected for conservation (Government of Western Australia 2013).</p> <p>The project area falls part of the Heddlie (1980) vegetation complex 'Mogumber Complex-South' that has 40.20% of its pre-European extent remaining.</p> <p>The National Objectives and Targets for Biodiversity Conservation 2001-2005 recognise that the retention of 30% or more of their pre-clearing extent of each ecological community is necessary for Australia's biological diversity to be protected. As the project area has over 50% of its pre-European extent remaining in its IBRA region and IBRA Sub-Region, and 40.20% of its pre-European extent remaining in the Heddlie (1980) vegetation complex it is not considered to be significant as a remnant of native vegetation requiring protection.</p>	<p>Noted.</p> <p>Resume noted.</p> <p>Application of Local Biodiversity Strategy is acknowledged and detailed in the agenda report.</p> <p>The Local Biodiversity Strategy (LBS) identifies the vegetation on Lot 9001 to be protected less than 10% locally and the Strategy aims to protect 30% of each vegetation complex. The Development Plan is expected to demonstrate a minimum of 30% protection.</p>

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	<p>'Lot 9001 Rosewood Drive is identified within the 'Mogumber Complex – South' vegetation complex, which has regional significance due to being under-protected. Lot 9001 is within the Indicative High Conservation Value Area 5.10 within the Lower Chittering Precinct, as per Figure 7 of the Local Biodiversity Strategy (Figure 4 below). Lot 9001 is identified as a Local Natural Area 'High Constraint Level', presumably due to existing planning decisions such as the currently valid subdivision approval and Development Plan.' (Shire of Chittering Town Planning Scheme No. 6 Amendment No. 55 p. 17)</p> <p>The Chittering Shire's Local Biodiversity Strategy was adopted at the ordinary council meeting on 21 April 2010 and the above are quotes taken from it regarding biodiversity highlighting the fact that it is vital that existing bushland be protected to maintain the biodiversity of the Chittering area.</p> <p>The strategy steps out key goals and recommendations to help preserve the remaining native vegetation in the Shire and states that there is a high number of properties in the Shire registered in the 'Land for Wildlife' program administered by the Department of Parks and Wildlife (DPAW) demonstrating the high level of interest and commitment by local residents to manage natural areas on private properties.</p> <p>I have seen this interest in conservation from neighbours and friends in the Chittering area. I bought my bush-land block after many years searching for property with a high conservation value. The intent was to purchase to protect habitat and wildlife after spending many years witnessing huge amounts of native vegetation clearing on the Coastal Plain. A neighbour's property entitled 'Slice of Heaven' sums up the general sentiment of myself and others living in Chittering Rise, that it truly is amazing to live amongst nature.</p> <p>The Local Biodiversity Strategy mentions that 'In 2050 the Shire of Chittering will have retained at least 20,000 hectares of its remaining 22,421 of Local Natural Areas (NLAs) and formally protected at least 6,328 hectares within these areas. In 2010 only 30% of the original (pre-European) extent of native vegetation remained within the Shire of Chittering.'</p> <p>Noting that only 30% of (pre-European) NLAs were remaining within the Shire in 2010 I would like to know the current percentage of retention within the Shire 5 years later. With other developments such as Chittering Springs in bush land areas, one would assume that percentage is lower now.</p>	<p>The 20 ha Conservation Lot is intended to be covenanted for conservation as part of the development due to Lot 9001 falling within the Indicative High Conservation Value Area 5.10 in the Local Biodiversity Strategy. The Conservation Lot will result in approximately 33% of the vegetation in Lot 9001 being retained for conservation in perpetuity post-development. Vegetation will be also retained as much as practicable within individual lots in order to reduce impacts to native fauna, with building envelopes being a maximum of 2,000m².</p> <p>Refer to comments above.</p> <p>The applicant has liaised with the Department of Parks and Wildlife in relation to the inclusion of the proposed Conservation Lot within DPAW's Nature Conservation Covenant Program. Previously, two Conservation Lots of 10ha each were proposed, but this was not considered acceptable by DPAW, resulting in the creation of one 20ha Conservation Lot. This has support from DPAW.</p> <p>The modified Development Plan aims to provide a revised lot layout to enhance the existing approvals over the site and guarantee the provision of a 20ha Conservation Lot: to control building envelope locations, vegetation retention areas and address implications for fire management; and to addressing requirements of the Shire and state government agencies.</p> <p>As part of the proposed development a 20 ha Conservation Lot will be created that will be covenanted for conservation. This will retain habitat to be utilised by fauna and will retain a linkage to surrounding habitat. The large Lot sizes proposed for the development, particularly within Lot 9001, have been designed in a way to retain as much vegetation as possible and to reflect the natural landscape that the site forms part of. Revegetation of local native species will also occur within the development within the road reserves, in the Lots and in the public open space.</p> <p>The proponent does not have access to the current percentage of retention of Local Natural Areas. Refer to previous comments regarding the extent of vegetation being protected for conservation.</p> <p>The 20 ha Conservation Lot is intended to be covenanted for conservation as part of the development due to Lot 9001 falling within the Indicative High Conservation Value Area 5.10 in the Local Biodiversity Strategy. The Conservation Lot will result in approximately 33% of the vegetation in Lot 9001 being retained for conservation in perpetuity post-development. Vegetation will be also retained as much as practicable within individual lots.</p> <p>Lot 9001 is known to contain foraging species utilised by Carnaby's Black Cockatoos, however no feeding evidence in the form of chewed nuts or cones was recorded during the habitat assessment. A 20 ha Conservation Lot will be created as part of the development that will be covenanted for conservation. This will retain habitat to be utilised by fauna, and will retain a linkage to surrounding habitat.</p> <p>The Rural Conservation Lots within Lot 9001 will retain as much vegetation as possible, with each lot having a maximum building envelope of 2,000m². It must be noted that clearing for the purposes of bushfire management (including fire service access routes, firebreaks and separation of vegetation from houses) is to achieve a balance between bushfire management requirements and environmental protection. This was considered in the design for the Development Plan.</p>	<p>Noted and acknowledged. The proposed Rural Conservation zoning would provide greater protection for the HCVA than what is currently approved.</p> <p>Noted.</p> <p>Noted and agreed. DPAW were notified of the proposal.</p> <p>The protection of the conservation value vegetation is part of the Shire's consideration and an environmental implication considered for the proposed development. The Applicant proposes Lot 9001 to be rezoned from Rural Residential to Rural Conservation in response to the conservation values.</p> <p>Noted.</p> <p>The LBS has not been reviewed since initial adoption. However as mentioned above the proposal to rezone Lot 9001 to Rural Conservation provides the opportunity for compliance with the LBS.</p> <p>Noted and agreed Lot 9001 is within an Indicative High Conservation Value Area identified by the Local Biodiversity Strategy.</p> <p>Noted. The Shire considers the Rural Conservation zoning is more appropriate for Lot 9001.</p>

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	<p>Locally significant natural areas are also important for the following reasons:</p> <p>To maintain the basic level of natural diversity in an area</p> <p>To buffer and provide connectivity between protected areas</p> <p>To benefit local communities, providing places of passive recreation, local environmental services, sense of place and amenity.</p> <p>Maintain water quality in groundwater resource areas</p> <p>Moderate local climates</p> <p>Support beneficial species that act as natural pest control</p> <p>Maintain rural lifestyle and a 'sense of place' – many people including myself and my partner moved from the city to enjoy a rural lifestyle. We commute 4 hours a day just for this reason. I believe with the amount of development proposed behind Chittering Rise that rural lifestyle and sense of place would be destroyed.</p> <p>Positive effects on human health, both physical and mental</p> <p>Buffers from roads, railway and industry</p> <p>Improved aesthetics of an area.</p> <p>Many areas identified through the local biodiversity planning process are of regional significance.' (Local Biodiversity Strategy p 13)</p> <p>Aside from their environmental importance, LNA's such as Lot 9001 provide a sanctuary and a sense of place for existing local residents, many of whom have travelled great distances to reside in the area due to its natural beauty, lack of infrastructure and small numbers of people. Many people have experienced real estate agents promising them that the surrounding bush land areas would remain untouched.</p> <p>A major focus of the Local Planning Strategy is natural resource management. This means the protection and enhancement of the natural environment necessary for the retention of the rural atmosphere.</p> <p>The Shire's mission is to work with and for the community to:</p> <p>Protect our natural environment</p> <p>Enhance our rural lifestyle</p> <p>Develop quality services and facilities</p> <p>Facilitate suitable development and employment opportunities.</p> <p>If this development is to go ahead the Shire would be reneging on its mission in two ways:</p> <p>1. Allowing a rare piece of High Conservation Value Area to be impacted by building and development (even in part) to create a densely populated area (in a rural sense) in a once small populated area would limit the Shire's ability to protect the natural environment.</p>	<p>The Development Plan recognises this in the form of one 20 ha Conservation Lot. The Conservation Lot is proposed to be covenanted for conservation, with the remainder of Lot 9001 for a mix of lot sizes.</p> <p>The Conservation Lot will retain natural diversity of flora and fauna through retention of vegetation.</p> <p>The Conservation Lot acts as an east-west landscape corridor.</p> <p>The proposed area of public open space aims to benefit the local community, providing recreation, sense of place and amenity. This will be supplemented by a landscape masterplan approach for the Development Plan area.</p> <ul style="list-style-type: none"> The applicant proposes to provide a reticulated water supply to the development, and the future Muchea Employment Node. On-site effluent disposal systems are proposed for each household. These systems will treat effluent water to meet the Australian Drinking Water Guidelines. Stormwater and drainage will be managed effectively within the Development area with localised infiltration and site storage and recharge into existing aquifers. <p>The preparation of the Fire Management Plan has influenced the lot layout on Lot 9001 Rosewood Drive to optimise vegetation retention whilst accommodating the fire management requirements.</p> <p>Noted. This is not a material planning consideration.</p> <p>Lot 2 Reserve Road should address noise attenuation measures associated with aircraft noise sourced from the RAAF Air Base Pearce and its flight paths. Lot 9001 Rosewood Drive is beyond the extent of the Military Consideration Special Control Area. No other buffers apply.</p> <p>A landscape masterplan and the retention of vegetation work provide amenity to the development.</p> <p>Lot 9001 is identified within an Indicative High Conservation Value Area within the Local Planning Strategy. The Development Plan recognises this in the form of one 20 ha Conservation Lot. The Lot is proposed to be covenanted for conservation, with the remainder of Lot 9001 for a mix of lot sizes.</p> <p>Noted, however this is not a material planning consideration. The proponent is not aware of what information has been provided by real estate agents to prospective purchasers.</p> <p>Refer above comments regarding Lot 9001 being identified within an Indicative High Conservation Value Area within the Local Planning Strategy.</p> <p>The compliance with the Shire's mission is not a material planning consideration. However, the Shire has sought to negotiate with the applicant to ensure an improved conservation outcome to that facilitated by the existing planning approvals over the site. The result being the creation of a 20ha conservation lot, and significant additional vegetation retention through the balance of Lot 9001.</p> <p>The Shire has sought to negotiate with the applicant to ensure an improved conservation outcome to that facilitated by the existing planning approvals over the site. The result being the creation of a 20ha conservation lot, and significant additional vegetation retention through the balance of Lot 9001.</p> <p>The Conservation Lot in Lot 9001 will preserve habitat to be utilised by native fauna and will provide an ecological linkage to surrounding habitat. This Lot will contribute to the Shire of Chittering's formerly protected Local Natural Area target.</p>	<p>Noted.</p> <p>Noted.</p> <p>Noted. The proposed Development Plan indicates a large 20ha Conservation lot to improve connectivity of biodiversity areas.</p> <p>The Applicant proposes the provision and development of POS consistent with DC 2.3 and Liveable Neighbourhoods.</p> <p>Noted.</p> <p>Retention of remnant vegetation assists with this.</p> <p>Noted. The Shire would encourage the Landscape Plan to use local and beneficial species.</p> <p>Impact on lifestyle is noted as a valid concern.</p> <p>Noted. Rural Conservation development is considered to provide a healthy lifestyle arrangement.</p> <p>The Applicant has submitted a Landscape Master Plan, including development of the POS, which is believed would improve the aesthetics.</p> <p>Noted.</p> <p>Noted importance of LNA's. It is considered the Rural Conservation zone provides for that.</p> <p>Noted. As per comment above, the Rural Conservation zone addresses the issue and responds to the environmental assets.</p> <p>It is acknowledged all these matters are taken into consideration.</p> <p>The current Rural Residential approval would result in a greater impact on the site and less protection measures. The proposed Rural Conservation zone is the appropriate zone for the site.</p>

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	<p>2. Rural lifestyle would be severely compromised with the amount of development (particularly the 500m2 lots)</p>	<p>Through discussions with Shire Officers and the Department of Planning, there was an expressed desire for development density to be increased given:</p> <ul style="list-style-type: none"> its close proximity to Muchea Employment Node and need to deliver living options for workers nearby the need to deliver a potable water supply scheme capable of supplying the Muchea employment Node and the district in general the desire to deliver 20ha of land for conservation purposes consistent with the Shire's Local Biodiversity Strategy 	<p>Noted.</p>
	<p>Flora and Fauna: Several flora and fauna species and ecological communities recorded within the Shire are protected by the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999.</p>	<p>None of the flora species identified are currently considered to be of conservation significance. Further work has determined that based on the habitat availability and known records of Threatened fauna species, the development area is only likely to contain suitable habitat for one Threatened fauna species the Carnaby's Black Cockatoos. At the time of writing the Black Cockatoo Habitat Assessment was in the process of being finalised. The impacts to these species will be assessed through the EPBC referral process. This information has been provided to the Shire.</p>	<p>Noted. The Applicant has submitted Flora and Fauna surveys of Lot 9001 as well as a basic ecological assessment. The Shire envisages prior to subdivision (if supported), referral to the EPBC would occur.</p>
	<p>In the 8 years I have been residing in Chitterling I have been compiling an observational list of fauna present in the area. see (Appendix 2). This list is continually growing as I identify more species. Local residents in Chitterling Rise have started to send me photos of wildlife they are seeing on their blocks and we are starting to generate a community survey of the area. This is fostering a sense of place amongst a previously disconnected community and many people have expressed their concerns about the future development affecting the flora and fauna of the area.</p>	<p>Appendix 2 is not provided to the applicant to view.</p>	<p>Noted. As previously mentioned Lot 9001 is currently approved for Rural Residential development, with lots across the entire site. It is believed the proposed Rural Conservation zone is the appropriate zone to address the environmental concerns.</p>
	<p>Currently the list only deals with fauna however I have been approached by a nature group to visit my property to formally identify all the flora species present. Members of the group had seen images of the flora on my property and were astounded at the biodiversity of a small area.</p>	<p>Appendix 2 is not provided to the applicant to view. The applicant has commissioned an environment consultant to undertake necessary studies for the Development Plan area.</p>	<p>Noted as per comment above. Development of Rural Conservation would provide greater protection than Rural Residential.</p>
	<p>As you will note there are several threatened species on the list which will all be affected by any development in the area. There have been a number of fauna fatalities in the local area including threatened species due to car strike. These include two Western Brush-tailed wallabies which have been hit and left on Sugar Gum Road. These mammals are locally present but are pushed out of areas when they become over populated. See Appendix 4.</p>	<p>Appendix 4 is not provided to the applicant to view. Brush-tailed wallabies are not a species that is listed as a 'Priority' species by the Department of Parks and Wildlife or as a 'Threatened' species under the Wildlife Conservation Act 1950 or EPBC Act. It is unlikely that clearing of habitat for the proposed development will impact on the survival on this species. Habitat retained in the Conservation Lot and within individual Lots will continue to provide habitat for the species.</p>	<p>Noted.</p>
	<p>The Western Brush Wallaby is listed by DPaw as Priority Four: Rare. Near Threatened and other species in need of monitoring (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy. See Appendix 3.</p>	<p>Noted. The Western Brush Wallaby is known to occur within the local area. However this species is not currently formally listed as 'Threatened' under the Wildlife Conservation Act 1950. It is not considered that the clearing proposed for the development area will impact on this species survival. Habitat retained in the Conservation Lot and within individual Lots will continue to provide habitat for the species.</p>	<p>Noted.</p>
	<p>I have been documenting those deaths and can provide further information at the Shire's requests. More population density will no doubt result in more fauna fatalities.</p> <p>Land Use Planning: The EPA considers that land use planning has an important role in protecting and maintaining naturally vegetated areas in urban and peri-urban environments. It recommends greater emphasis on appropriately protecting these areas at all stages of the planning process.</p>	<p>Noted.</p> <p>Noted. Amendment No. 55 was referred to the EPA with a decision of Scheme Not Assessed – advice given relating to Terrestrial Fauna, dated 16 March 2015. This matter is being addressed by the applicant to ensure compliance with the requirements of the EPBC Act. DPaw were also consulted during the formulation process of the Development Plan and subsequent to lodgement of the Development Plan. We understand that DPaw will be supporting the proposal on the basis of the improved Conservation outcome and have agreed to enter into a Conservation Covenant for the 20ha lot also.</p>	<p>Impact on wildlife noted.</p> <p>The EPA commented supporting the proposed conservation development.</p>

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	<p>Currently, many of the proposed structure plans and scheme amendments referred to the EPA do not adequately consider the protection of naturally vegetated areas and, if implemented, would result in significant loss of these areas and the biodiversity and amenity value they support. "Flora and vegetation" and "Terrestrial fauna" are the main environmental factors related to natural areas. The EPA's objectives for these factors are:</p>	<p>Noted. Refer comments above regarding EPA decision of Scheme Not Assessed.</p>	<p>The Shire forwarded the proposal to the EPA as required by the Town Planning Regulations. The EPA decision was to not assess the proposal and supported the conservation development. The Shire referred the proposed rezoning and Development Plan to the Department of Environment and Conservation and the Ellen Brockman Integrated Catchment Group for comments.</p>
	<p>Flora and vegetation: to maintain representation, diversity, viability and ecological functions at the species, population and community level.</p>	<p>See above comment.</p>	<p>As above.</p>
	<p>Terrestrial fauna: to maintain representation, diversity, viability and ecological function at the species, population and assemblage level. (EPA, 2013)</p>	<p>See above comment.</p>	<p>As above.</p>
	<p>Regardless of whether or not the EPA assesses or provides advice on a referral, planning authorities should also take account of and seek to protect the values of naturally vegetated areas through the planning process. (EPB No 20 Protection of natural areas through planning and development p. 2)</p>	<p>See above comment.</p>	<p>Noted. Environmental implications are assessed in accordance with legislation and policy and considered in the agenda report.</p>
	<p>I refer to Appendix 5 of my submission where the EPA has provided advice to the Shire regarding this development. They state that the clearing of the proposed development could cause loss of habitat for threatened black cockatoo species including Baudin's, Carnaby's and Forest Red-tailed black cockatoos, all protected by the Wildlife Conservation Act 1950 and the Environment Protection and Biodiversity Conservation Act 1999. The EPA goes on to say that the proponent should consider responsibilities regarding matters on National Environmental Significance if the scheme fails and impact is shown to affect protected fauna.</p>	<p>Since the development plan was submitted the proponent has performed a site specific assessment of the habitat value of the site in accordance with a commitment made in previous correspondence to the Shire. At the time of writing the Black Cockatoo Habitat Assessment was in the process of being finalised. Some trees on Lot 9001 have been identified to be potential breeding trees (as defined by federal guidelines) due to their size however none of these trees were found to contain suitable breeding hollows for Carnaby's Black Cockatoo. Breeding for Carnaby's Black Cockatoos primarily occurs in the Wheatbelt (Johnstone & Storr 1998). Due to the lack of hollow bearing trees within the site and the fact that Carnaby's Black Cockatoos primarily breed in the Wheatbelt, it is concluded that Lot 9001 is not currently a breeding site for Carnaby's Black Cockatoos. Lot 9001 is known to contain foraging species utilised by Carnaby's Black Cockatoos, however no feeding evidence in the form of chewed nuts or cones was recorded during the habitat assessment.</p> <p>A 20 ha Conservation Lot will be created as part of the development that will be covenanted for conservation. This will retain habitat to be utilised by fauna and will retain a linkage to surrounding habitat. The Rural Conservation Lots will retain as much vegetation as possible, with each lot having a maximum building envelope of 2,000m². It must be noted that clearing for the purposes of bushfire management (including fire service access routes, firebreaks and separation of vegetation from houses) is to achieve a balance between bushfire management requirements and environmental protection. This was considered in the design for the Development Plan.</p>	<p>The Applicant has prepared an ecological assessment and flora and fauna survey with the Development Plan application.</p>
	<p>Myself and other residents are currently monitoring the Black cockatoos and have installed artificial nesting hollows for these birds. I also take part in the annual Cocky Count to document the population dynamics of this threatened species. It is heartening to see the community concern for these birds as they continue to decline and it encouraging that the Shire's vision and mission encapsulates the protection of remaining vegetation which directly affects these priority species.</p>	<p>Noted. Refer comments above</p>	<p>Noted.</p>
	<p>Decisions and actions made by local authorities affect the status of biodiversity of the region. It is imperative that the Shire of Chittering analyze biodiversity conservation needs in the area. Biodiversity is best conserved by protecting existing communities rather than attempting to recreate natural space through revegetation which can never capture the full complex of a vegetation community previously untouched. 'It is important to note that before final decisions are made regarding which parts of remaining vegetation are to be retained and protected, on ground assessment and confirmation of vegetation complexes and their condition needs to be conducted.' (Local Biodiversity Strategy p.18)</p>	<p>Noted.</p>	<p>The Local Biodiversity Strategy is considered by the Shire in the agenda report.</p>
	<p>The Local Biodiversity Strategy provides ecological criteria for prioritising local biodiversity assets and recommends adopting three goals on which to base the Shire's local biodiversity conservation efforts and form its land use planning policy.</p>	<p>Noted.</p>	<p>Noted and agreed.</p>
	<p>Goal 1: Retention of natural areas –</p>		

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	<p>Goal 2: Protection of natural areas - Considering the growing pressure for development in the Shire, Goal 2 is of highest priority. The Shire should seek opportunities to protect natural areas of highest ecological value. These exist within 'Indicative High Conservation Value Areas' (HCVAs) identified in this document.</p>	<p>The Development Plan recognises this in the form of one 20 ha Conservation Lot. The Lot is proposed to be covenanted for conservation, with the remainder of Lot 9001 for a mix of lot sizes. The Department of Parks and Wildlife has been consulted with in regards to the Conservation lot and have agreed to enter into a Conservation Covenant for the 20 ha conservation lot.</p>	<p>It is considered the proposed rezoning provides the opportunity to protect the HCOA.</p>
	<p>The Shire of Chiltering is truly a special place to live because of its rural lifestyle but especially because it retains some sense of pre European settlement reflected in the surviving bush land. This is something to be cherished and celebrated and certainly could generate income in the form of eco tourism. As an environmental education specialist, I can see the value of boosting existing education and tourism opportunities within the Shire to ensure that natural areas are recognized for their importance but also utilized in a sustainable way for tourism opportunities.</p>	<p>Noted. Indicative vegetation retention areas are identified on the Development Plan.</p>	<p>Noted.</p>
	<p>Planning Issues recognised for proposed Scheme Amendment and Development Plan - Proposed Development Plan requirements I would like to address and ask questions of are as follows:</p>		
	<p>2. Vegetation management - Vegetation management is permitted outside of the designated building envelope specified for each lot on the Development Plan, where those trees are diseased, present danger to life or property, or require removal/maintenance as specified within the approved Fire Management Plan.</p>	<p>This reference is to clause 5.8 of the Shire's Scheme, which prevents clearing of vegetation unless in five circumstances, including '(a) the vegetation is dead, diseased or poses a danger to humans or stock'.</p>	<p>Noted as being consistent with the Shire's Town Planning Scheme.</p>
	<p>Vegetation management - how is this managed? Is it at the owner's discretion?</p>	<p>Vegetation management is undertaken in accordance with the requirements of the Development Plan and the Fire Management Plan.</p>	<p>Vegetation on private property is to be managed by the landowners in accordance with the provisions of the Scheme and applicable Development Plan (and Environmental Management Plan).</p>
	<p>Living and dead trees provide essential habitat for wildlife including Carnaby's cockatoos and other bird species, microbats, insect communities as well as supporting other plants. Many people view old or dead trees as dangerous if they are dead. Trees are also targeted as potential wood sources for open fires. It is often the case that old and dead trees will be removed without any professional advice, whether they are causing a danger to life or property is often not 100% apparent. Fallen timber is also vital to many species found in the Chiltering area and is often harvested for fire or burnt as part of fire management.</p>	<p>Vegetation can be removed in five circumstances pursuant to clause 5.8 of the Shire's Scheme.</p>	<p>Habitat vegetation is acknowledged and can be protected by way of conservation covenant however landowners are permitted to remove dead trees as per the Town Planning Scheme. An Environmental Management Plan would assist in protecting known and likely habitat and is recommended to be required as a provision of the Development Plan.</p>
	<p>Is there an approved fire management plan for this proposed development?</p>	<ul style="list-style-type: none"> - A draft fire management plan for the proposed development has been prepared by ICS Group. - The draft fire management plan will be submitted to the Shire of Chiltering, DFES and WAPC for approval in accordance with their requirements. 	<p>The Applicant has submitted a Fire Management Plan which will be subject to a number of approvals and the outcomes being incorporated into the design of this development.</p>
	<p>Other threats listed in the Local Biodiversity Strategy document is the pathogen Phytophthora cinnamomi causing dieback. It is seen as the next greatest threat to biodiversity but can be managed by strict control on the movement of vehicles and people from areas of known infestation and by careful selection of road making basic raw materials from disease free deposits. By creating more hundreds of blocks in the immediate area, the likelihood of dieback being transferred through the remaining vegetation would be increased greatly due to excess traffic and more roads being made. Currently there is banksia die off on the ridge at the back of my Lot 221 and Lot 220. It is not known whether this is due to Phytophthora and further investigation is needed. If Phytophthora is present it will be in close proximity to Lot 9001. This will present challenges in managing any future development and certainly management of a conservation lot.</p>	<p>Phytophthora cinnamomi (dieback) was not identified in environmental studies performed within the development area. However, if dieback is seen as a threat to the natural environment by the DPW or Shire, strict controls will be put in place for the development, particularly at construction stage. The Department of Conservation and Land Management ((CALM) now the DPW) Best Practice for the Management of Phytophthora cinnamomi will be adhered to should dieback be seen as a risk in the development area.</p>	<p>Applicant's response noted. A Dieback Management Plan would be a condition of subdivision to ensure dieback is managed accordingly.</p>
	<p>3. Indicative Building Envelopes - All development including buildings, water tanks and waste disposal systems, are to be contained within a cleared building envelope, which shall not exceed 2,000m². The position of the building envelopes are indicative as shown, and a final building envelope plan will need to be approved by the Shire prior to subdivision clearance and comply with the provisions of the Scheme, the requirements of the Development Plan and the approved Fire Management Plan. Buildings, water tanks etc. That are to be located outside the nominated.....</p>	<p>Noted. Building envelopes are indicatively shown on the Development Plan and will be determined at detailed subdivision stage in consultation with the Shire.</p>	<p>Noted as being consistent with the Shire's Town Planning Scheme.</p>

Submitter	Submission comments	Applicant response comments	Officer comments
	The proposed blocks to be developed behind Rosewood Drive are only 5000m2 in size. Once the building envelope has been cleared (2000m2) an area of only 3000m2 will be left. This will severely reduce the biodiversity of the area as existing bushland will become fragmented. It will also impede movement of local fauna, particularly those that require significant understorey for protection from predators.	Lot 2 Reserve Road is predominately cleared of vegetation (previous use as a plant nursery). A landscape Master plan proposes vegetation replanting within Lot 2 (as long as it complies with the Fire Management requirements. Road reserves within the development will be landscaped with rows of native wildflowers using specimens transplanted from the site and road side swales will be planted with endemic species.	Noted. The 5,000sq m lots have been designed to be clustered to reduce fragmentation.
	The scale and design of the proposed development including the conservation lots is inconsistent with the adjoining development Chittering Rise which range in size from 5 – 20 acres.	Refer comment above.	The proposed zones allow for smaller lot sizes.
	How does the development fit with any objective of the planning scheme to protect and enhance the natural environment?	The Development Plan is prepared in accordance with the Scheme provisions. The Development Plan considers the extent of vegetation types and Indicative High Conservation Value Areas, the impact of implementing Bushfire requirements, the interface between development and vegetation, the recommendations of the Local Biodiversity Strategy, the addition of a conservation covenant on the Conservation Lot, and the impacts on immediately adjoining land.	The Rural Conservation is the appropriate zone for areas identified in the Local Biodiversity Strategy. The proposed zone would give greater protection of the natural environment than what is currently approved.
	Several flora and fauna species and ecological communities recorded within the Shire are protected by the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 and it is highly likely that they will be affected by the fragmentation of existing foraging areas through development. In a highly fragmented landscape the distribution of the remaining natural areas is critical to the maintenance of biodiversity in that landscape. When looking outside the administrative boundaries of the Shire of Chittering, extensive areas of native vegetation remain along the East - South East boundary and also to the North West. However, the remnant vegetation in between is critical to maintain the connection between these natural areas, enable movement and exchange of animals, seeds and pollen. Patches of native vegetation scattered across a landscape have a capacity to remain functional natural systems if they are of adequate size and connected to other patches through a good quality network of linkages. This connectivity is important to assist with natural system recovery after events such as fires and will be critical to climate change adaptation.	A 20 hectare (ha) Conservation Lot will be created as part of the development that will be covenanted for conservation. This will retain habitat to be utilised by fauna, and will retain a linkage to surrounding habitat. The Rural Conservation Lots within Lot 9001 will retain as much vegetation as possible, with each lot having a maximum building envelope of 2,000m². It must be noted that clearing for the purposes of bushfire management (including fire service access routes, firebreaks and separation of vegetation from houses) is to achieve a balance between bushfire management requirements and environmental protection. This was considered in the design for the Development Plan.	Noted. The proposed Development Plan reduces fragmentation of Lot 9001 from what is approved.
	Further Concerns: Potential traffic and parking issues associated with the development – two access roads in and out of two adjoined developments with hundreds of properties in the area – fire risk	<ul style="list-style-type: none"> The existing special rural subdivision to the east of the proposed development of Lot 2 and Lot 9001 currently only has one access point – Sugar Gum Drive. This does not meet the requirements for access listed in the previous and the current Planning for Bush Fire Protection Guidelines (FESA & WAPC 2001 & Edition 2, FESA & WAPC May 2010). Both guidelines state that two different access routes should be available to the subdivision. The road network in the proposed development on Lot 2 and Lot 9001 will connect the road network in the existing special rural subdivision to Reserve Road. This will provide two access points to Great Northern Highway for residents in the existing special rural subdivision as well as for residents in the proposed development. The design of the road network proposed for the development of Lot 2 and Lot 9001 meets the requirements of both the existing Planning for Bush Fire Protection Guidelines (Edition 2, FESA & WAPC May 2010) and the Planning for Bushfire Risk Management Guidelines (WAPC & D&P, Draft May 2014). 	Noted. The proposed development complies with the Planning for Bush Fire Protection Guidelines by providing two access/egress points. Currently Chittering Rise has one entry/exit. The development would result in improved fire emergency access.
	More traffic in the area will pose threats to existing and new residents with lack of safe walking areas (pathways etc)	The proposed internal roads will incorporate road design measures to the specifications and satisfaction of the Shire. The majority of internal roads will be designed to be predominately straight, which will assist in providing sufficient sightlines for motorists to see pedestrians and cyclists, as well as to identify and avoid wildlife.	Noted.
	Chittering Rise has an existing problem with domestic dogs roaming off properties on the streets and onto other properties. I have had personal experience of being rushed at many times by off lead and off property dogs and am now to uncomfortable to walk through the area. I have raised this with the Shire Ranger as have other residents. Dogs have been seen chasing wildlife also. I have concerns that a more densely populated area would increase this existing problem for people and wildlife.	The Shire's rangers are responsible where appropriate to impound dogs, issue warning and infringement notices on offending dog owners, investigate dog attacks and any other matters under the Dog Act 1976.	Keeping and control of dogs are dealt with by the Dog Act 1976 and relevant local law.
	The following recommendations are listed in order of priority:		

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Public 1	The proposed retention of 20 hectares and lots ranging between 5,250m ² and 1,0845ha be discarded and amended to retaining the whole of Lot 9001 as Indicative High Conservation Value Area providing critical corridors for wildlife and the vegetation complex found in the area. Lot 9001 would help the Shire realise part of their overall vision to retain at least 20,000 hectares of its remaining 22,421 of Local Natural Areas and formally protected at least 6,328 hectares within these areas.	Lot 9001 is subject to an approved Development Plan and subdivision approval for creating 45 lots with an average size of 1 ha, with no Conservation Lot. Lot 2 Reserve Road is not identified in the Local Biodiversity Strategy. Lot 9001 Rosewood Drive is identified within the 'Mogumber Complex - South' vegetation complex, which has regional significance due to being under-protected. Lot 9001 is within the Indicative High Conservation Value Area 5.10 within the Lower Chittering Precinct, as per Figure 7 of the Local Biodiversity Strategy. Lot 9001 is identified as a Local Natural Area 'High Constraint Level', presumably due to existing planning decisions such as the currently valid subdivision approval and Development Plan. The modified Development Plan aims to retain a significant portion of Lot 9001, through the creation of a 20ha Conservation Lot and 35 Rural Conservation lots. The proposed lot sizes are guided by minimum lot sizes of 5,000m ² for clustering development whilst proposing one 20ha Conservation Lot for contributing towards protection of land identified within the Indicative High Conservation Value Area.	The Shire considers the proposed Rural Conservation zone and Development Plan to provide greater protection of the vegetation on Lot 9001 than the current approved Rural Residential development.
	For any blocks that do get approved, please amend the scale to be consistent with block sizes in the adjoining Chittering Rise development (5-20 acres minimum).	Not supported. With the withdrawal of Water Corporation as a water service provider, the landowners and their associates have committed to now applying for a Water Service Provider Licence and constructing a water treatment plant. This involves considerable investment and risk, and changes the financial risk and cost per lot significantly for the landowners. More recent discussions with the officers of the Department of Planning have indicated an opportunity to investigate increasing the density due to the establishment of the Muchea Employment Node immediately south of the subject site, which is currently remote from a workforce population. This proposal seeks to address the requirements to supply water to the Employment Node, increase the potential residential population in close proximity to the Employment Node, protect the conservation area on Lot 9001, and deliver a viable development within an approved planning framework.	Chittering Rise is a Rural Residential estate. Lots 2 and 9001 are currently Rural Residential with the lots. There is no planning grounds to increase lot sizes given what is currently approved and what is proposed.
	That the Public Open Space if it goes ahead, be made from retained bushland and linked through to the conservation lot to the north to create a habitat corridor.	The central park area is to make use of the existing mature stand of Eucalypts as a backdrop to nestle in resident park amenity. The central park will be organised spatially through the use of desire lines that cross the park providing not only cross access however a circuitous route within the park itself. The larger area is to be endemically rehabilitated to encourage local planting as a strong suggestion of the sites original landscape type.	There is no identified biodiversity linkage through Lot 2 or Lot 9001 to justify a habitat corridor. The Rural Conservation development of Lot 9001 provides protection for an existing link between IHCVA vegetation. The Landscape Plan outlines the POS will be rehabilitated with native species and is subject to a separate approval from the Shire.
	Thank you for the opportunity to comment on this proposed development. I understand the need for development however I do not think it should be at the expense of natural areas. Density in disturbed land such as old farm land previously cleared should be the option for future developments as there is a large amount of farmland in the Shire and limited natural areas left.	The Development Plan aims to balance increased lot yield on Lot 2 Reserve Road (which is cleared of remnant vegetation, previously used as a plant nursery) and reduced lot yield on Lot 9001 Rosewood Drive to address biodiversity and environmental objectives and ensure the delivery of a 20 ha conservation lot.	Noted.
	I cannot stress enough the importance of habitat protection and I would like to offer my services to help look after Lot 9001 if it were to be retained as a whole for conservation purposes only.	The proponent intends to have the Conservation Lot included under a conservation covenant with the Department of Parks and Wildlife's Nature Conservation Covenant Program (NCCP). The future landowner of the Conservation Lot will be responsible for the maintenance of biodiversity values which will be subject to the Conservation Covenant.	Noted.
	* Attached Appendices, EPA S48A advice and Qualifications. We strongly object to this proposal and asked the Shire to reject it.	Appendices not provided to applicant to view.	Noted. Objection noted.
	There is nothing positive for our rural community if this proposal gets it's approval.	This opinion is not accepted. In particular provision of reticulated water system, which contributes to water supply to Muchea Employment Node, which opens up opportunities for local employment, creates a positive outcome for the community. Locally, the plan proposes the provision of public open space, provision of mix of lot sizes and additional vegetation retention which are all positive outcomes from this development.	The Rural Conservation zone and development would provide greater protection of Lot 9001. The viability of sale of smaller lots is not a consideration of the planning proposal. The lot sizes are consistent with the proposed zone.
	Where one read the description, it reads like a fairytale come true, but obviously they have no idea to live here, here in a rural community, which was the choice of all the residents. It's not done to buy a large land site as a speculator, which no intention to live here and then get as many as possible little squares on a map, to gain the most profit out of it and after this comes the next amendment and it will be halved again.		
	they have not mentioned these real facts: no public transport at all	School bus services are monitored and provided by the PTA.	Public Transport is a PTA matter. If approved this proposal will be referred to the PTA for consideration of population intensification. In a wider context the PTA had no objections to the Shire's Local Planning Strategy and population forecasts due to identified development.

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			Many residents maintain work outside of the Shire. Residential development would provide demand and opportunity for local business. The Muchea Employment Node will provide additional employment opportunities in the near future.	
Public J	no work here and not for the next years, even decades to come	Through discussions with Shire Officers and the Department of Planning, there was an expressed desire for development density to be increased given the proximity to established townsites such as Muchea, and the future Muchea Employment Node.	Many residents maintain work outside of the Shire. Residential development would provide demand and opportunity for local business. The Muchea Employment Node will provide additional employment opportunities in the near future.	
	work, if you get one, at least 50km+ away	Local conveniences are provided at the Muchea IGA X-Press (within 10km from the site), Bulsbrook IGA, Bindoon IGA and Gingin IGA X-Press.	Noted. Distance to shopping complexes would be a personal choice by a landowner whether to locate to the Shire or not. As development intensifies services and additional amenities such as shopping centres are developed, however, as this area is of low density it is unlikely to see these facilities in the near future.	
	big shopping complexes also 50km+ away		Many Shire residents choose to commute. Should a person purchase in the Shire it would be expected they acknowledge these constraints.	
	daily driving around 100km - 150km for work if petrol prices rise again, one weekly wage per month only for petrol.	The commuting patterns of residents are not a material planning consideration.	Rural character can be maintained for lots less than 5 acres. The Residential R2 zone is considered low density. Further to this the Landscape Plan and rezoning of Lot 9001 to Rural Conservation provides opportunity for retention and enhancement to the rural character.	
	All rural shires, remain their rural character and identity with 5 acres/plus for subdividing large land sites. Chittering Shire should do the same, as this is what the people here want and that is why they have chosen this shire to live here.	The 'Residential R2' is a zone within the Shire's Scheme and at an R2 density, a minimum lot size of 5,000m ² is acceptable.		
	This dense subdivision will bring only problems to the shire and also to the people who live here, not to mention unemployment, crimes and neighbourly problems.	Refer previous comments regarding crime prevention.	Dismissed. Crime is not a direct relation to residential development.	
	so we urge the shire to reject this proposal of rezoning and keen our rural identity with 5 acres plus restrictions.		Noted.	
	Thank you for the opportunity to forward our concerns as bounding residents that will be directly affected by the proposed development plan.		Noted.	
	We purchased our block in the Chittering Rise estate direct from the developer in October of 2003, whilst still living in Sydney with the intention of moving our life across to WA, which we did in July of 2004. We are the original owners of the property. When we purchased the block we were under the understanding that the estate was to be kept as is (pristine Banksia woodland), which would allow the wildlife to have a corridor for us to co exist with them.	Lot 9001 Rosewood Drive is freehold land. A Development Plan was approved in June 2009. A current subdivision approval is in place for 45 lots with an average lot size of 1ha.	The proposal does not impact the development of lots in Chittering Rise.	
	Please below our objections and concerns regarding the above proposed development plan. Whilst we support progress it needs to be realistic and sustainable.	The proposed Development Plan aims to reduce the yield to 35 lots and to propose one 20ha Conservation Lot. The areas of vegetation retention aim to provide three east-west landscape corridors.	Noted.	
Public J	Our concerns are as follows:			
	Questions for the Development 'NOTES':			
	2. Vegetation Management			
	Who decides if a tree is diseased? The unqualified land owner or a botanist?	It is standard practice that trees would be assessed by an arboriculturalist, commissioned on behalf of a landowner, to determine if a tree is diseased. Biological surveys performed by the proponent's environmental consultants, VDM and 360 Environmental, did not identify the presence of dieback within the development area.	Landowners would be recommended to obtain expert advice.	
	Where is the Dieback Management plan in the 'Notes' of the Draft Development Plan.	Dieback was not identified in environmental studies performed within the development area. A Dieback Management has not been prepared, however if dieback is identified as an issue by the DPaW or the Shire a Dieback Management Plan will be prepared in accordance with the Department of Conservation and Land Management (CALM) now the DPaW 'Best Practice for the Management of Dieback in a Conservation Area'.	The Applicant has outlined a dieback assessment was undertaken. The Shire would impose a condition of a Dieback Management Plan prior to subdivision works commencing.	
	Considering they bounder us and we have it is a condition of our land why should they not			
	How will my bush be protected from their neglect of unclean machinery transferring dieback to my bush.	<ul style="list-style-type: none"> The three easements for the fire service access routes shown on Lot 2 and Lot 9001 do not impinge on the properties on Rosewood Drive and Ghost Gum Ridge. These easements are on private properties located within Lot 2 and Lot 9001. Owners of these three properties will be responsible for the maintenance of these fire service access routes. 	As above. A Dieback Management Plan would mitigate the spread of dieback.	
	7. Potable Water			
	Where is the potable water supply coming from?	The applicant is applying for a Water Service Provider Licence and constructing a water treatment plant for provision of water.	Applicant's response noted.	
	It states that potable water is available for fire fighting purposes. How will this work? We are constantly reminded by FESA that you should not rely on 'mains water pressure' in a bush fire. Why would this water supply be different to normal mains?	<ul style="list-style-type: none"> It is proposed to install below-ground fire hydrants along roads within the proposed development. The water supply infrastructure will include a back-up system to ensure that water will be available during a power failure. Notes:	Water Corporation regulations require fire hydrants every 200m for reticulated residential developments. This would comply with the Planning for Bush Fire Protection Guidelines. The Shire would also require landowners to maintain rainwater storage on site for fire fighting purposes.	

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		<ul style="list-style-type: none"> In areas where water is supplied via Water Corporation's water mains, it is generally recommended that homeowners in bushfire-prone areas maintain a back-up water supply in case of low water pressure or when the mains water supply fails. The same advice applies to residents in the proposed development. 	
	As we bounder this development are we going to be expected to tap into this water supply at a later date?	The Development Plan does not propose reticulated water connections to existing dwellings within the Rural Residential subdivision to the east; however the option will be available to surrounding residents.	This is not proposed.
	9. Bores, Dams and Water Courses What effect on the water table will the possible sinking of 246 more bores have?	The applicant is applying for a Water Service Provider Licence and a reticulated water supply is proposed for the development. The Water Service Provider's Licence has strict Management and monitoring requirements to address implications on the water table.	There is a bore proposed which will be utilised to reticulate all of the lots within the proposed subdivision.
	10. Fire Control Where is this 'Fire Management Plan' that the development plan mentions? Considering this development backs on to me, for our family's safety, I believe we should be made aware of it.	<ul style="list-style-type: none"> A draft fire management plan for the proposed development has been prepared by ICS Group. The draft fire management plan will be submitted to the Shire of Chittering, DFES and WAPC for approval. The fire management plan for the proposed development will become a public document. 	A draft Bush Fire Management Plan has been submitted with the application. It should be noted that bushfire planning is only improving with time, therefore, it is likely that your property will be positively impacted from a bushfire fighting perspective should this proposal go ahead.
	This is already an issue for the residents of Chittering Rise. If a fire comes towards us from the Great Northern Highway, where do potentially 632 vehicles go to get to safety? WE CURRENTLY HAVE 1 ROAD ENTRY/EXIT IN & OUT OF OUR ESTATE .	<ul style="list-style-type: none"> The existing subdivision to the east of the proposed development of Lot 2 and Lot 9001 currently only has one access point – Sugar Gum Drive. This does not meet the requirements for access listed in the previous and the current Planning for Bush Fire Protection Guidelines (FESA & WAPC 2001 & Edition 2, FESA & WAPC May 2010). Both guidelines state that two different access routes should be available to the public. The road network in the proposed development on Lot 2 and Lot 9001 will connect the road network in the existing special rural subdivision to Reserve Road. This will provide two access points to Great Northern Highway for residents in the existing special rural subdivision as well as for residents in the proposed development. These two access points are more than 4km apart The design of the road network proposed for the development of Lot 2 and Lot 9001 meets the requirements of both the existing Planning for Bush Fire Protection Guidelines (Edition 2, FESA & WAPC May 2010) and the Planning for Bushfire Risk Management Guidelines (WAPC & DoP, Draft May 2014). <p>Notes:</p> <ul style="list-style-type: none"> In order to reduce the risk to residents, DFES recommends that residents leave well before a bushfire impacts on an area, rather than during the time a bushfire impacts on an area. Provided that this advice is followed, the relocation of residents can be undertaken in a controlled manner. Houses in the proposed development are required to be constructed to comply with the Australian Standard for the Construction of buildings in bushfire-prone areas AS3959. This would allow residents to shelter in their houses during the passage of a wildfire, reducing the need to evacuate the area late, when a bushfire is already in operation on the area. 	The proposed development provides road and fire emergency access linkages with Chittering Rise which results in 2 road access/egress points.
	Reserve Rd could not cope with the excess vehicles. Questions for the Development 'LEGEND'	Reserve Road will be upgraded as part of the proposed development.	Reserve Road would be subject to upgrade in accordance with subdivision guidelines.
	Public Open Space - The Shires TPS 6 - LPP no 28 -Public Open Space dedication on Rezoning.	The proposed Conservation Lot comprises approximately 20ha, and through application of a Conservation covenant this would result in approximately 33 percent of the previous 58ha of potential lost vegetation being retained. The initial proposal was to provide the Conservation Lot to the Shire as public open space however this was not supported by the Shire; instead the lot will remain freehold with a Conservation Covenant proposed.	LPP 28 is not relevant to the development as the Residential R2 zone is captured by DC 2.3 (provision of POS in residential development). The Applicant is to cede and develop the POS proposed.
	5.1. states that 10% of the development is to be set aside as a reserve for parks & recreation. The current proposed reserve is less than 4% of the development area.	The proposed Development Plan instead includes an area of public open space in addition to the provision of Community Infrastructure such as play equipment, BBQ and ablation facilities that addresses the Shire's requirements. For 208 lots on Lot 2 Reserve Road, it is considered the area of public open space and associated infrastructure is sufficient for the intended residential population.	DC 2.3 allows for less than 10% to be dedicated if POS is to be developed or cash in lieu is accepted.
	Fire Breaks	<ul style="list-style-type: none"> The dataset provided by Landgate shows that a 5m wide reserve abuts the eastern boundary of Lot 9001. A fire service access route ('strategic firebreak') is located in this reserve. 	Firebreaks are detailed in the draft Bush Fire Management Plan.

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		<ul style="list-style-type: none"> As part of the proposed development, the fire service access route located in the 5m wide reserve along the eastern boundary of Lot 9001 will be widened by 1m, so that it complies with the requirements contained in both the existing Planning for Bush Fire Protection Guidelines (Edition 2, FESA & WAPC May 2010) and the draft Planning for Bushfire Risk Management Guidelines (WAPC & DoP, Draft May 2014). 	
	The Shires TPS 6 -LPP no 21 -Fire Management Plans	Notes:	Noted and agreed.
	3.2.c.iv. states that the access route must be 6 metres wide and trafficable	<ul style="list-style-type: none"> It is acknowledged that parts of the existing fire service access route ('strategic firebreak') located in the 5m wide reserve along the eastern boundary of Lot 9001 is not adequately maintained. This is outside the control of the proponent. 	Noted.
	Fire Service Access Route as per the development plan 'legend'	<ul style="list-style-type: none"> The developer could, in partnership with the Shire of Chittering, upgrade the existing fire service access routes located in the reserves located along the eastern boundaries of Lot 2 and Lot 9001. 	Existing firebreaks outside of the proposed site is not part of this consideration.
	States Existing 6 metre reserve. This is untrue, for the fire break that separates the properties on Ghost Gum Ridge and Lot 9001 there is a strategic fire break approx 3 wide (existing strategic fire break for the Chittering Rise estate), then depending on what area your standing in, up to approx 3 metres of remnant vegetation, then approx 3 metres of cleared vegetation (on Lot 9001 side). Please see attached pictures.	<ul style="list-style-type: none"> The dataset provided by Landgate shows that 6m wide easements exist on two properties adjacent to the eastern boundary of Lot 2. Fire service access routes ('strategic firebreaks') are located on these easements. 	As above.
	States Existing 6 metre easement. This is untrue. It is approx 3 metres wide.	Notes: <ul style="list-style-type: none"> It is acknowledged that parts of the existing fire service access routes ('strategic firebreak') located on the 6m wide easements on two properties adjacent to the eastern boundary of Lot 2 may not be adequately maintained. This is outside the control of the proponent. For fire service access routes, both the existing Planning for Bush Fire Protection Guidelines (Edition 2, FESA & WAPC May 2010) and the draft Planning for Bushfire Risk Management Guidelines (WAPC & DoP, Draft May 2014) require that turn around areas suitable for 3.4 fire appliances are available every 500m. The three fire service access routes shown on the draft development plan for Lot 2 and Lot 9001 are less than 165m in length and therefore do not require turn around areas. These three fire service access routes provide turn around areas for fire appliances where they intersect with the existing fire service access routes located in the reserves along the eastern boundaries of Lot 2 and Lot 9001. It is proposed to install below-ground fire hydrants along roads within the proposed development. A provision for a water tank has therefore not been made. 	The draft Bush Fire Management Plan complies with the Planning for Bush Fire Guidelines for turn around areas.
	3.2.c.v. states that they must provide turn around areas -there is no provision for this in the development plan.		
	3.4. Water Supply -there is no provision for a water tank for fire fighting purposes		Fire hydrants are proposed as required by the Planning for Bush Fire Protection Guidelines.
	General Questions / Concerns		
	Fauna & Flora	Environmental Surveys that have been undertaken within the development area that were used in determining the likelihood of Threatened species occurring within the project area include: <ul style="list-style-type: none"> Basic Ecological Assessment for Lot 2 Reserve Road (VDM 2005) Vegetation Survey for Lot 9001 (Formerly Lot 7) Rosewood Drive (VDM 2008) Black Cockatoo Habitat Assessment (360 Environmental in prep 2015) 	Flora and Fauna surveys have been undertaken and submitted with the application.
	A survey needs to be completed at the developer's expense, at the appropriate time of year, to ascertain the fact of what is part of our land and not just assumptions.	Noted. The Western Australian Christmas Tree (Nuytsia floribunda) was identified within the development area; however it is not listed as a 'Priority' species by the Department of Parks and Wildlife or as a 'Threatened' species under the Wildlife Conservation Act 1950 or EPBC Act.	Vegetation Protection Areas have been identified on the Development Plan.
	The Shires TPS no 6 LPP No 32 -specifically mentions that a development plan should include natural features worthy of preservation 'in particular WA Christmas Trees' -we have plenty, but you won't see them in May. See attached aerial view of 159 Ghost Gum Ridge.		
	Block size		
	Lot 9001 -. Lots 220 221 & 220 Ghost Gum Ridge directly bounder this block. This bush is exactly the same as ours (Banksia woodland which has been classified as a threatened ecological community).	Lot 9001 Rosewood Drive is identified within the 'Mogumber Complex - South' vegetation complex, which has regional significance due to being under-protected.	Noted. Lot 9001 is proposed to be rezoned to Rural Conservation, which makes provision to protect vegetation.
		The modified Development Plan aims to retain a significant portion of Lot 9001, through the creation of a 20ha Conservation Lot and 35 Rural Conservation lots. The 20ha Conservation Lot contributes towards protection of land identified within the Indicative High Conservation Value Area.	

Submitter	Submission comments	Applicant response comments	Officer comments
	Please don't set us up for disaster!		
	Road Width - If the proposed development is to be attached to us and use our roads, then the roads of that development need to be of the same width , so that vehicles can easily and safely pass each other .	The proposed road reserves within the Development Plan are 20 metres, which are consistent with the road reserve widths of Rosewood Drive, Sugar Gum Drive and Ghost Gum Ridge. Roads will be designed to seamlessly connect to Reserve Road and Rosewood Drive.	Road reserves meet the subdivision guidelines and allow for two way traffic.
	Trespassers	This is not a material planning consideration, criminal activity is a police matter.	Trespassing is a police matter.
	How do we police the problems associated with trespassers.		
	Our blocks are not fenced. This was an intentional thing as to let the wildlife travel freely. They lived here 151 ll	If fencing is required it is proposed to be to a rural standard, i.e. post and wire, which would permit the movement of fauna.	As above. Trespassing is a police matter.
	To ensure a visible boundary is seen and can help to stop people entering our properties, the developers should have to fence our properties at their cost with plain wire. This will then allow wildlife to still move freely and stop people cutting down our trees for fire wood.		
	The Shire's Local Planning Strategy -Revised March 2014		
	Mission Statement -this development contradicts all 4 points		
	7.1 Environmental Issues -This development will contribute to the environmental issues; loss of remnant vegetation, weed invasion, the spread of dieback.	Phytophthora cinnamomi (dieback) was not identified in environmental studies performed within the development area. The Conservation Lot will be managed in a way to prevent weed invasion, by restricting access. The 20 ha Conservation Lot has been proposed to be covenanted for conservation. The Conservation Lot will result in approximately 33% of the vegetation in Lot 9001 being retained for conservation in perpetuity post-development.	The Shire considers the proposed development improves the protection of the environmental assets to what is currently approved. Additional environmental management plans would be required should this proposal progress to subdivision.
	7.1.1. AIMS-As the block sizes are smaller than the adjoining estate the aims will be unattainable. Protection of remnant vegetation ,land degradation , threatened ecological communities and watercourses will be near impossible.	Vegetation will be also retained as much as practicable within individual lots in order to reduce impacts to native fauna, with building envelopes being a maximum of 2,000m ² . The Development Plan addresses the relevant aims of the Local Planning Strategy, and approaches the development of the land for a mix of lot sizes that are reflective of the land capabilities as well as the feasibility and viability for the provision of necessary infrastructure such as reticulated water supply.	The proposed scheme amendment along with associated development plan were submitted with detailed documentation justifying the reduction in lot sizes based on land capability, bushfire fighting ability, retention of important vegetation in accordance with the Biodiversity strategy, provision of additional services to ensure that this development is suitable.
	The Shire's Draft Local Planning Strategy -24th July 2014		
	Indicates the Chittering Rise Estate as Rural Residential.	Scheme Amendment 55 proposes to rezone Lot 9001 to Rural Conservation and Lot 2 Reserve Road to Residential R2.	Noted. As per applicant's response.
	Indicates Lot 9001 Rosewood Drive as Indicative High Conservation Value Area, yet the letter we received from Shire re this development classifies Lot 9001 as Rural Residential-so now I'm left wondering which document is correct.		
	Indicates Lot 2 Reserve Road as Rural Residential.		
	The above parcels of land link together the recently acquired DPAW land on Ippolito Rd. This vegetation provides nests and food sources for the Carnaby's Black Cockatoo as well as a corridor for loads of over native species. Please see attached some pics of some of our native residents.	A 20 ha Conservation Lot will be created as part of the development that will be covenanted for conservation. This will retain habitat to be utilised by fauna, and will retain a linkage to surrounding habitat. The Rural Conservation Lots within Lot 9001 will retain as much vegetation as possible, with each lot having a maximum building envelope of 2,000m ² . It must be noted that clearing for the purposes of bushfire management (including fire service access routes, firebreaks and separation of vegetation from houses) is to achieve a balance between bushfire management requirements and environmental protection. This was considered in the design for the Development Plan.	Further to the applicant's response, further environmental management plans including a plan focusing on the protection of the Carnaby cockatoo would be required if this progresses to the subdivision stage. The current documentation is considered to sufficiently address any possible environmental impact at this stage of the proposal.
	The Shires Town Planning Scheme No 6 - LPP no 32 -Development Plans		
	5.3.a. Drainage -states that storm water drainage is to be designed there is no mention of this in the development plan	The Development Plan report discusses stormwater drainage. Stormwater is to be managed effectively within road reserves.	A Local Water Management Strategy will be required to be submitted prior to the Development Plan being considered by Council.
	5.3.c. Lots -does not state the required lot size for R2 or Rural Conservation.	The Development Plan complies with the lot size requirements under the Shire's Scheme for the Residential R2 and Rural Conservation zones. A minimum lot size of 5,000m ² is applicable to lots coded 'R2'. The objectives of the 'Rural Conservation' zone include: <ul style="list-style-type: none">• To create lot/s that are of sufficient size to sustain the long-term protection and management of these values.• Encourage innovative subdivision design, such as consolidated cluster style development, that maximises the long-term protection and management of these values	As per consultants comments. In addition to this, the supporting scheme amendment and development plan documentation justify the reduction in lot size from 2ha.

Submitter	Submission comments	Applicant response comments	Officer comments
	5.3.e. Fire Management - There are no alternate means of escape shown on the development plan.	<ul style="list-style-type: none"> - The existing subdivision to the east of the proposed development of Lot 2 and Lot 9001 currently only has one access point – Sugar Gum Drive. This does not meet the requirements for access listed in the previous and the current Planning for Bush Fire Protection Guidelines (FESA & WAPC 2001 & Edition 2, FESA & WAPC May 2010). Both guidelines state that two different access routes should be available to the public. - The road network in the proposed development on Lot 2 and Lot 9001 will connect the road network in the existing special rural subdivision to Reserve Road. This will provide two access points to Great Northern Highway for residents in the existing special rural subdivision as well as for residents in the proposed development. - The design of the road network proposed for the development of Lot 2 and Lot 9001 meets the requirements of both the existing Planning for Bush Fire Protection Guidelines (Edition 2, FESA & WAPC May 2010) and the Planning for Bushfire Risk Management Guidelines (WAPC & DoP, Draft May 2014). <p>Notes:</p> <ul style="list-style-type: none"> - In order to reduce the risk to residents, DFES recommends that residents leave well before a bushfire impacts on an area, rather than during the time a bushfire impacts on an area. Provided that this advice is followed, the relocation of residents can be undertaken in a controlled manner. - Houses in the proposed development are required to be constructed to comply with the Australian Standard for the Construction of buildings in bushfire-prone areas AS3959. This would allow residents to shelter in their houses during the passage of a wildfire, reducing the need to evacuate the area late, when a bushfire is already impacting on the area. 	<p>The Bushfire Management Plan has identified sufficient points of access and egress for resident safety as part of this proposal. Further amendments are required to the Bushfire Management Plan prior to Councils final consideration of the Development Plan.</p>
	The only positive I can see with this development, is at a time in the future, if we decide we would like to subdivide our nearly 20 acres, we should face no problems.	<p>Noted. The objectives of the Rural Residential zone include "to meet the demand for a rural lifestyle on small lots, generally in excess of 1 hectare". A 20 acre lot is equivalent to 8.09ha, and may be considered for subdivision subject to application being made to the Western Australian Planning Commission.</p>	Any future subdivision of land within the Shire of Chittering is subject to it being identified for that purpose within the Local Planning Strategy. The Shire of Chittering is currently reviewing its Local Planning Strategy which will be advertised for public comment in the next 6-12 months. Should you be interested in subdividing your site in the future you should make a submission on the draft strategy when its released for public comment.
	We look forward to hearing of sustainable, environmentally friendly outcome to this unrealistic proposed development plan * Attached photos of existing firebreaks (not 6m wide) and photos of wildlife found in the area.	<p>Noted</p> <p>Photos not provided to applicant to view.</p>	<p>Noted.</p> <p>Noted.</p>



Risk Management
Community Safety
Wildfire Protection
Project Management

Bushfire management plan

Lot 2 Reserve Road & Lot 9001 Rosewood Drive Shire of Chittering



28 July 2015

Bushfire management plan

Lot 2 Reserve Road &

Lot 9001 Rosewood Drive

Shire of Chittering

28 July 2015

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Disclaimer

Representations, statements, opinions and advice expressed or implied in this document are based on information contained in the *Planning for Bush Fire Protection Guidelines* (Edition 2, FESA & WAPC, 2010), the *Draft Planning for Bushfire Risk Management Guidelines* and *Draft State Planning Policy 3.7 Planning for Bushfire Risk Management* (DoP & WAPC, May 2014), the *Australian Standard for the Construction of Buildings in Bushfire-prone Areas* (AS3959-2009), the Shire of Chittering Firebreak Notice 2014 – 2015 and site inspections undertaken in December 2014, and in May and July 2015.

Any representation, statement, opinion, or advice expressed or implied in this document is made in good faith, and on the basis that the ICS Group is not liable for any damage or losses whatsoever which may occur as a result of action taken or not taken (as the case may be) in respect of any representation, statement, opinion or advice referred to herein.



ICS Group

ICS Group specialises in risk and emergency management, wildfire protection and community safety. It provides consultancy services in fire preparedness and response planning, wildfire investigation, wildfire behaviour research and fire impact assessment.

Klaus Braun

Klaus Braun, the principal of ICS Group, has completed wildfire risk management and wildfire behaviour projects for State and Local Governments, conservation organisations, as well as for corporate clients within the land development, plantation and insurance industries. He assisted with the Council of Australian Governments National Inquiry on Bushfire Mitigation and Management (COAG, 2004), and conducted research in wildfire behaviour and impact in blue gum plantations in Australia and Portugal.

Klaus Braun presented papers on wildfire risk management at State, National and International conferences.

Prior to forming the ICS Group, Klaus has worked as Manager Wildfire Prevention and Environment Branch, Operations Manager, Regional Fire Safety Officer with the Bush Fire Service and the Fire and Emergency Services Authority of Western Australia. During this time he coordinated a number of major fire operations, developed the framework for wildfire mitigation planning in Western Australia, and undertook wildfire investigations.

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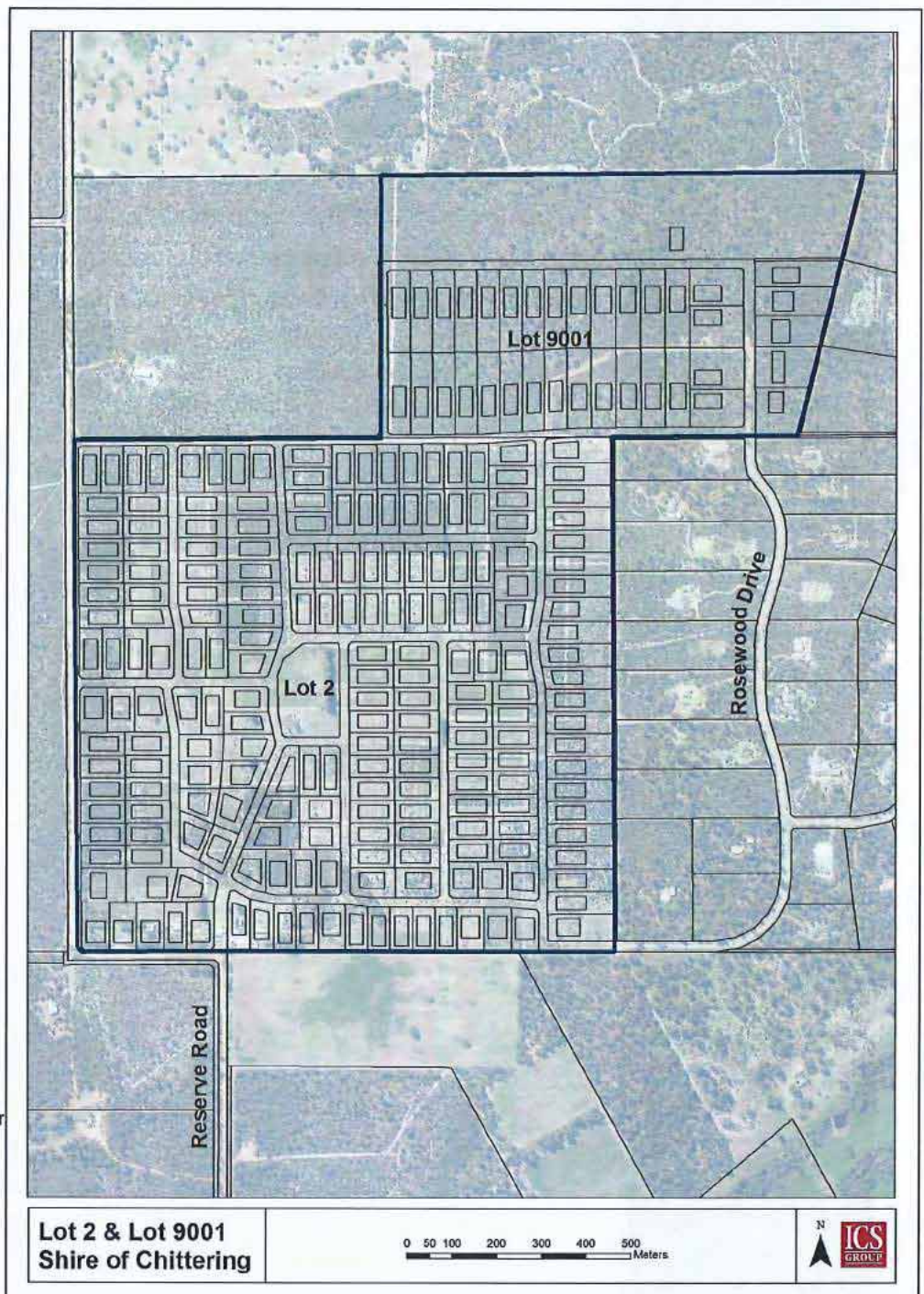
1 Introduction

Lot 2 Reserve Road and Lot 9001 Rosewood Drive are currently zoned Rural Residential. Approvals are currently in place to subdivide these two lots into 155 lots.

On behalf of Riverside Investments (WA) No. 2 Pty Ltd, Taylor Burrell Barnett Town Planning & Design have prepared the proposed Scheme Amendment 55 and a Development Plan for the subject site to create 243 lots ranging in size from 5,000m² and 20.4ha, public open space and a site for drinking water protection and infrastructure. The proposed Scheme Amendment 55 changes the zoning for Lot 2 from Rural Residential to Residential R 2 and, for Lot 9001, from Rural Residential to Rural Conservation.

Right: Map showing the plan for the proposed development on Lot 2 Reserve Road and Lot 9001 Rosewood Drive.

The subject site is inside the boundary marked in blue. Indicative building envelopes are also shown on each lot.



1.1 Scope

This Bushfire Management Plan is a strategic level plan. It outlines the bushfire protection measures which will be applied to the proposed development of Lot 2 Reserve Road and Lot 9001 Rosewood Drive, to achieve compliance with the following:

- *Planning for Bush Fire Protection Guidelines* (Edition 2, FESA & WAPC, 2010);
- *Draft Planning for Bushfire Risk Management Guidelines* (DoP & WAPC, May 2014);
- *Draft State Planning Policy 3.7 Planning for Bushfire Risk Management* (DoP & WAPC, May 2014);
- *Australian Standard for the Construction of buildings in bushfire-prone areas* (AS3959-2009); and
- Shire of Chittering Firebreak Notice 2014 – 2015.

The Bushfire Management Plan should be read in conjunction with the proposed Development Plan and associated planning documents prepared by Taylor Burrell Barnett, Town Planning and Design.

1.2 Background information

Lot 2 was previously used as a nursery and the vegetation on this lot is introduced. Vegetation cover varies significantly and includes paddocks, scrub and shrubland, as well as banksia plantations.

Vegetation cover on Lot 9001 is *Xanthorrhoea* – *Eucalyptus* woodland, *Adenanthos* woodland and *Banksia* – *Eucalyptus* woodland.

Access to Lot 2 is via Reserve Road, which connects to Great Northern Highway. Lot 2 is approximately 2km from Great Northern Highway.

Access to Lot 9001 is via Rosewood Drive, which connects to Great Northern Highway via Ghost Gum Ridge and Sugar Gum Drive. These roads are located in the special rural subdivisions to the east of the subject site. Sugar Gum Drive currently provides the only access and egress for residents in these special rural subdivisions. By road, Lot 9001 is approximately 3.1km from Great Northern Highway.

The road network in the proposed development will connect to the existing road network in the special rural subdivisions to the east. This will provide additional access and egress options for residents in both the existing and the proposed developments. (See map on page 16.)

1.3 Bushfire risk management planning context

A number of different bushfire protection planning documents, standards and requirements are currently in place, or are proposed, in Western Australia. These documents, standards and requirements are not always consistent, which can cause some confusion. The following provides an overview of the documents which are currently in place and which were incorporated in the bushfire risk management solutions for the proposed development of Lot 2 Reserve Road and Lot 9001 Rosewood Drive.

In cases where the requirements contained in the different documents are inconsistent or have shortfalls, the bushfire risk management solutions contained in this Bushfire Management Plan were developed to meet the requirements of the Australian Standard for the Construction of buildings in bushfire-prone areas AS3959.

Draft bushfire risk management documents

On 1 May 2014, the Department of Planning released the *Draft State Planning Policy 3.7 Planning for Bushfire Risk Management* and the *Draft Planning for Bushfire Risk Management Guidelines* for public consultation. At the time, the Department advised that it anticipated that the new Policy and Guidelines would be finalised and adopted in late 2014.

In August 2014, the Department of Planning released the proposed *Planning and Development (Bushfire Risk Management) Regulations 2014*. At the time, the Department advised that it anticipated that the Regulations would be gazetted in late 2014 and that they will take effect on 1 May 2015.

At the time of writing this Bushfire Management Plan, the draft policy and guidelines are still under review and changes are expected to be made before these documents are finalised. The proposed regulations have also not yet been adopted. The Government has advised that it anticipates that the new regulations and associated planning documents will come into effect in September 2015.

Bushfire-prone area map

The Department of Fire and Emergency Services has carried out mapping to identify and designate bushfire-prone areas in Western Australia. A bushfire-prone area map has been developed for the Shire of Chittering, but this map is not yet available to the public. As mentioned above, the Government has advised that it anticipates that the regulations and the bushfire-prone area map will come into effect in September 2015.

For the purpose of this Fire Management Plan, it is assumed that Lot 2 Reserve Road and Lot 9001 Rosewood Drive will be designated as a bushfire-prone area.

Current bushfire protection planning documents

The bushfire protection planning documents which currently apply to new developments are:

- State Planning Policy No 3.4 – Natural Hazards and Disasters (WAPC, 2006)
- Planning for Bush Fire Protection (Edition 2, FESA & WAPC, 2010)

AS3959

The Australian Standard for the Construction of buildings in bushfire-prone areas AS3959 applies in areas which have been formally designated as bushfire-prone areas.

Shire of Chittering Firebreak Notice 2014 – 2015

The Shire of Chittering issues an annual Firebreak Notice. The Notice may change from year to year. The Firebreak Notice for 2014 – 2015 lists a number of requirements, including:

- On lots which are less than 2 hectares, boundary firebreaks are not required. These lots should meet the requirements listed under General Fire Hazard Reduction.
- Lots with an area greater than 2 hectares must maintain 3m wide firebreaks clear of all flammable materials along the inside boundary of the property. A 4m vertical clearance along the firebreak is also required.
- 20m wide Building protection zones must be maintained around all buildings. Bushfire fuels in building protection zones must be maintained below 2t/ha.

Shire of Chittering Local Planning Policy No 21 – Fire Management Plans

The objectives of the Shire of Chittering Local Planning Policy No 21 – Fire Management Plans are to protect life and property and to maintain the rural character of the Shire. The Policy contains requirements and information in relation to:

- private property owners and occupiers' responsibilities for fire safety;
- fire service access routes;
- individual firebreaks;
- general fire hazard reduction;
- water supply; and
- fire management plans.

2 Objectives of the bushfire management plan

The objectives of this Bushfire Management Plan are to:

- provide bushfire protection solutions to enable the proposed development, houses within the development and residents to withstand a bushfire event on days where the fire danger index is 80 (FDI 80);
- document bushfire attack levels within the proposed development in accordance with AS3959;
- achieve consistency with the objectives and requirements of the current and proposed bushfire risk management planning regulations, policy and guidelines;
- nominate individuals and/or organisations responsible for bushfire risk management and associated works in the context of the proposed development;

3 Description of the area

Topography

The topography within and adjacent to the subject site is best described as gently sloping to the east and south east. Slopes are between 0° and 5°. The highest point is approximately 165m and the lowest point 140m.

Bushfire fuels

Lot 2 was previously used as a nursery and the vegetation on this lot was introduced. Vegetation cover varies significantly and includes paddocks, scrub and shrubland, as well as banksia plantations. A landscaping plan has been developed to modify and manage the existing vegetation, to improve the amenity of the proposed rural residential development and to significantly reduce bushfire attack on future houses in the area.

Vegetation cover on Lot 9001 is *Xanthorrhoea* – *Eucalyptus* woodland, *Adenanthos* woodland and *Banksia* – *Eucalyptus* woodland. A landscaping plan has been developed for the rural conservation lots which allows the retention of clusters of vegetation while maintaining sufficient separation between the vegetation and houses so that bushfire attack levels do not exceed BAL-29.

The development design also retains the majority of the vegetation on the large conservation lot on the northern boundary of Lot 9001. The exceptions are the area surrounding the future house, where the vegetation must be managed as low fuel to reduce bushfire attack levels to BAL-29 (or below), the firebreaks and strategic fire service access routes which must be maintained along the western, northern, eastern and part of the southern boundaries of the conservation lot.

Vegetation cover in the special rural subdivisions to the east of the subject site is woodland. The rural lots to the north and west, and to the south-west generally also have a cover of woodland. The rural property to the south of Lot 2 has been cleared and is maintained as a paddock. (See aerial photo and map on page 2.)

The development design incorporates setbacks for building envelopes to provide sufficient separation from woodland vegetation on the adjacent lots, so that bushfire attack levels on houses along the interface do not exceed BAL-29.



Above left: A paddock in the centre of Lot 2.



Above right: Kangaroo Paws in the centre of Lot 2.



Above left: Introduced sparse low shrubland in a north-western part of Lot 2.



Above right: Introduced shrubland in the centre of Lot 2.



Above left: Part of the Banksia plantation in the northern part of Lot 2.



Above right: Looking south-east across the paddock adjacent to the southern boundary of Lot 2.



Above left, right and below: Woodland vegetation in the centre of Lot 9001. Vegetation cover is best described as a mix of open areas with low shrubland and clusters or thickets of small woodland trees and shrubland.



Land uses

Lot 2 Reserve Road and Lot 9001 Rosewood Drive are currently zone Rural Residential. Special rural subdivisions are located to the east of these lots. Rural land, both cleared and not cleared, is located adjacent to the northern, western and southern boundaries of the subject site.

Access

As described earlier, access to Lot 2 is via Reserve Road, which connects to Great Northern Highway. Lot 2 is approximately 2km from Great Northern Highway.

Access to Lot 9001 is via Rosewood Drive, which connects to Great Northern Highway via Ghost Gum Ridge and Sugar Gum Drive. By road, Lot 9001 is approximately 3.1km from Great Northern Highway.

Sugar Gum Drive, Ghost Gum Ridge and Rosewood Drive are located in the special rural subdivisions to the east of the subject site. Sugar Gum Drive is currently the only access and egress point for residents in these special rural subdivisions. An alternative access/egress option is currently not in place.

The road network in the proposed development will connect to the existing road network in the special rural subdivisions to the east. This will provide additional access and egress options for residents in both the existing and the proposed developments. (See map on page 16.)

A number of strategic firebreaks (now referred to as fire service access routes) are located in the special rural subdivisions to the east. Some of them are located within reserves while others are located in easements on individual lots. The width of the reserves varies. To the east of Lot 2, the reserve which contains the fire service access route is 6m wide. To the east of Lot 9001, the reserve is 5m wide.

Residents from the adjacent special rural subdivisions have advised that the existing fire service access routes are not always adequately maintained. Gates are currently also not in place to prevent unauthorised vehicles from using the fire service access tracks.

The Shire of Chittering has advised that the existing fire service access routes along the eastern boundaries of Lot 2 and Lot 9001 should be incorporated in the development design rather than constructing duplicate fire service access routes along the eastern boundaries of Lot 2 and Lot 9001. The developer will work with the Shire of Chittering with a view of upgrading the existing fire service access routes along the eastern boundaries of Lot 2 and Lot 9001, so that they meet the requirements of the guidelines.

The development design includes four short fire service access routes. They provide a connection between the existing fire service access routes in the special rural subdivisions to the east of Lot 2 and Lot 9001 and roads within the subject site. These additional fire service access routes will be located in easements. This allows lot owners to control unauthorised access. (See map on page 17.)

Water supply

A reticulated water supply and fire hydrants are currently not available in the area. A reticulated drinking water supply and fire hydrants along roads within the proposed development will be installed by the developer.

4a Bushfire hazard level assessment

It was initially recommended to only provide an indicative bushfire attack level assessment in this Bushfire Management Plan, based on the vegetation cover on the site after it has been developed. However, the Shire of Chittering requested that a bushfire hazard level assessment is also provided. Both assessments are therefore included in this Bushfire Management Plan.

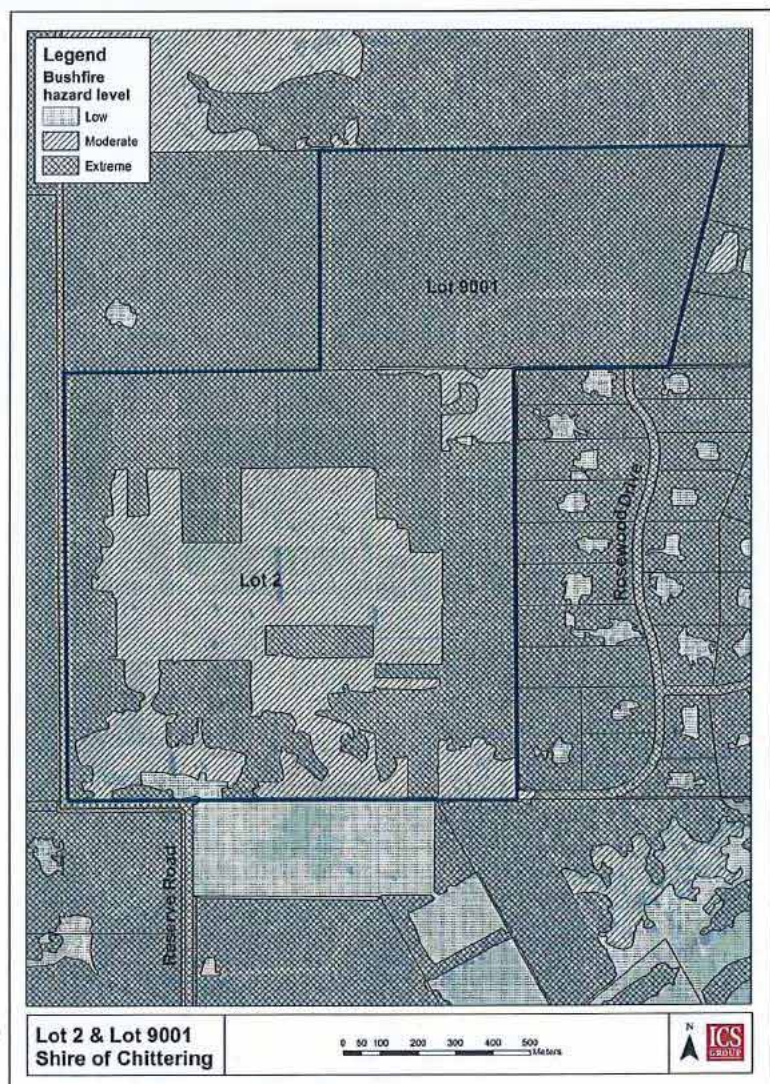
The guidelines state that the purpose of a bushfire hazard level assessment is to provide an "initial determination of the site suitability for subdivision ..." (FESA & WAPC, 2010). However, Lot 2 Reserve Road and Lot 9001 Rosewood Drive have already been zone rural residential and subdivision approvals for both lots are in place. This limits the usefulness of the bushfire hazard level assessment.

The bushfire hazard assessment methodologies listed in the current *Planning for Bush Fire Protection Guidelines* (Edition 2, FESA and WAPC, 2010) and the *Draft Planning for Bushfire Risk Management Guidelines* (DoP, May 2014) have serious flaws and do not provide very meaningful outcomes.

The bushfire hazard level assessment methodologies are too broad and do not provide a tool to clearly identify areas which, from a bushfire perspective, should not be developed. The methodologies assign an extreme hazard level to areas with forest, woodland and tall shrubland vegetation. This includes many areas of Western Australia which could be developed in accordance with the requirements contained in the existing and the draft guidelines, and in accordance with the requirements listed in AS3959 to construct houses to bushfire attack levels not exceeding BAL-29. Furthermore, the methodologies assign an extreme bushfire hazard level even when bushfire fuels in forest and woodland vegetation are maintained low. As a result, an area which is maintained in accordance with the requirements for *Hazard Separation Zones* listed in the guidelines and the Shire of Chittering Firebreak Notice would be considered to have an extreme bushfire hazard level.

The bushfire hazard assessment methodologies also do not align with the methodology contained in AS3959-2009 to determine bushfire attack levels and do not align with the new standard for bushfire-prone area mapping developed by DFES and the Office of Bushfire Risk Management (DFES 2014).

Right: Map showing bushfire hazard levels on the site and in the surrounding area. Bushfire hazard levels were derived from high resolution aerial photos.



The bushfire hazard level assessment carried out here applied the methodology listed in the Planning Fire Bush Fire Protection Guidelines (Edition 2, FESA & WAPC, 2010). Bushfire hazard levels on Lot 2 and Lot 9001 are based on the vegetation cover pre-development. When the site is developed, the vegetation will be modified in line with the Landscape Master Plan to reduce bushfire attack levels on houses.

4b Bushfire attack level assessment

A bushfire attack level assessment was undertaken for the proposed development in accordance with Assessment Method 1 outlined in AS3959. The assessment provides indicative bushfire attack levels after the proposed development has been established and after bushfire fuel levels within the proposed development have been reduced.

Please note that site specific bushfire attack level assessments should be undertaken to determine bushfire attack levels and building construction requirements under AS3959, before buildings are constructed. It is anticipated that this will also become a requirement once the bushfire-prone area maps have been released by DFES and once the new bushfire risk management regulations, policy and guidelines have been introduced.

Default bushfire fuel loads

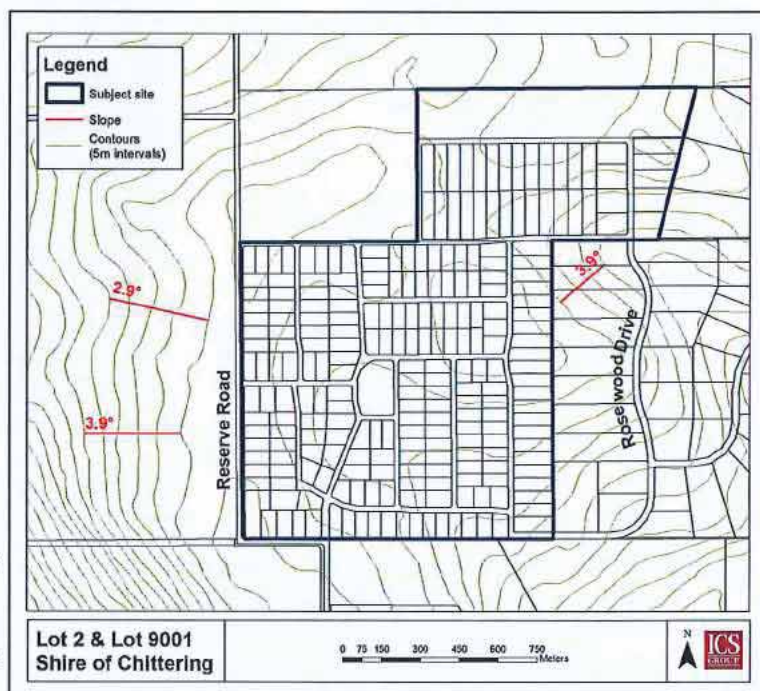
Default bushfire fuel loads (25t/ha) listed in AS3959 were applied to areas of woodland vegetation within and outside the proposed development. This includes the native vegetation cover and bushfire fuels on the existing special rural lots adjacent to the eastern boundaries of Lot 2 and Lot 9001, and vegetation cover on the rural lots which have not been cleared. The vegetation on the cleared rural lot adjacent to the southern boundary of Lot 2 was classified as unmanaged grassland.

Slope

Adjacent to the western and eastern boundaries of Lot 2 and Lot 9001, and along the southern boundary of Lot 2, the land under the vegetation was classified as 'downslope'. Along the southern boundary of the large conservation lot and for the purpose of determining bushfire attack levels on the building envelope the land under the vegetation was classified as 'upslope'. For this assessment, the land was considered to be in the 0°-5° slope category, even though many parts are essentially flat.

Slopes to the south-west of Lot 2 are approximately 6°, as can be seen by the spacing of the contour lines in the lower left hand corner of the map. However, these steeper slopes are more than 200m from the boundary of Lot 2 and have, therefore, not been included in this assessment.

Right: Map showing contour lines at 5m intervals. Slopes within and adjacent to the subject site are between 0° and 5°. Slopes were measured along the red lines.



Low threat vegetation (AS3959-2009)

The Development Plan and the Landscape Mater Plan show that clusters of vegetation can be retained, in particular on the rural conservation lots (Lot 9001), but also within the former nursery (Lot 2). These clusters of vegetation do not exceed 2,500m² in size and are a minimum of 20m away from the next vegetation cluster or classified vegetation adjacent to the subject site, and a minimum of 20m away from a house. Short grass (<100mm in height) will be maintained between vegetation clusters, and between vegetation clusters and houses, to provide separation and to reduce erosion.

AS3959 considers these clusters to be low threat vegetation and classifies them BAL-LOW (see extract below). However, it is still possible that bushfires can burn in this vegetation and that ember attack can impact on houses which are more than 100m away from classified vegetation. The bushfire management plan therefore requires that:

1. Site specific bushfire attack level assessments must be completed in accordance with AS3959 to determine the level of bushfire attack and minimum construction requirements when building plans are prepared and submitted to Council. and
2. As a minimum, all habitable buildings in the proposed development must be constructed to BAL-12.5, even when houses are located in an area where a bushfire attack level assessment carried out under AS3959 has classified a site as BAL-Low, as ember attack can still impact on buildings.

AS3959-2009:

2.2.3.2 Exclusions – Low threat vegetation and non-vegetated areas

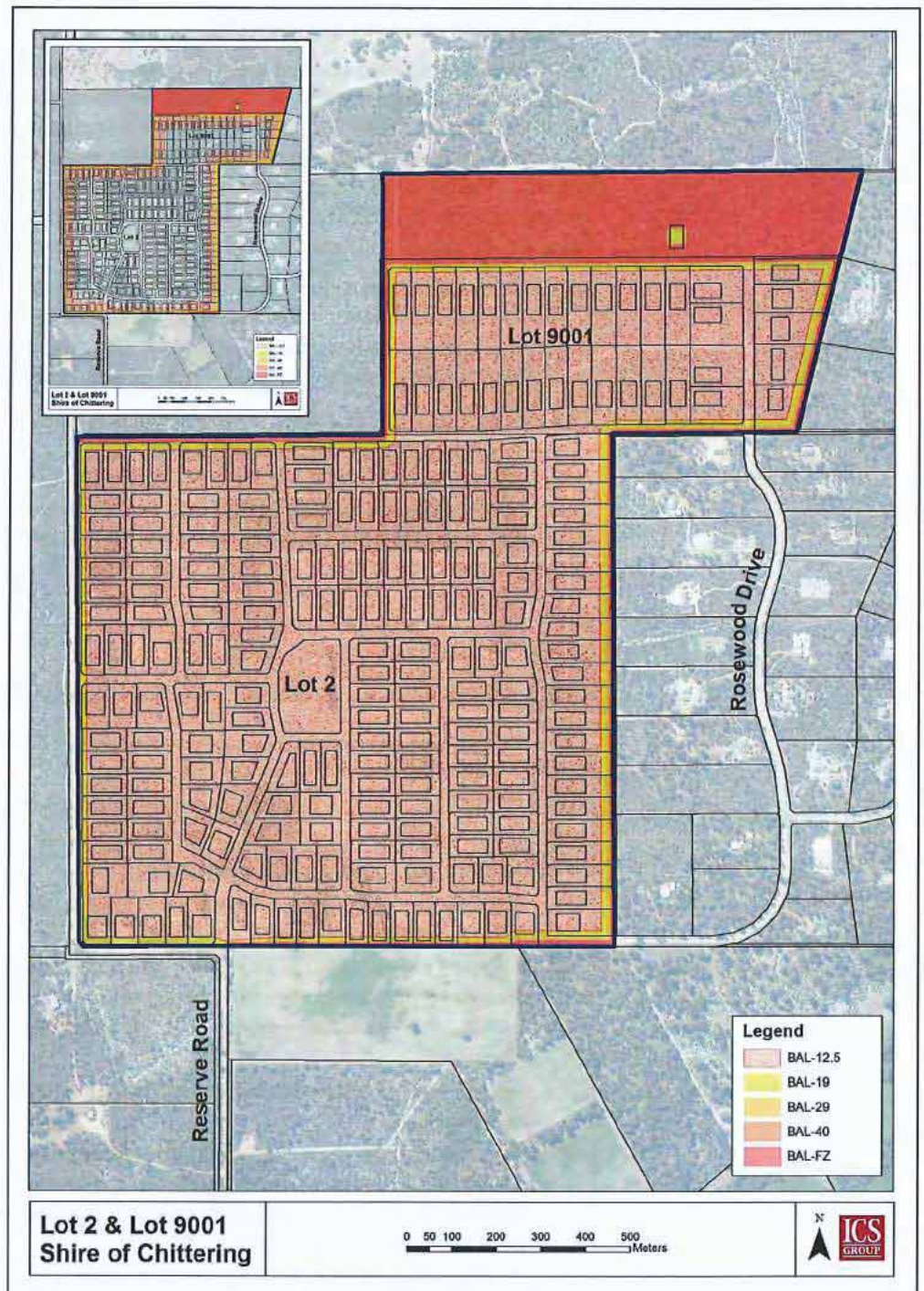
The Bushfire Attack Level shall be classified BAL—LOW where the vegetation is one or a combination of any of the following:

- (a) *Vegetation of any type that is more than 100 m from the site.*
- (b) *Single areas of vegetation less than 1 ha in area and not within 100 m of other areas of vegetation being classified.*
- (c) *Multiple areas of vegetation less than 0.25 ha in area and not within 20 m of the site, or each other.*
- (d) *Strips of vegetation less than 20 m in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20 m of the site or each other, or other areas of vegetation being classified.*
- (e) *Non-vegetated areas, including waterways, roads, footpaths, buildings and rocky outcrops.*
- (f) *Low threat vegetation, including grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks.*

NOTE: Minimal fuel condition means there is insufficient fuel available to significantly increase the severity of the bushfire attack (recognizable as short-cropped grass for example, to a nominal height of 100 mm).

Large conservation lot

As mentioned earlier, the woodland vegetation across the majority of the large conservation lot can be retained. By applying AS3959, the bushfire attack level on a future house on this lot can be reduced to BAL-29 when 14m to 20m separation is maintained between the house and the woodland vegetation where the slope under the woodland is 'upslope' or flat, and between 17m and 25m where the slope is 'downslope' between 0° and 5°. (Note: The bushfire planning guidelines and the Shire's Firebreak Notice requires that 20m wide building protection zones must be maintained. A minimum separation of 20m is therefore required around habitable buildings.)



Above: The map shows indicative bushfire attack levels for Lot 2 and Lot 9001. These are based on the vegetation cover which will be in place when the land is developed. The majority of the vegetation within lots zoned Rural Residential and Rural Conservation will be maintained as open woodland where clusters of vegetation will be retained, as shown on the Development and Landscape Master Plans.

As discussed above, when vegetation across most of the site is maintained as low threat vegetation, AS3959 assigns BAL-LOW to areas which are further than 100m from classified vegetation. This represents the majority of the site, as is shown on the map in the inset. However, in order to achieve a better safety outcome, BAL-12.5 has been assigned to these areas, as shown on the map above.

Only parts of a small number of building envelopes extend into areas where the bushfire attack level is BAL-19. The majority of lots are located in areas where the level of bushfire attack is BAL-12.5. The exception is the building envelope on the large conservation lot where BAL-29 extends into the building envelope.

Indicative bushfire attack levels are only shown for the subject site and not for adjacent land, as this is outside the scope of this Bushfire Management Plan.

The Planning for Bush Fire Protection Guidelines (Edition 2, FESA & WAPC, 2010) and the draft Planning for Bushfire Risk Management Guidelines (DoP & WAPC, 2014) both stipulate that habitable buildings should generally only be allowed in areas where bushfire attack levels do not exceed BAL-29.

Note: The indicative bushfire attack levels shown on the map on the previous page were used to determine the minimum setback distances for building envelopes to ensure that houses are not exposed to bushfire attack levels exceeding BAL-29.

5 Bushfire risk management measures

The following section lists the bushfire risk management measures which will be applied to enable the proposed development, houses within the development and residents to withstand a bushfire event on days where the fire danger index is 80.

5.1 Managing bushfire fuel levels

Lot 2 Reserve Road and Lot 9001 Rosewood Drive will be developed in accordance with the Development Plan and Landscape Master Plan. These plans include details for vegetation retention and revegetation to meet bushfire protection as well as conservation and amenity objectives. The implementation of these plans ensures that bushfire attack levels on houses in this development do not exceed BAL-29. This meets the requirements of the Shire of Chittering, DFES and WAPC.

Right: Map from the Landscape Masterplan developed by UDLA. It shows the vegetation which can be retained within the vegetation corridors and clusters, and on the large conservation lot.

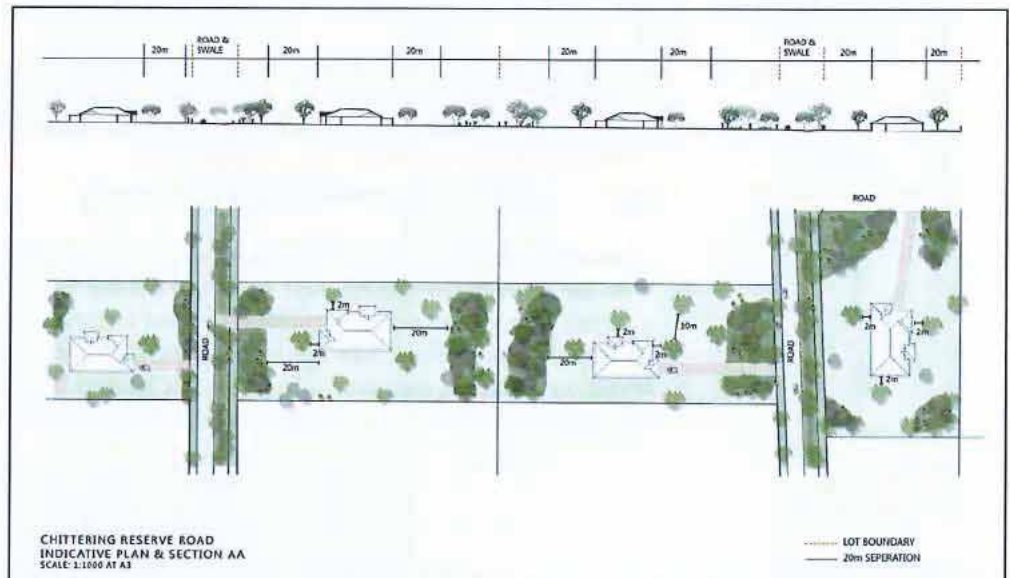


Rural residential and rural conservation lots

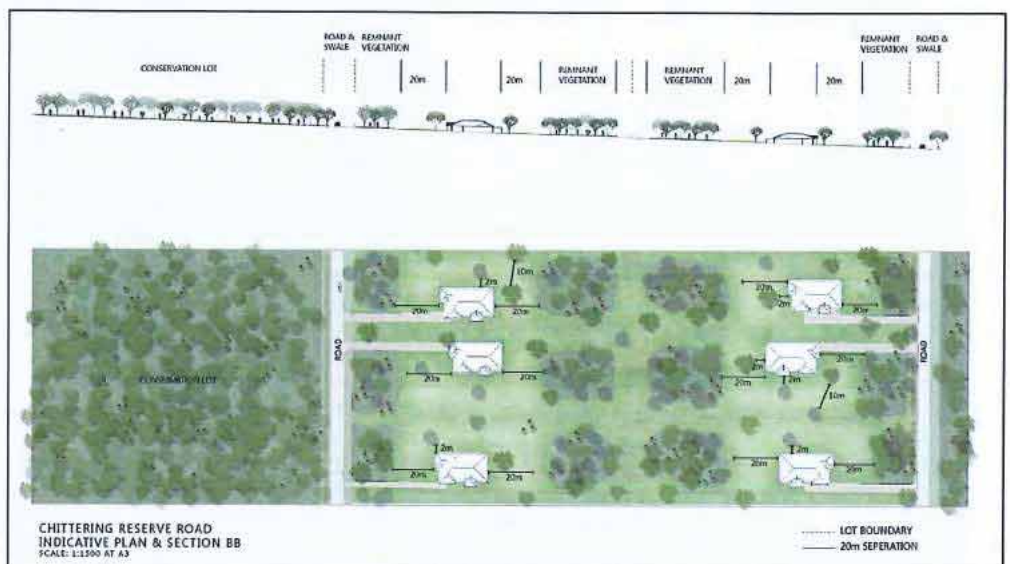
Clusters of vegetation can be retained, in particular on the rural conservation lots (Lot 9001), but also within the former nursery (Lot 2). These clusters of vegetation must not exceed 2,500m² in size and must be a minimum of 20m away from the next vegetation cluster or classified vegetation adjacent to the subject site, and a minimum of 20m away from a house. A cover of grass should be maintained between vegetation clusters, and between vegetation clusters and houses, to provide separation and to reduce erosion. During the fire season grassed areas must generally be maintained below 50mm in height, in accordance with the requirements of the Shire of Chittering Firebreak Notice.

When clusters of vegetation are less than 2,500m² in size and when a minimum of 20m separation is maintained between clusters, and between clusters and houses, AS3959 considers these clusters to be low threat vegetation.

The Shire of Chittering firebreak notice does not require perimeter firebreaks on lots which are less than 2ha in size. However, the grassed areas which provide separation between clusters of vegetation and around houses should be maintained so that 4wd fire appliances can safely access the rear of each lot. These grassed separation areas should generally be maintained in accordance with the requirements for building protection zones (see below).



Above, Section AA provides an indication of the vegetation which can be retained or planted on rural residential lots. (Indicative plan courtesy of UDLA.)



Above, Section BB shows the vegetation on the large conservation lot and the clusters of vegetation which can be retained on the rural conservation lots. (Indicative plan courtesy of UDLA.)

Large conservation lot

The woodland vegetation on the large conservation lot can be retained and managed to achieve conservation objectives. Bushfire hazard reduction on the large conservation lot is not specifically required to protect the adjacent rural conservation lots. The bushfire risk management solution for the adjacent rural conservation lots can be implemented within the rural conservation lots without impacting on the large conservation lot.

The vegetation around the house on the large conservation lot must be managed in accordance with the requirements for building protection zones (see below). The building protection zone must be wide enough to reduce bushfire attack levels on the house to BAL-29.

Building protection zones

The Shire of Chittering Firebreak Notice and the Planning for Bush Fire Protection Guidelines (Edition 2, FESA & WAPC, 2010) require that building protection zones are maintained around houses. Building protection zones must be a minimum of 20m wide.

The following are some of the requirements which apply to building protection zones. Landowners should refer to the Shire of Chittering Firebreak Notice and the planning guidelines for further information as the requirements may change in the future.

- no tall shrub or tree is to be planted within 2 metres of a building;
- tree crowns to be a minimum of 10m apart;
- trees are to be under/low pruned at least to a height of 2 metres;
- bushfire fuel loads to be maintained at or below 2 tonnes per hectare.

Vacant lots

Vegetation cover on rural residential and rural conservation lots must be managed in accordance with the Development Plan and the Landscape Master Plan, irrespective of whether a house has been built on a lot. This is required to maintain the vegetation as low threat vegetation to reduce bushfire attack levels on houses which may be constructed or which have been built on adjacent lots.

Road verges

Vegetation in road verges must be managed in the context of the overall vegetation cover within the development or parts of the development. The vegetation in verges can contribute to the size of clusters of vegetation which will be retained on individual lots. This vegetation must therefore be managed so that clusters do not exceed 2,500m² in size and that 20m separation is maintained between clusters of vegetation, and between clusters of vegetation and houses.

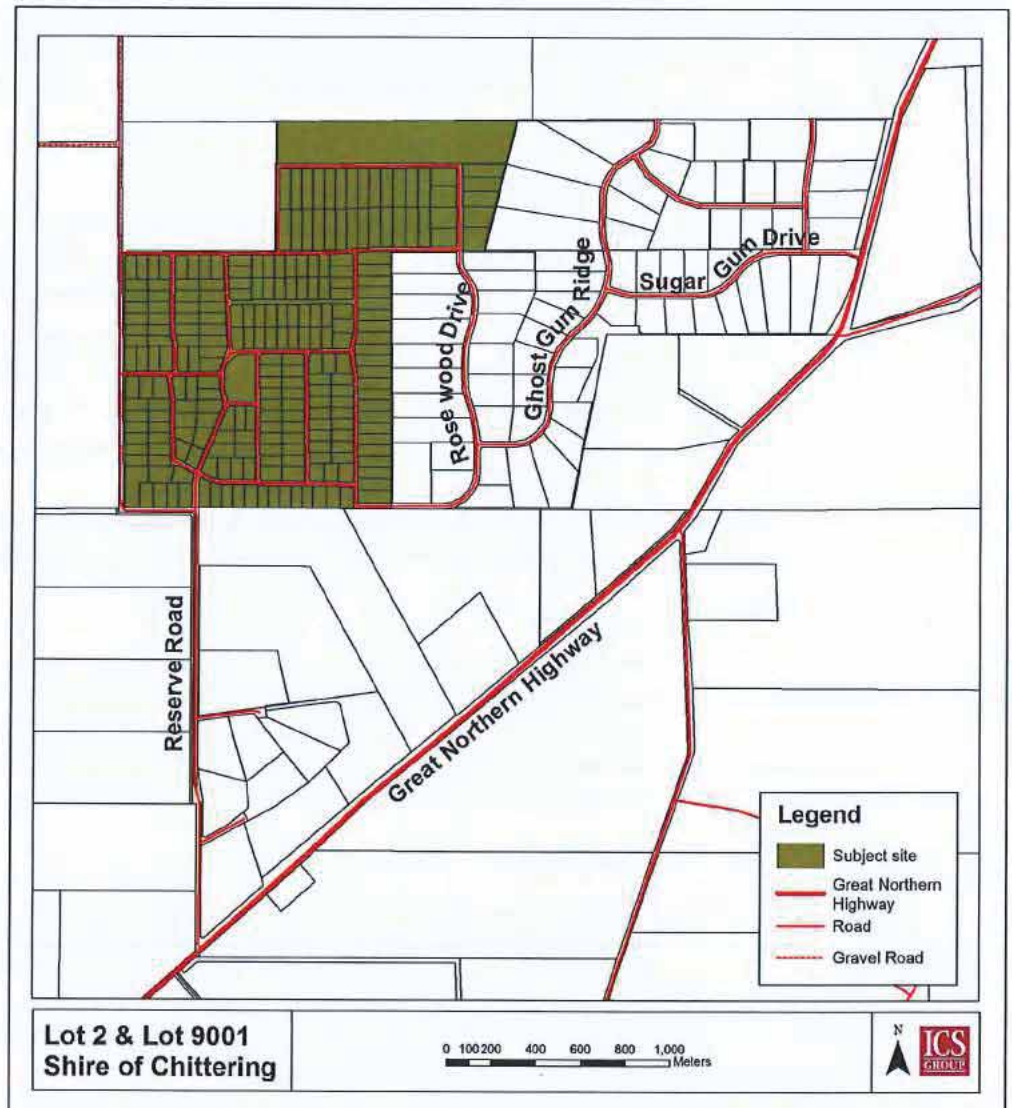
5.2 Vehicular access

Roads

As described earlier, access to Lot 2 is via Reserve Road, which connects to Great Northern Highway. Access to Lot 9001 is currently via Rosewood Drive, which connects to Great Northern Highway via Ghost Gum Ridge and Sugar Gum Drive.

Sugar Gum Drive, Ghost Gum Ridge and Rosewood Drive are located in the special rural subdivisions to the east of the subject site. Sugar Gum Drive is currently the only access and egress point for residents in these special rural subdivisions. An alternative access/egress option is currently not in place.

The road network in the proposed development connects to the existing road network in the special rural subdivisions to the east. This provides additional access and egress options for residents in both the existing and the proposed developments.



Above: This map shows the road network in the existing special rural subdivisions to the east of Lot 2 and Lot 9001 and the road network in the proposed development. Sugar Gum Drive is currently the only access and egress point for residents in the special rural subdivision to the east of the proposed development.

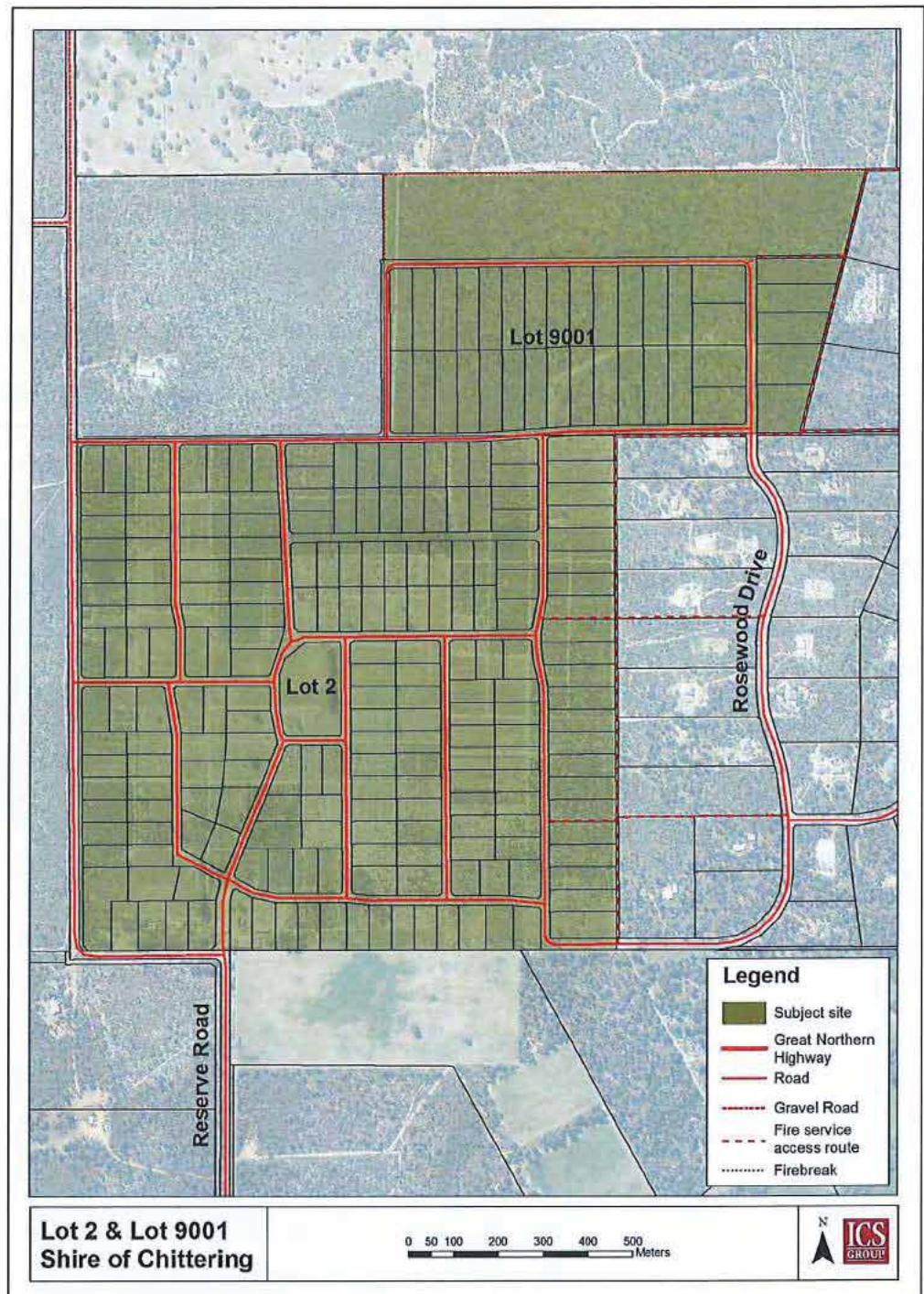
The road network in the proposed development connects to Rosewood Drive. This provides different access and egress options to and from Great Northern Highway for residents in the proposed development and in existing special rural subdivisions. (Note: Reserve Road is constructed to a distance of 2.8km north of Lot 2. It then becomes a 4wd track which is not suitable as an egress point.)

Fire service access routes

A number of fire service access routes (previously referred to as strategic firebreaks) are located in the special rural subdivisions to the east. Some of them are located within reserves while others are located in easements on individual lots. The width of these reserves varies. To the east of Lot 2, the reserve which contains the fire service access route is 6m wide. To the east of Lot 9001 the reserve is 5m wide.

The Shire of Chittering advised that the existing fire service access routes along the eastern boundaries of Lot 2 and Lot 9001 should be incorporated in the development design rather than constructing duplicate fire service access routes along the eastern boundaries of Lot 2 and Lot 9001.

The development design therefore incorporates four short fire service access routes to connect the existing fire service access routes in the special rural subdivisions to the east of Lot 2 and Lot 9001 to roads within the proposed development. These additional fire service access routes will be located in easements. This allows lot owners to control unauthorised access.



Above: This map shows the 4 short fire service access routes which provide a link between roads in the proposed development and the fire service access routes in the adjacent special rural subdivisions. The map also shows the roads in the proposed development and how they connect to Rosewood Drive.

As mentioned above, the reserve which contains the fire service access route to the east of Lot 9001 is currently only 5m wide. The guidelines require that fire service access routes are 6m wide. A 1m strip of land along the eastern boundary of Lot 9001 will therefore be added to the reserve to widen the fire service access route to 6m.

Fire service access routes will be constructed in accordance with the requirements listed in the planning guidelines:

- 6m trafficable surface;
- 4m vertical clearance;
- suitable for use by 3.4 fire appliances (15t);
- where required, gates will be installed to prevent unauthorised access (gates to be a minimum of 3.6m wide);
- gates may be locked, provided that the lock is keyed to a common key used by local bushfire brigades;
- where required, signs will be installed;
- where required, corners will be truncated and gates set back to allow 3.4 appliances to turn into fire service access routes at intersections;
- the owners of lots which have easements for fire service access routes are required to maintain the fire service access route, gates and signs.

Residents from the special rural subdivisions have advised that the existing fire service access routes are not always adequately maintained. Gates are currently also not in place to prevent unauthorised vehicles from using these fire service access routes.

The developer will work with the Shire of Chittering with a view of upgrading the existing fire service access routes along the eastern boundaries of Lot 2 and Lot 9001, so that they meet the requirements of the planning guidelines.



Above: The fire service access route in the reserve along the eastern boundary of Lot 2 is currently not adequately maintained. The developer will work with the Shire of Chittering with a view of upgrading it.

Firebreaks – rural residential and rural conservation lots

Rural residential and rural conservation lots are less than 2ha in size. These lots are not required to maintain boundary firebreaks under the Shire of Chittering firebreak notice.

On these lots, the grassed areas which must be maintained to provide separation between clusters of vegetation, and between clusters of vegetation and houses, allow fire appliances to access the rear of lots. These areas should be kept open so that fire appliances can access the rear of properties in the event of a bushfire.

Firebreaks – large conservation lot

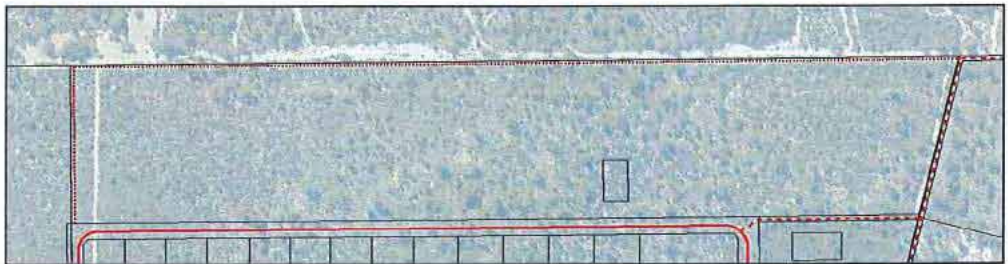
A 3m wide firebreak must be maintained along the western and northern boundaries. The Shire of Chittering Firebreak Notice requires that the firebreak is clear of all flammable material and has a 4m vertical clearance.

Gates may be installed where the firebreak intersects with the road on the south-western corner of this lot and with the fire service access route on the north-eastern corner. These gates may be locked, provided that the locks are keyed to a common key used by local bushfire brigades.

The Department of Parks and Wildlife asked that clearing on the conservation lot is kept to a minimum. The development design does therefore not require that a firebreak is maintained along the eastern boundary of this lot, where the fire service access route is located in the adjacent reserve, and along the southern boundary, where the road and the fire service access route in the easement are located. This approach reduces vegetation clearing while still allowing fire appliances to travel along the boundary of the conservation lot.

Note:

Along the western boundary of the conservation lot a firebreak is currently in place approximately 30m away from the lot boundary. However, the Shire of Chittering Firebreak notice requires that firebreaks are maintained along the boundary of the property. The developer will liaise with the Shire to determine whether the firebreak in its current position is acceptable to the Shire or whether it should be relocated to the boundary.



Above: The extract from the larger map shows the large conservation lot and the location of the proposed fire service access routes and the firebreak. The existing firebreak near the western boundary can be clearly seen approximately 30m away from the boundary.

5.3 Fire fighting water supply

Scheme water is currently not available in the area.

A reticulated drinking water supply will be installed as part of this development. The water supply will be extracted groundwater. The infrastructure for this supply will be located in the south-western corner of Lot 2.

Fire hydrants and markers will be installed at 200m intervals within the residential area and at 400m intervals in the rural conservation zone, along roads in the proposed development in accordance with the requirements of the planning documents.

The water supply infrastructure in the south-western corner of Lot 2 will be constructed to meet the requirements listed in AS3959, so that it can withstand bushfire attack. Redundancy will be built into the design of the infrastructure so that it can continue to function when power is lost during a bushfire event.

Even though the water supply infrastructure will be designed to withstand bushfire attack, residents should consider installing water tanks and pumps on their properties as a back-up supply during bushfires. The same advice is provided to residents in bushfire-prone areas who are connected to scheme water.

5.4 Building protection – AS3959

All houses within the proposed development must be constructed in accordance with the requirements of the Australian Standard for the Construction of buildings in bushfire-prone areas AS3959.

Site specific bushfire attack level assessments must be completed in accordance with AS3959 to determine minimum construction requirements. Houses must not be located in areas where the level of bushfire attack exceeds BAL 29. The indicative bushfire attack levels shown on the map on page 12 can be used as an initial guide to determine the level of bushfire attack at a site.

As a minimum, all houses within the proposed developments must be constructed to BAL-12.5, even if they are located in an area where a bushfire attack level assessment carried out under AS3959 has classified a site as BAL-LOW, as ember attack can still impact on buildings.

Notes:

AS3959 only applies in areas which have been formally designated as bushfire-prone areas. Lot 2 and Lot 9001 are currently not designated bushfire-prone areas.

The Western Australian Government has advised that it anticipates that the new planning regulations, policy and guidelines, as well as the bushfire-prone area map which designates areas as bushfire-prone, will come into effect in September 2015.

If this does not occur, or if the bushfire-prone area map does not designate the proposed development, or parts of the proposed development as a bushfire-prone area, it is recommended that the Shire of Chittering designates the area as bushfire-prone to ensure that AS3958 applies.

5.5 Staging

In the event that the development is staged, the following bushfire risk management measures should be applied.

- adequate separation must be maintained between bushfire hazards in undeveloped stages and building envelopes in developed stages so that bushfire attack levels on houses do not exceed BAL-29;
- two different access/egress options must be available for residents;
- access for fire appliances must be available between developed and undeveloped stages;
- undeveloped stages must comply with the Shire of Chittering Firebreak Notice.

5.6 Map

Maps and GIS datasets will be provided to the Shire of Chittering and the Department of Fire and Emergency Services. The maps and GIS datasets will include the following information:

- development design;
- location of fire hydrants;
- fire service access routes;
- landscaping plan.

6 Implementation

6.1 Developer's responsibility

6.1.1 Manage vegetation by implementing the Development Plan and Landscape Master Plan so that the vegetation on rural residential lots, rural conservation lots and road verges is generally maintained as low threat vegetation in accordance with AS3959:

- clusters of vegetation must not exceed 2,500m² in size;
- vegetation clusters must be a minimum of 20m away from the next cluster;
- vegetation clusters must be a minimum of 20m away from a house;
- grass should be maintained between vegetation clusters, and between vegetation clusters and houses, to provide separation and to reduce erosion;
- during the fire season grassed areas must generally be maintained below 50mm in height, in accordance with the requirements of the Shire of Chittering Firebreak Notice.

6.1.2 Building envelopes and grassed areas must generally be maintained in accordance with the requirements for building protection zones:

- tree crowns are a minimum of 10m apart;
- trees are to be under/low pruned at least to a height of 2 metres;
- bushfire fuel loads to be maintained at or below 2 tonnes per hectare.

6.1.3 Provide a second access and egress option for residents by connecting roads within the proposed development to Rosewood Drive.

All roads within the proposed development must meet the requirements listed in the Planning for Bush Fire Protection Guidelines (Edition 2, FESA & WAPC, 2010).

6.1.4 Construct 4 fire service access routes to connect the existing fire service access routes in the special rural subdivisions to the east of Lot 2 and Lot 9001 to roads within the proposed development. Fire service access routes must meet the requirements listed in the Planning for Bush Fire Protection Guidelines (Edition 2, FESA & WAPC, 2010). This includes the following requirements:

- 6m trafficable surface;
- 4m vertical clearance;
- suitable for use by 3.4 fire appliances (15t);
- where required, gates must be installed to prevent unauthorised access (gates to be a minimum of 3.6m wide);
- where gates will be locked, the lock must be keyed to a common key used by local bushfire brigades;
- install signs where required;
- where required, truncate corners and set back gates to allow 3.4 appliances to turn into fire service access routes at intersections;
- place easements for the 4 fire service access routes on lots where they are located.

6.1.5 Along the eastern boundary of Lot 9001, add a 1m strip of land from Lot 9001 to the reserve which contains the fire service access route. This will widen the reserve from 5m to 6m to align the width of the reserve along the boundary of Lot 9001 with the requirements for fire service access routes.

- 6.1.6 Maintain a firebreak along the northern and western boundaries of the large conservation lot until it is sold:
- the firebreak must be 3m wide with 4m vertical clearance;
 - liaise with the Shire of Chittering to determine whether the current location of the firebreak 30m away from the western boundary is acceptable to the Shire;
 - relocate the firebreak to the western boundary if the current location is not acceptable to the Shire;
 - if required, install gates where the firebreak intersects with the road on the south-western corner of this lot and with the fire service access route on the north-eastern corner;
 - where gates will be locked, locks must be keyed to a common key used by local bushfire brigades.
- 6.1.7 Provide a fire fighting water supply:
- install fire hydrants and markers at 200m intervals within the residential area and at 400m intervals in the rural conservation zone, along roads in the proposed development in accordance with the requirements listed in the Planning for Bush Fire Protection Guidelines (Edition 2, FESA & WAPC, 2010);
 - incorporate a back-up system so that the water supply is available when power supply is lost during a bushfire;
 - construct the water supply infrastructure in the south-western corner of Lot 2 in line with the requirements listed in AS3959, so that it can withstand bushfire attack.
- 6.1.8 In the event that the development is staged, implement appropriate bushfire risk management measures:
- adequate separation between bushfire hazards in undeveloped stages and building envelopes in developed stages so that bushfire attack levels on houses do not exceed BAL-29;
 - two different access/egress options for residents;
 - access for fire appliances between developed and undeveloped stages;
 - undeveloped stages to comply with the Shire of Chittering Firebreak Notice.
- 6.1.9 Provide maps and GIS datasets to the Shire of Chittering and the Department of Fire and Emergency Services. The maps and GIS datasets must include the following information:
- development design;
 - location of fire hydrants;
 - fire service access routes;
 - landscaping plan.

6.2 Property owner's responsibility

- 6.2.1 On rural residential lots and rural conservation lots, manage vegetation by implementing the Development Plan and Landscape Master Plan so that the vegetation is generally maintained as low threat vegetation in accordance with AS3959:
- clusters of vegetation must not exceed 2,500m² in size;
 - vegetation clusters must be a minimum of 20m away from the next cluster;
 - vegetation clusters must be a minimum of 20m away from a house;
 - grass should be maintained between vegetation clusters, and between vegetation clusters and houses, to provide separation and to reduce erosion;
 - during the fire season grassed areas must generally be maintained below 50mm in height, in accordance with the requirements of the Shire of Chittering Firebreak Notice.
- 6.2.2 Building envelopes and grassed areas must generally be maintained in accordance with the requirements for building protection zones:
- tree crowns are a minimum of 10m apart;
 - trees are to be under/low pruned at least to a height of 2 metres;
 - bushfire fuel loads to be maintained at or below 2 tonnes per hectare;
 - the grassed areas which provide separation between clusters of vegetation, and between clusters of vegetation and houses should be kept open so that fire appliances can access the rear of properties in the event of a bushfire.
- 6.2.3 On lots with easements for fire service access routes, maintain fire service access routes in accordance with the requirements listed in the Planning for Bush Fire Protection Guidelines (Edition 2, FESA & WAPC, 2010). This includes the following requirements:
- 6m trafficable surface;
 - 4m vertical clearance;
 - suitable for use by 3.4 fire appliances (15t);
 - gates can be used to prevent unauthorised access (gates to be a minimum of 3.6m wide);
 - where gates will be locked, locks must be keyed to a common key used by local bushfire brigades;
 - maintain signs as required;
 - where gates are installed, they may have to be set back to allow 3.4 appliances to turn into fire service access routes at intersections.
- 6.2.4 Large conservation lot.
- a building protection zone must be maintained to provide adequate separation between the woodland vegetation and the house, to reduce the bushfire attack level to BAL-29; (Note: the Shire of Chittering Firebreak Notice requires that the building protection zone is a minimum of 20m wide)
 - maintain a 3m wide firebreak along the western and northern boundaries clear of all flammable material and has a 4m vertical clearance;
 - gates may be installed where the firebreak intersects with the road on the south-western corner of this lot and with the fire service access route on the north-eastern corner;
 - gates may be locked, provided that locks are keyed to a common key used by local bushfire brigades.
- 6.2.5 Prior to designing and constructing a house, carry out a site specific bushfire attack level assessment in accordance with AS3959, to determine the construction standards required for the house.
- A house must not be located in an area where the level of bushfire attack exceeds BAL 29.

As a minimum, all houses within this development must be constructed to BAL-12.5, even if a house is located in an area where a bushfire attack level assessment carried out under AS3959 has classified a site as BAL-LOW, as ember attack can still impact on buildings.

- 6.2.6 Even though the water supply infrastructure will be designed to withstand bushfire attack, residents should consider installing water tanks and pumps on their properties as a back-up supply during bushfires. (Note: The same advice applies to residents in bushfire-prone areas who are connected to scheme water.)

6.3 Shire of Chittering's responsibility

- 6.3.1 Manage vegetation in road verges by implementing the Development Plan and Landscape Master Plan so that the vegetation is generally maintained as low threat vegetation in accordance with AS3959.
- 6.3.2 Apply the Australian Standard for the Construction of buildings in bushfire-prone areas AS3959 to building approvals.
- 6.3.3 The Western Australian Government has advised that it anticipates that new planning regulations, policy and guidelines, as well as the bushfire-prone map which designates areas as bushfire-prone, will come into effect in September 2015. This should designate the proposed development as a bushfire-prone area.

If this does not occur, or if the bushfire-prone area maps do not designate the proposed development or parts of the proposed development as a bushfire-prone area, formally designate the area as bushfire-prone to ensure that AS3958 applies.

7 Disclaimer

The preparedness and behaviour of people before, during and after a bushfire form an important part of bushfire risk management. This includes aspects such as being well informed about bushfire risk and risk management, leaving well before an area is affected by a bushfire or actively protecting a building, being able to deal with small spot fires, the maintenance of a building and its surrounds, wearing appropriate protective clothing and whether property owners have prepared a suitable plan for bushfires. Building design and construction, as well as development design, contribute to bushfire safety. They cannot, however, replace adequate preparedness and the appropriate behaviour of residents in relation to bushfire risk management.

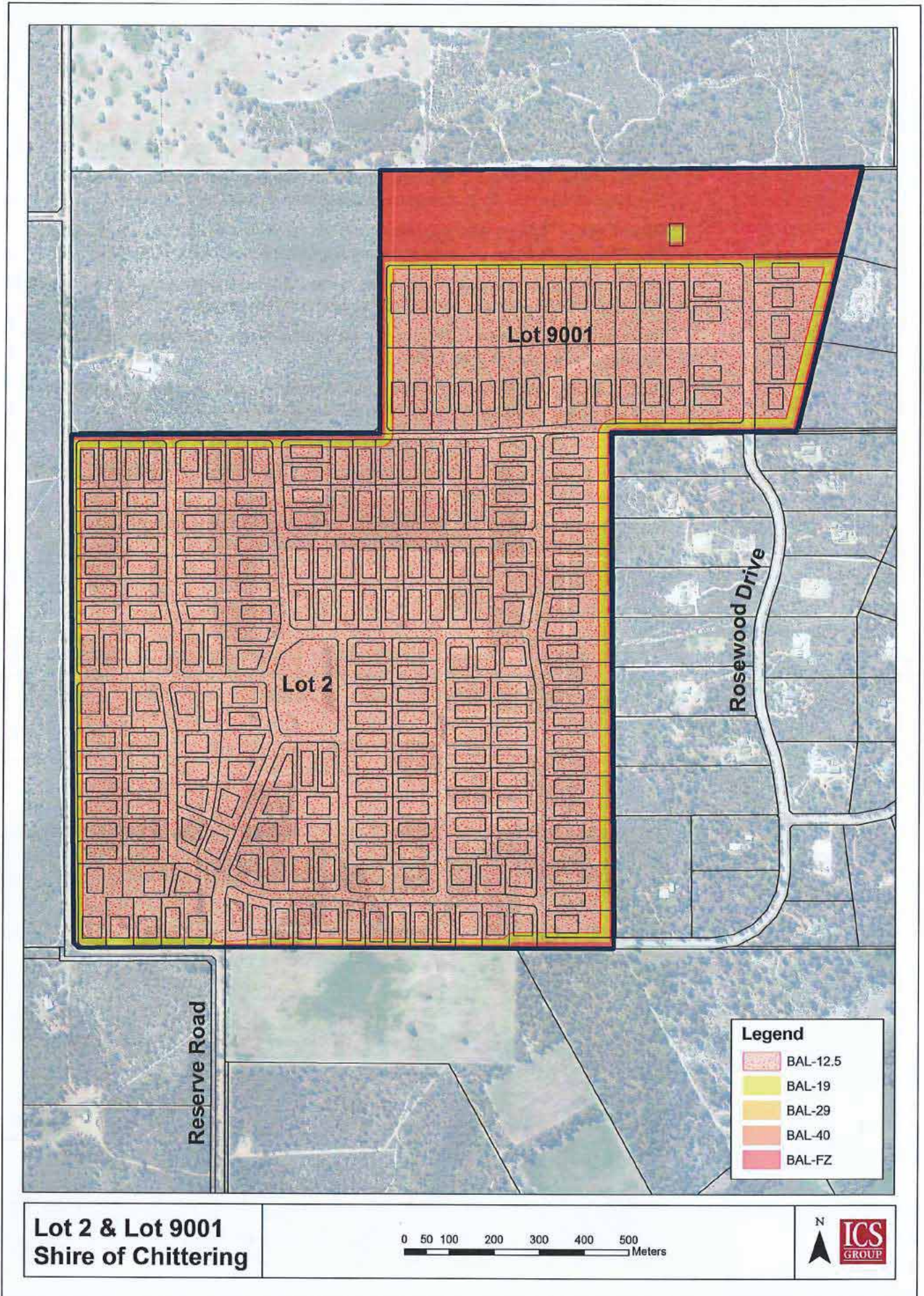
This fire protection report addresses development design and building construction requirements in line with fire services, planning and local government requirements. It cannot achieve the preparedness and behaviour of people after the development has been established. Residents who live in areas which may be exposed to bushfires must therefore take some responsibility to manage bushfire risk.

It must be noted that a refuge, place of last resort or neighbourhood safer place is not available within this development. This aspect must be considered when residents prepare their bushfire plans.

References

- Department of Fire and Emergency Services, 2014. *Bushfire-Prone Area Mapping Standard Western Australia, Office of Bushfire Risk Management, May 2014.*
- Department of Planning and Western Australian Planning Commission, 2014. *Draft Planning for Bushfire Risk Management Guidelines May 2014.*
- Department of Planning and Western Australian Planning Commission, 2014. *Draft State Planning Policy 3.7 Planning for Bushfire Risk Management May 2014.*
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- Department of Planning and Western Australian Planning Commission, 2014. *Bushfire regulations discussion paper August 2014.*
- Fire and Emergency Services Authority and Western Australian Planning Commission, 2010. *Planning for Bush Fire Protection Guidelines Edition 2 May 2010.*
- Shire of Chittering, 2014. *Firebreak Notice 2014 – 2015.*
- Standards Australia, 2009. *Australian Standard – Construction of buildings in bushfire-prone areas (AS 3959-2009).*
- Western Australian Planning Commission, 2006. *State Planning Policy No 3.4 – Natural Hazards and Disasters, April 2006.*





RIVERSIDE INVESTMENTS WA No2 Pty Ltd

LOT 2 RESERVE ROAD & LOT 9001 ROSEWOOD DRIVE,
CHITTERING

TRAFFIC ASSESSMENT

September 2015



PO Box Z5578
Perth WA 6831
0413 607 779 Mobile

Issued on	3 September 2015	Amendments	Date
Version	V3	GNH Reviewed	9/8/15
Reference	843	Reserve Rd count added	3/9/15

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- 1.0 EXECUTIVE SUMMARY
- 2.0 THE SITE AND SURROUNDING ROAD NETWORK
- 3.0 TRAFFIC GENERATION AND DISTRIBUTION
- 4.0 TRAFFIC IMPACT
- 5.0 ACCESS

1.0 EXECUTIVE SUMMARY

Riley Consulting has been commissioned through Taylor Burrell Barnett to assess the traffic issues associated with a proposed development plan for Lot 2 Reserve Road and Lot 9001 Rosewood Drive, Chittering. The analysis undertaken in this report indicates the following:

- The land area considered by this report already has approval to be subdivided to create 155 residential lots. The development application considered by this report will create an additional 88 lots resulting in a future subdivision of 243 lots.
- Peak hour traffic demands recorded at Sugargum Drive show existing residential lots generate 0.48 peak hour movements per lot. On this basis, it is expected that the proposed subdivision of the subject land could generate an additional 1,100 vehicle movements per day to the surrounding road network.
- Based on WAPC guidelines, the development application to increase the approved subdivision by 88 lots would have no material impact. In total the development of 243 lots is also shown to have no material impact.
- Sidra analysis of the Great Northern Highway / Reserve Road existing intersection shows that Level of Service A is maintained for all movements. Design life assessment (20 years) indicates that delays to Reserve Road could increase to result in Level of Service B. This indicates that acceptable operation of the intersection is maintained in the long term.
- Assessment of the Reserve Road / Great Northern Highway intersection shows that acceptable levels of visibility are achieved.
- Current planning by MRWA proposes to provide a left turn and right turn lane on the Great Northern Highway to Reserve Road. The proposed works are expected to commence in 2016 and once complete will provide access in accordance with Austroads standards for the proposed development.

2.0 THE SITE AND SURROUNDING ROAD NETWORK

The site is located to the northern side of the Great Northern Highway at Chittering. Access to the site is predominantly provided by Reserve Road. The location of the site is shown in Figure 1.

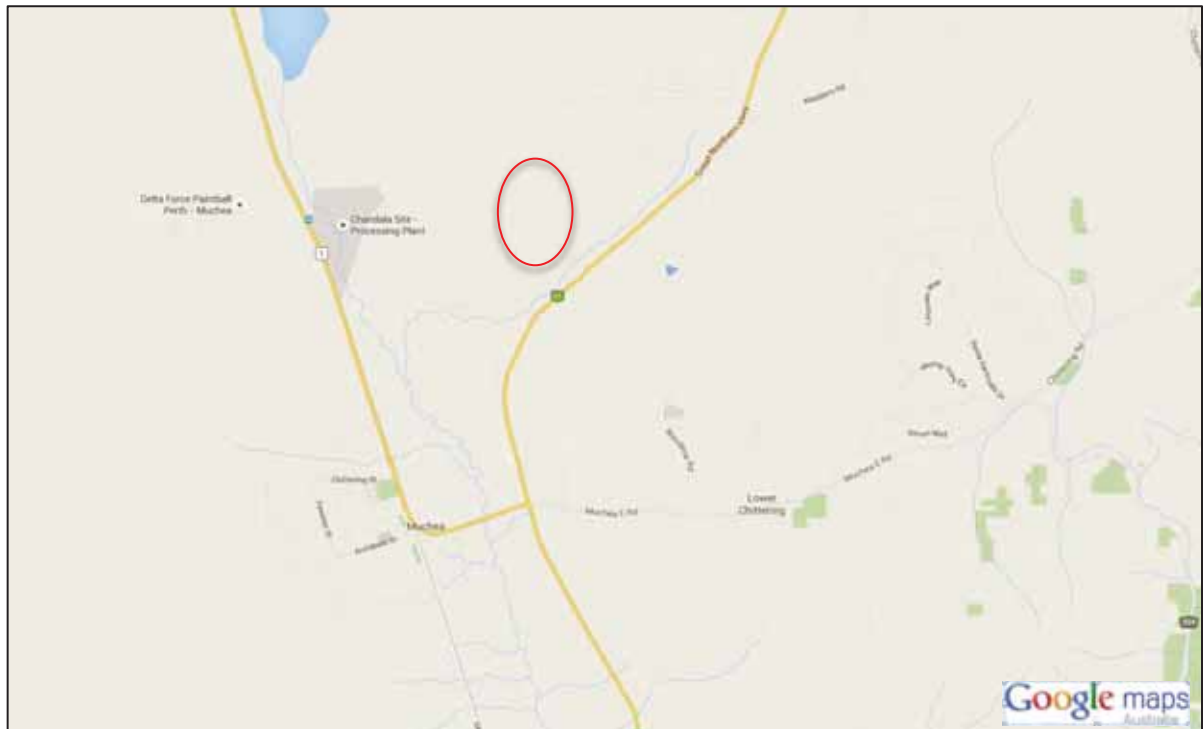


Figure 1 Site Location

Roads of significance to the development site are considered below.

Great Northern Highway

The Great Northern Highway is a primary regional road under the control of Main Roads Western Australia (MRWA). It is constructed with a 7m (approximate) carriageway within a road reservation of 20 metres south of Reserve Road and 40 metres north of Reserve Road. Traffic data retrieved from the MRWA website shows 3,906 vehicles per day (vpd) to the north of Muchea East Road (July 2015). The peak period of movement occurs between 3pm and 4pm, with the traditional peaks of 8am-9am and 5pm-6pm passing about 10% less traffic. The MRWA data is attached as Appendix A.

Discussions with the consultant for Main Roads Western Australia (MRWA) designing the upgrade to the Great Northern Highway has identified that the intersection of Reserve Road

will be amended to provide a more correct approach for Reserve Road, a left turn deceleration lane and a right turn deceleration lane on Great Northern Highway. The proposed works will be designed to current standards and are expected to commence in mid 2016. Completion of the project should occur by 2018.

Reserve Road

Reserve Road is a local access street and is presently a cul de sac. It provides access to approximately 11 existing developed lots. It is constructed with a standard 7m carriageway within a 20m road reservation. Its intersection with the Great Northern Highway is provided with a 60 metre left turn lane (including 20m taper) but no widening to the southbound lane. A traffic count supplied by the Shire of Chittering indicates a daily flow in the order of 30 vehicles. On this basis of 11 dwellings the local trip rate is 2.7 trips per dwelling. This is much lower than expected and for the purpose of this report, 100 movements per day is used to provide robustness to the assessment.

Sugargum Drive

Sugargum Drive is a local access street and is effectively a cul de sac. It provides access to approximately 71 residential lots of which 62 lots are developed. It is constructed with an 8m carriageway within a 25m road reservation. Its intersection with the Great Northern Highway is provided with a 160 metre left turn deceleration lane (including 40m taper) and widening to the southbound lane to approximately 5.5 metres¹ to provide a basic right turn treatment. No traffic data could be sourced for Sugargum Drive. A traffic count has been undertaken at the intersection of Sugargum Drive and Great Northern Highway. The count is summarised in Appendix B.

The concept layout for the proposed subdivision is shown in Figure 2.

¹ The treatment does not meet Austroads standards

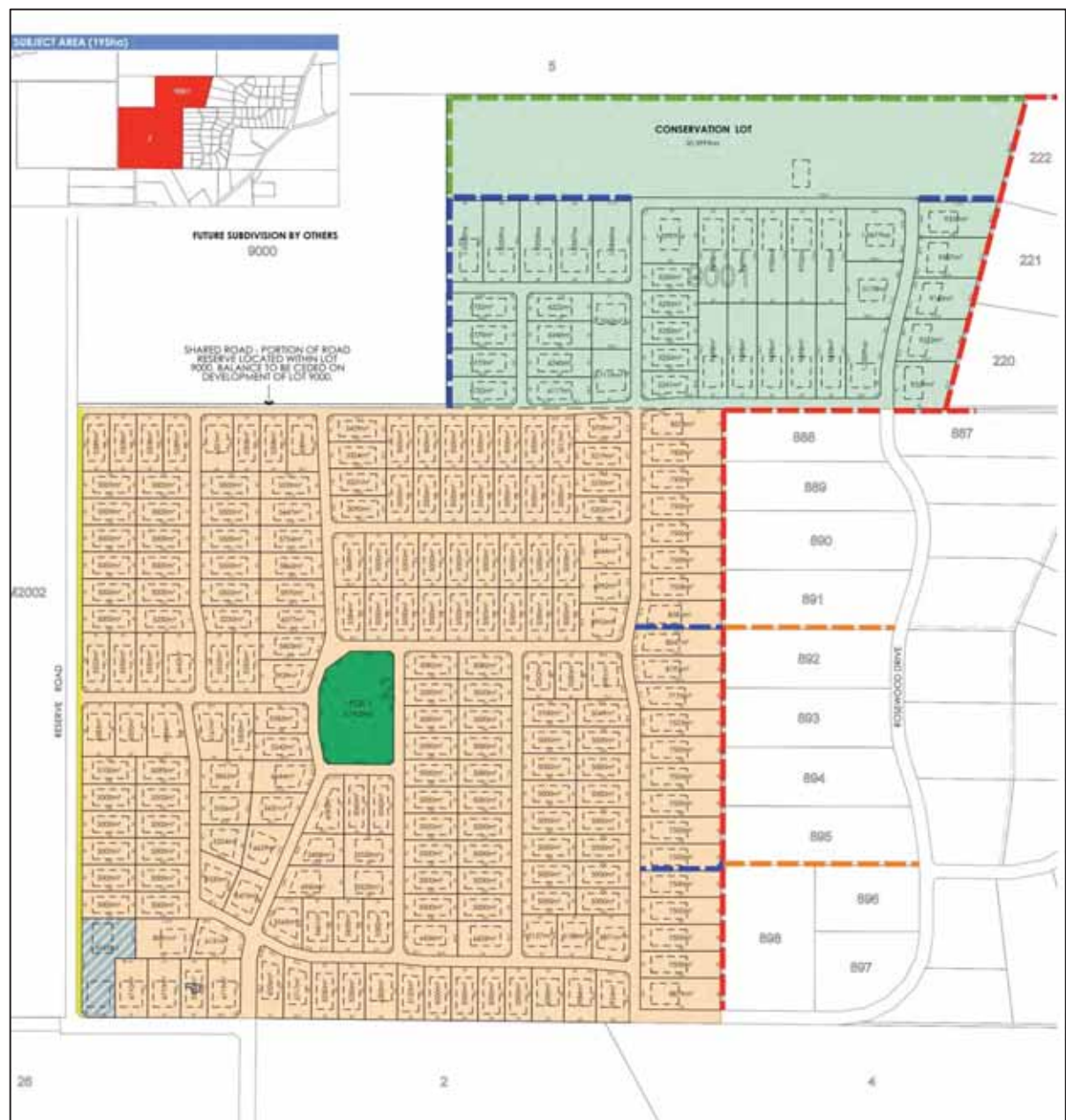


Figure 2 Indicative Development Plan (refer to Planner for detail)

3.0 TRAFFIC GENERATION AND DISTRIBUTION

The subject land has subdivision approval for 155 lots to be created. The application under consideration seeks to increase the overall yield of the subject land by 88 lots to 243 lots. It is understood that previous approvals have not required a traffic assessment to be undertaken and therefore, this report will also consider the impact of the full development.

Residential Trip Rate

Reference to recognised trip generation source documents indicates a trip rate of 10 trips per dwelling per day would be used for structure planning purposes. On this basis the overall development of 243 lots could generate up to 2,430 vehicle movements per day. It is known however that this is higher than local development currently generates.

A traffic count of Sugargum Drive recorded 30 vehicles during the peak period suggesting that the 62 developed lots generate $(30/62)$ 0.48 peak movements per lot. Based on typical residential profiles, the adjacent rural residential lots are generating about 5 trips per lot per day.

As discussed, approval has already been granted for 155 lots to be developed and this approval would result in an increase of (155×5) 775 additional vehicle movements to the local road network. The current proposal would increase the traffic forecast by (88×5) 440 movements pre day.

Distribution

The distribution of traffic generated by the subdivision is based on the turning movements recorded at Sugargum Drive, which showed:

North	13%
South	87%

The distribution indicates that the directional split is 80% in the peak direction, which is typical of residential development.

4.0 TRAFFIC IMPACT

Based on the expected traffic generation of the proposed development, Table 1 indicates the expected road network increases.

Table 1 Traffic Increases

Road	Existing Volume	Approved Increase	Proposed Increase	% of Capacity*	Peak Hour
Reserve Road	100	775	440	3.2%	40
Great Northern Highway North	3,906	101	58	<1%	5
Great Northern Highway South	3,906	674	382	2.8%	35

* At Level of Service D

Reference to the WAPC Transport Assessment Guidelines for Developments (Volume 4) states that:

“where a traffic increase as a result of a proposed development is less than 10% of current road capacity, it would not normally have a material impact”.

The capacity of a standard 7 metre wide carriageway is in excess of 20,000 vehicles per day. However, it is commonly recognised that a Level of Service D is the lowest operating standard desirable in Western Australia and reference to Appendix C suggests this would occur at about 13,500vpd.

The WAPC guidelines further state that:

“For ease of assessment, an increase of 100 vehicles per hour for any lane can be considered as equating to around 10% of capacity. Therefore any section of road where traffic would increase flows by more than 100 vehicles per hour for any lane should be included in the analysis”.

From Table 1 it can be seen that the maximum increase as a result of the development application to any road is 40 vehicles in any hour and thus the forecast increases would not be deemed to require further analysis.

In regard to the overall development of 243 lots, the increase to Reserve Road would be 109 vehicles in the peak hour, of which 80% is expected in the peak direction. The increase to any traffic lane is therefore less than 100 vehicles.

The increase to any single lane on the Great Northern Highway would equate to about 76 vehicles, which falls below the threshold of 100 vehicles stated by the WAPC guidelines. With the current peak flow on the Highway of about 160 vehicles, the increase would result in a possible flow of up to 240 vehicles. The forecast demand is significantly less than the Austroads capacity of 900 vehicles per hour for a single traffic lane.

Table 2 considers the daily impacts of the full development of the subject land.

Table 2 Traffic Increases of Full Development

Road	Existing Volume	Development Increase	% of Capacity*
Reserve Road	<150	1,215	9%
Great Northern Highway North	3,906	159	1.1%
Great Northern Highway South	3,906	1,056	7.8%

* At Level of Service D – refer Appendix C

It can be seen from Table 2 that the maximum increase equates to 9% of current road capacity and under WAPC guidelines further assessment would not be warranted.

It is considered that the proposed development would have no material traffic impact.

5.0 ACCESS

Access to the site will predominantly be taken from Reserve Road. Access to the existing subdivision off Sugargum Drive will also be provided, but it is unlikely that significant levels of traffic will pass between the two subdivisions.

Visibility

The approach visibility to Reserve Road has been measured using Locate² and by visual inspection on-site. Great Northern Highway operates at 110kph adjacent to Reserve Road and Austroads requires that the minimum SISD visibility of 285 metres must be achieved.

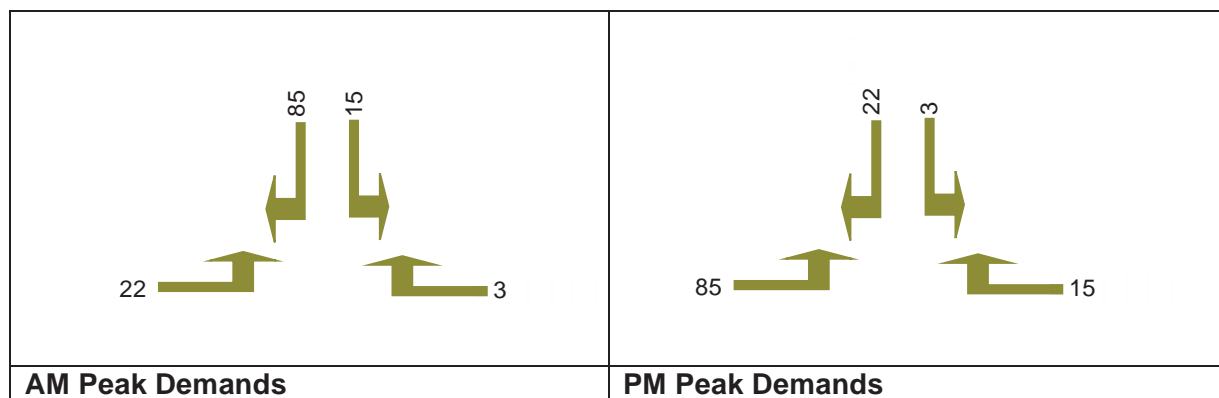
Horizontal visibility in excess of 500 metres is indicated from aerial mapping. The on-site inspection identified that a crest exists to the north of Reserve Road and a prohibition to overtaking commences 275 metres north of Reserve Road. The on-site inspection recorded visibility at Reserve Road to the north was in the order of 20 seconds to large vehicles and 18 seconds to cars. Based on a travel speed of 100kph the minimum length of visibility achieved is 450 metres. Appendix D shows the visibility achieved.

Reserve Road meets the minimum visibility requirements of Austroads.

Turn Lane Requirements

The proposed subdivision is shown to increase the number of lots proposed from 155 to 243 and it is the higher number that is considered in regard to whether turn lanes are warranted. During the peak period it has been identified that local rural residential development generates 0.48 trips per lot. Therefore the 243 proposed lots and the existing 11 lots would be expected to generate (254 x 0.48) 122 peak hour movements. Based on current traffic movements at Sugargum Drive the traffic demands shown in Figure 3 are expected.

² WA Government aerial mapping using Google Earth

**Figure 3 Peak Hour Turning Demands****Left turn lane**

Reverence to Austroads Figure 4.9 of Part 4A indicates that a peak turning demand of 85 vehicles with a through flow of 149 vehicles would just meet the warrants for an AUL(S) lane treatment to be provided (the side road demand exceeds the maximum flow considered by the table). Based on the MRWA traffic count showing 168 northbound vehicles the warrant for an AUL(S) treatment would be warranted. Austroads Table 8.2 shows that an auxiliary turn lane of 85 metres with a 30 metre taper would be the minimum appropriate treatment for Reserve Road.

A left turn lane is warranted

Right turn lane

Figure 3 shows that the peak right turn demand is 15 vehicles and will be opposed by (149 northbound + 114 southbound + 85 left turn) 348 vehicles. Reverence to Austroads Figure 4.9 of Part 4A indicates that a peak turning demand of 15 vehicles with a through flow of 348 vehicles would meet the warrants for a CHR(S) turn lane treatment to be provided.

A right turn lane is warranted.

MRWA Great Northern Highway Upgrade

MRWA has engaged Jacobs consulting engineers to design the upgrading of Great Northern Highway in the Chittering locality. At Reserve Road the Great Northern Highway carriageway is being moved east and will be provided with left and right turn lanes to Reserve Road. Reserve Road is also to be re-aligned. These improvements are scheduled to commence in 2016.

Reserve Road will be upgraded to provide left and right turn lanes in 2016 by MRWA.

Whilst the overall development of 243 rural residential lots would warrant the provision of basic left and right turn lanes to the Great Northern Highway, it is highly unlikely that occupation of even 100 lots would occur prior to the MRWA works being completed. This level of development would not warrant the upgrading proposed by MRWA. On this basis there is no requirement for the development to undertake or contribute to the proposed works.

INTERSECTION ANALYSIS

SIDRA analysis of the Reserve Road / Great Northern Highway intersection is undertaken to consider the impact of the proposed development application. Table 3 shows a summary of the analysis that is attached as Appendix E. The Sidra analysis has not included the assessment of the existing left turn lane or the Austroads minimum requirement for a right turn lane. The analysis therefore considers the worst-case scenario.

Table 3 Great Northern Highway / Reserve Road Sidra

Approach	Approved Development LoS		Proposed Development LoS	
	AM	PM	AM	PM
Great Northern Highway North	A	A	A	A
Reserve Road	A	A	A	A
Great Northern Highway South	A	A	A	A

It can be seen from Table 3 that the intersection is forecast to operate with Level of Service A during both peak periods with full development of the subdivision area to provide 243 lots.

Appendix E also includes design life assessment using Sidra for a 20 year planning horizon and shows the maximum delay forecast is 16 seconds (right turn out of Reserve Road) suggesting a potential Level of Service B may occur.

Sidra analysis indicates excellent Levels of Service will be maintained.

Recommendation

Although the occupation of lots is unlikely to achieve 100 prior to the MRWA works being completed in 2017, it is recommended the developer be conscious that the current intersection is not suited to significant increases to peak hour traffic movements due to road safety issues associated with road trains. It is recommended that lot occupancy be limited until the Great North Highway / Reserve Road works are complete.

APPENDIX A

Weekly Volume by Hour

Traffic Flow:Directional

Road Name:Great Northern Hwy (H006)

Site No:6845

Location Description:N of Muchea East Rd (SLK 38.09)

Date Range:13 Jul 2015 to 14 Jul 2015

Count Type:Classification Counts

Average Vehicle Volume

Hour	Mon		Tue		Wed		Thu		Fri		Sat		Sun		Mon - Fri		Mon - Sun	
	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S	N	S
0000	0	4	5	6											3	5		
0100	4	4	7	9											6	7		
0200	5	3	8	4											7	4		
0300	6	8	4	14											5	11		
0400	16	21	14	30											15	26		
0500	32	67	45	66											39	67		
0600	113	124	106	106											110	115		
0700	116	117	109	140											113	129		
0800	133	133	110	127											122	130		
0900	135	137	122	146											129	142		
1000	132	174	131	156											132	165		
1100	118	173	125	151											122	162		
1200	135	126	113	130											124	129		
1300	122	111	135	116											129	114		
1400	128	133	133	137											131	135		
1500	145	152	180	179											163	166		
1600	180	139	151	154											166	147		
1700	177	101	141	112											159	107		
1800	113	82	124	80											119	81		
1900	62	45	61	36											62	41		
2000	38	29	44	26											41	29		
2100	30	14	36	14											33	14		
2200	16	7	20	15											18	11		
2300	10	10	12	9											11	10		
Total	1966	1916	1936	1965											1959	1947		

APPENDIX B**Sugargum Drive Traffic Count**

Time	A	B	C	D	Total	GNH N	GNH S
3pm – 4pm	3	1	1	17	22	113	90
3:30pm – 4:30pm	3	2	1	21	27	119	94
4pm – 5pm	4	2	1	21	28	127	86
4:30pm – 5:30pm	5	2	3	20	30	149	114
5pm – 6pm	3	2	3	20	28	140	88
MRWA 4pm – 5pm						168	147

- A Right turn out
 B Left turn out
 C Right turn in
 D Left turn in

APPENDIX C

Table 3 Level of Service Based on Daily Volume

LOS	Single Carriageway ¹	2 Lane Boulevard ²	Dual Carriageway (4 Lanes) ³
A	2,400vpd	2,600vpd	13,000vpd
B	4,800vpd	5,300vpd	28,000vpd
C	7,900vpd	8,700vpd	38,000vpd
D	13,500vpd	15,000vpd	48,000vpd
E	22,900vpd	25,200vpd	58,000vpd

¹ Based on Table 3.9 Austroads - Guide to Traffic Engineering Practice Part 2

² Based on single carriageway +10% (supported by Table 3.1 Austroads - Guide to Traffic Engineering Practice – Part 3) – Boulevard or division by medians.

³ Based on Table 4.8 Austroads - Guide to Traffic Engineering Practice Part 2. Hourly flow reduced by 250 vehicles and 70/30 split assumed. Daily = hourly x 10.

APPENDIX D

GREAT NORTHERN HIGHWAY VISIBILITY

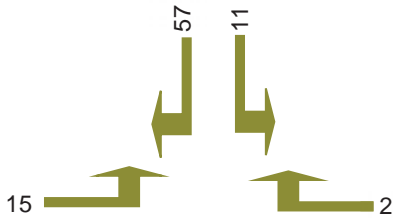
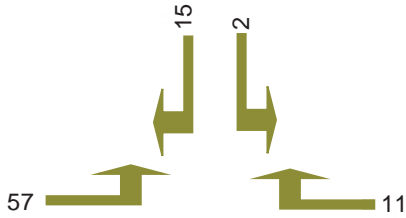
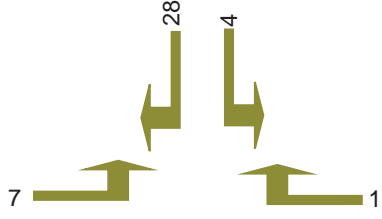
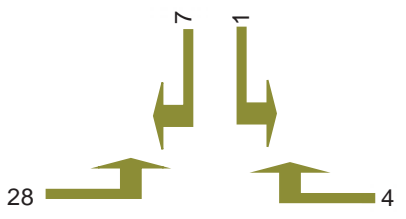
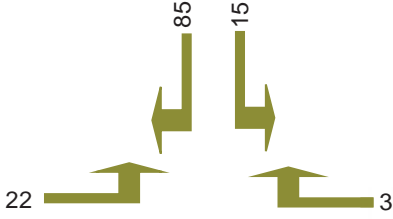
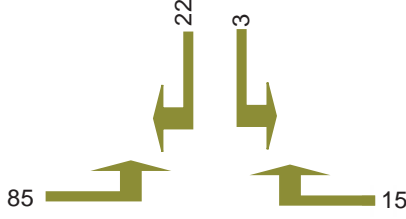


View to north



view to south

APPENDIX E SIDRA ANALYSIS

	
AM Peak Demands	PM Peak Demands
EXISTING APPROVED TRAFFIC DEMANDS	
	
AM Peak Demands	PM Peak Demands
DEVELOPMENT APPLICATION TRAFFIC DEMANDS	
	
AM Peak Demands	PM Peak Demands
ULTIMATE FULL DEVELOPMENT TRAFFIC DEMANDS	

SIDRA ANALYSIS OF APPROVED DEVELOPMENT

MOVEMENT SUMMARY

Site: GNH-Reserve Road AM Peak
Approved

Great Northern Highway / Reserve Road
AM Peak with Approved Development
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Great Northern Highway South											
1	L	16	3.0	0.014	8.3	LOS A	0.0	0.0	0.00	0.77	49.0
2	T	128	20.0	0.069	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		144	18.1	0.069	0.9	LOS A	0.0	0.0	0.00	0.08	58.6
North: Great Northern Highway North											
8	T	137	20.0	0.081	0.7	LOS A	0.6	4.8	0.30	0.00	54.6
9	R	2	3.0	0.081	9.0	LOS A	0.6	4.8	0.30	0.95	49.1
Approach		139	19.7	0.081	0.8	LOS A	0.6	4.8	0.30	0.01	54.5
West: Reserve Road											
10	L	12	3.0	0.024	8.9	LOS A	0.0	0.4	0.25	0.61	47.8
12	R	60	3.0	0.107	11.9	LOS A	0.5	3.7	0.48	0.75	45.2
Approach		72	3.0	0.107	11.4	LOS A	0.5	3.7	0.44	0.73	45.6
All Vehicles		355	15.7	0.107	3.0	NA	0.6	4.8	0.21	0.19	53.9

MOVEMENT SUMMARY

Site: GNH-Reserve Road PM Peak
Approved

Great Northern Highway / Reserve Road
PM Peak with Approved Development
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Great Northern Highway South											
1	L	60	3.0	0.033	8.3	LOS A	0.0	0.0	0.00	0.67	49.0
2	T	177	20.0	0.102	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		237	15.7	0.102	2.1	LOS A	0.0	0.0	0.00	0.17	56.6
North: Great Northern Highway North											
8	T	155	20.0	0.100	1.2	LOS A	0.8	6.3	0.39	0.00	53.0
9	R	12	3.0	0.100	9.5	LOS A	0.8	6.3	0.39	0.92	49.1
Approach		166	18.8	0.100	1.7	LOS A	0.8	6.3	0.39	0.06	52.7
West: Reserve Road											
10	L	2	3.0	0.005	9.2	LOS A	0.0	0.1	0.32	0.60	47.6
12	R	16	3.0	0.033	13.1	LOS A	0.2	1.1	0.52	0.75	44.1
Approach		18	3.0	0.033	12.7	LOS A	0.2	1.1	0.50	0.73	44.5
All Vehicles		421	16.4	0.102	2.4	NA	0.8	6.3	0.17	0.15	54.5

SIDRA ANALYSIS OF DEVELOPMENT APPLICATION

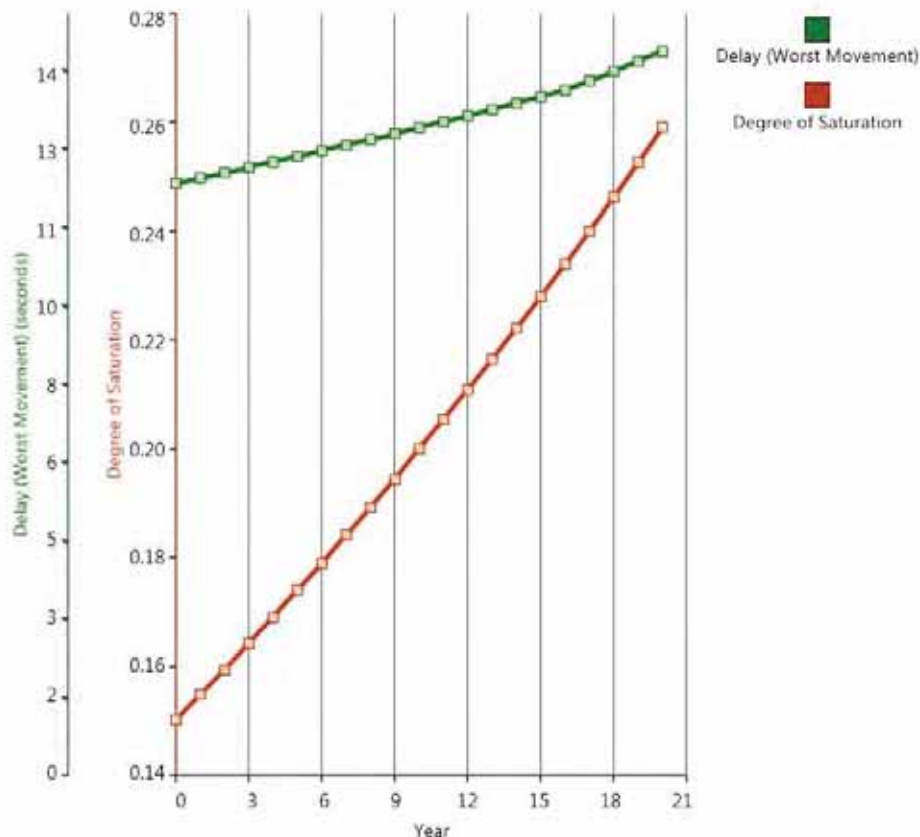
MOVEMENT SUMMARY

Site: GNH-Reserve Road AM Peak
Full Development

Great Northern Highway / Reserve Road
AM Peak with Full Development
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Great Northern Highway South											
1	L	23	3.0	0.015	8.3	LOS A	0.0	0.0	0.00	0.70	49.0
2	T	128	20.0	0.073	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		152	17.4	0.073	1.3	LOS A	0.0	0.0	0.00	0.11	58.0
North: Great Northern Highway North											
8	T	137	20.0	0.082	0.7	LOS A	0.6	4.8	0.30	0.00	54.5
9	R	3	3.0	0.081	9.0	LOS A	0.6	4.8	0.30	0.95	49.1
Approach		140	19.6	0.082	0.9	LOS A	0.6	4.8	0.30	0.02	54.3
West: Reserve Road											
10	L	16	3.0	0.033	9.0	LOS A	0.1	0.5	0.26	0.62	47.8
12	R	89	3.0	0.160	12.1	LOS A	0.8	5.8	0.50	0.77	45.0
Approach		105	3.0	0.160	11.7	LOS A	0.8	5.8	0.46	0.75	45.4
All Vehicles		397	14.4	0.160	3.9	NA	0.8	5.8	0.23	0.25	52.9

Design Life Assessment



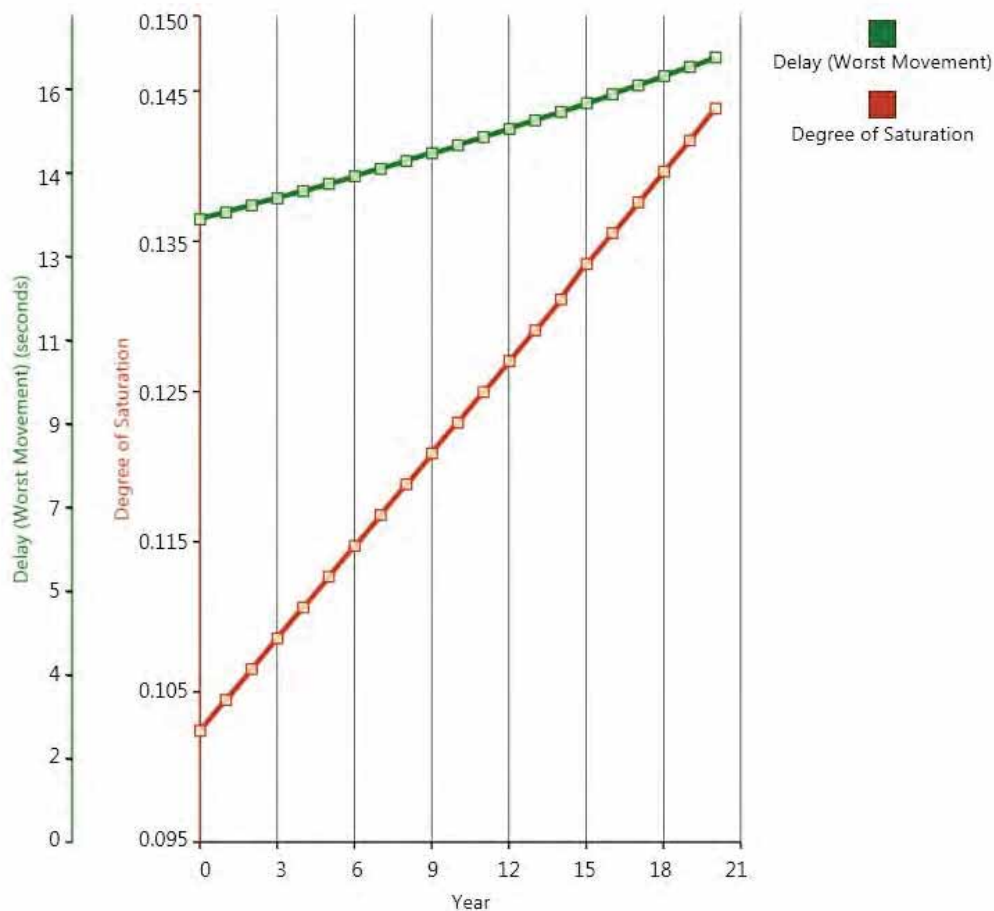
MOVEMENT SUMMARY

Site: GNH-Reserve Road PM Peak
Full Development

Great Northern Highway / Reserve Road
PM Peak with Full Development
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles-veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Great Northern Highway South											
1	L	89	3.0	0.049	8.3	LOSA	0.0	0.0	0.00	0.67	49.0
2	T	177	20.0	0.102	0.0	LOSA	0.0	0.0	0.00	0.00	60.0
Approach		266	14.3	0.102	2.8	LOSA	0.0	0.0	0.00	0.22	55.8
North: Great Northern Highway North											
8	T	155	20.0	0.104	1.3	LOSA	0.8	6.7	0.41	0.00	52.6
9	R	16	3.0	0.105	9.7	LOSA	0.8	6.7	0.41	0.91	49.0
Approach		171	18.4	0.104	2.1	LOSA	0.8	6.7	0.41	0.08	52.2
West: Reserve Road											
10	L	3	3.0	0.007	9.3	LOSA	0.0	0.1	0.33	0.61	47.5
12	R	23	3.0	0.050	13.5	LOSA	0.2	1.7	0.54	0.78	43.8
Approach		26	3.0	0.050	13.0	LOSA	0.2	1.7	0.51	0.76	44.2
All Vehicles		463	15.2	0.104	3.1	NA	0.8	6.7	0.18	0.20	53.6

Design Life Assessment





Lot 2 Reserve Road and Lot
9001 Rosewood Drive,
Chittering

Local Water Management Strategy

Prepared for:

Riverside Investments WA
Pty Ltd

September 2015

● people ● planet ● professional

Document Reference	Revision	Prepared by	Reviewed by	Submitted to Client	
				Copies	Date
1250BA	INTERNAL DRAFT	AN	RP	-	3/09/2015
1250BB	CLIENT DRAFT	AN	RP	1 Electronic (email)	9/09/2015
1250BC	SUBMISSION	AN	RP	1 Electronic (email)	21/09/2015

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Executive Summary

Key Water Management Principles (Adapted from State Planning Policy 2.9, Stormwater Management Manual for WA & Better Urban Water Management)				
Integration of water and land use planning				
Ensure stormwater management planning is precautionary, recognises inter-generational equity, conservation of biodiversity and ecological integrity				
Ensure stormwater management is part of total water cycle management				
Recognise stormwater as a valuable resource and ensure its protection, conservation and reuse				
Category	Objectives	Site Considerations	Key Management Features	
Water Sustainability To maximise the reuse or stormwater and minimise use of potable water particularly for non-drinking water purposes.	Promote efficient use of potable water and alternative water sources. Potable water consumption target of not more than 40-60kL/person/yr. Maintain appropriate aquifer levels.	The site currently has a groundwater Licence's for the Leederville aquifer. There is allocation available from the Superficial and Yarragadee Aquifer. The Leederville Aquifer is fully allocated. The Site is not located within any Public Drinking Water Source Areas.	The existing licence to take water from the artesian aquifer is the main source of potable water. The superficial aquifer is the secondary water supply for the Site. Households will adhere to waterwise home guidelines. Local, native waterwise plants will be used in landscaping.	
Stormwater To maintain the total water cycle balance within development areas relative to the pre-development conditions. To protect the built environment from flooding.	Retain natural drainage lines and minimise use of piped drainage systems. Frequent events (≤1yr ARI) retained and infiltrated within property boundaries, using soakwells where possible. Large events (>1yr ARI) contained in landscape retention/detention areas, road reserves, POS and linear multiple use corridors. Retain runoff (≤100yr ARI) within the Site.	There are no surface water features (wetlands, waterways or drains) within the Site. There is minimal runoff from the site during high-intensity storm owing to the sandy soil and vegetation cover. The site is suitable for disposal of stormwater through infiltration.	Existing catchment will be maintained. Frequent events (≤1yr ARI) will be infiltrated through soakwells on lots, road drains and the bio-retention basin within the POS Major events (up to 100yr ARI) will be retained and infiltrated within the POS (Lot 2).	
Groundwater To maintain the total water cycle balance within development areas relative to the pre-development conditions. To protect the built environment from water-logging.	Maintain appropriate recharge characteristics and groundwater levels, and minimise impervious areas. Ensure 1.2m of separation from maximum groundwater levels, including the use of subsoil drainage and importation of fill, where required. Maximise infiltration close to source or high in the catchment.	According to the Perth maximum groundwater contours and water management strategy (VDM, 2008a) there is sufficient clearance to groundwater for development across the Site. No areas of water-logging were identified on site. Further groundwater data will be provided in the UWMP.	No direct measures, subsoil drainage or lowering of groundwater are proposed for managing groundwater across the Site. Imported granular fill must comply with the material requirements as stated in AS3798. Final lot levels and clearance to groundwater will be provided in the UWMP following refinement of any earthwork design.	
Water Quality To maintain or improve the surface water and groundwater quality within development areas relative to pre-development conditions.	Install bio-retention areas, sized at ≥2% of constructed impervious areas for treatment of frequent (≤1yr ARI) events. Apply a treatment-train approach to flows prior to discharge. Implement non-structural controls, such as education programs.	Groundwater samples were collected at the DoW Monitoring Bore (61602501) to determine the groundwater quality of the artesian aquifer. Results indicated that the artesian aquifer contains a suitable water quality with most parameters below their respective drinking water quality criteria; except for iron and manganese exceeding ANZECC guidelines.	A treatment train approach to water quality improvement is adopted. Frequent events will be infiltrated close to source by soakwells, drains and bio-retention area. Further measures will be outlined in the UWMP.	
Protection of Receiving Environments To retain natural drainage systems and protect ecosystem health.	Maintain pre-development hydrological and water quality conditions. Retain seasonal wetlands and vegetation and apply appropriate buffers. No direct drainage to conservation category wetlands.	There are no Bush Forever or Environmentally Sensitive Areas on the Site. The Site is not located within or directly adjacent to any geomorphic wetlands, with the nearest system approximately 4.5km west.	The treatment train approach (above) will provide water quality improvement measures and protection to receiving environments.	
Public Health and Risk To minimise the public risk, including risk of injury or loss of life to the community.	Prevent flooding (0.3m clearance from 100yrARI water levels to lots), water logging and erosion of waterways/slopes/banks. Immobile stormwater infiltrated within 96hrs to prevent mosquitos. Manage acid sulphate soils and contamination risks.	No flooding or water logging was identified. Regional mapping indicates there is no ASS risk. No contaminated sites exist on or within 3km of the site.	The habitable floor level will be >0.5m above the 100yr ARI flood level and >1.2m the maximum groundwater level to prevent water logging. Stormwater will be infiltrated within 96hrs to prevent standing water and mosquito breeding.	
Social Values To ensure that social aesthetic and cultural values are recognised and maintained when managing stormwater.	Integrate stormwater structures into the landscape and POS. Retain remnant vegetation, where possible. Minimise the use of artificial/piped drainage systems. Conserve Aboriginal Heritage and environmentally sensitive areas.	The Site is surrounded by native bush. There are no areas of Aboriginal Heritage on this Site.	Stormwater structures will be integrated into the POS Design. Remnant vegetation will be retained (where possible).	
Further Planning To ensure delivery of best practice stormwater management through planning.	Integrate water management with urban planning and ensure all BUWM (WAPC, 2008) requirements are fulfilled. Apply WSUD approach to road, lot and POS layouts.	The guiding water management document for the Site is Lot 2 Reserve Road, Chittering & Surrounds Water Management Strategy (VDM, 2008a) which provides a summary of key water objectives just for Lot 2 in the Site.	The UWMP will document the final stormwater management strategy incorporating any additional engineering, planning and landscaping requirements.	
Implementation/ Construction To ensure delivery of best practice stormwater management through high quality developed areas in accordance with sustainability and precautionary principles.	Prevent impacts on the hydrological regime during construction. Apply sediment control measures during construction to prevent excessive waterways/slopes/banks erosion. Utilised a non-potable water source for dust-suppression. Monitor water quality, flows, and levels near sensitive environments.	The UWMP will need to adjust strategies/plans in the context of the new information. There is sufficient clearance to groundwater to prevent the need for ongoing dewatering.	Direct impacts from construction activities, such as dust, erosion and waste disposal will be managed through appropriate site practices. Where possible, the timing of construction works be undertaken to minimise impacts on the water cycle.	
Post-Development To implement stormwater systems that are economically viable in the long term.	Consider the maintenance requirements. Following completion of construction, monitor groundwater and surface water near sensitive environments.	Trees and vegetation on the conservation lot will be retained and the stormwater will be managed separately within its boundary.	No post-development groundwater water quantity or quality monitoring program is considered across the Site.	

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Appendix A: Urban Water Management Plan Checklist (WAPC, 2008)
Appendix B: Lot 2 Reserve Road, Chittering and Surrounds Water Management Strategy (VDM, 2008a)
Appendix C: Development Plan (TBB, 2015)
Appendix D: Landscape Masterplan (UDLA, 2015)

1 Introduction

360 Environmental Pty Ltd (360 Environmental) have been commissioned by Riverside Investments (the Client) to prepare this Local Water Management Strategy (LWMS) to accompany the submission of a Local Structure Plan (LSP) for Lot 2 Reserve Road and Lot 9001 Rosewood Drive in Chittering (the Site). The Site is approximately 195 hectares (ha) in size and is located in the Shire of Chittering. It is approximately 70 kilometres (km) north of the Perth CBD (Figure 1).

The proposed development will influence the total water cycle as a result of an increase in impervious areas, the clearing of small amounts of native vegetation, cut and fill and changes to existing stormwater infrastructure. The LWMS has been prepared to provide strategies and plans for total water cycle management across the Site in accordance with the principles of Water Sensitive Urban Design (WSUD) and the guiding documents in Section 1.2. It provides a summary of local and regional environmental data that informs management strategies for stormwater, groundwater, protection of receiving environments and water conservation. A strategy for implementing the total water cycle management during construction and post-development is also provided.

A checklist for the LWMS requirements is included in Appendix A and outlines the compliance of this document with the Better Urban Water Management (BUWM) (WAPC, 2008) framework.

1.1 Planning Background

The BUWM framework (WAPC, 2008) integrates water management into the land use planning process to ensure planning strategies include total water cycle management and WSUD.

The Site is located within the Shire of Chittering's local government area and is currently zoned as Rural Residential under the Town Planning Scheme (TPS No. 6) (DPI, 2004). The LSP has been developed to coordinate the provision and planning for land use development at the site (Figure 3). This LWMS has been prepared in support of the LSP.

1.2 Guiding Documents

Development and associated water management strategies for the Site have been prepared with consideration for the following guidelines and policy documents:

- Lot 2 Reserve Road, Chittering & Surrounds Water Management Strategy (VDM, 2008a) (Appendix B);
- State Planning Policy 2.9 Water Resources (WAPC, 2006);
- Stormwater Management Manual for Western Australia (DoW, 2004-07);
- Better Urban Water Management (WAPC, 2008);

- Decision Process for Stormwater Management in Western Australia (DoW, 2009);
- Guidance Note 3: Preparation and Assessment of Water Management Reports (DoW, 2013); and
- Shire of Chittering Town Planning Scheme No. 6 District Zonning Scheme (DPI, 2004)

1.3 Design Objectives

A summary of the key principles and objectives for the Site, based on the guiding documents, is provided in Table 1.

Table 1: LWMS Key Principles and Objectives.

Key Water Management Principles (Adapted from State Planning Policy 2.9, Stormwater Management Manual for WA & Better Urban Water Management).	
<p>Integration of water and land use planning</p> <p>Ensure stormwater management planning is precautionary, recognises inter-generational equity, conservation of biodiversity and ecological integrity</p> <p>Ensure stormwater management is part of total water cycle management</p> <p>Recognise stormwater as a valuable resource and ensure its protection, conservation and reuse</p> <p>Define stormwater quality management objectives in relation to the sustainability of the receiving environment</p> <p>Recognise the need for site specific solutions and implement appropriate non-structural and structural solutions</p> <p>Integrate Stormwater Treatment into the landscape</p> <p>Add value while minimising development costs</p>	
Category	LWMS Objectives
Water Sustainability To maximise the reuse of stormwater and minimise use of potable water particularly for non-drinking water purposes.	Promote efficient use of potable water and alternative water sources. Potable water consumption target of not more than 40-60kL/person/yr. Maintain appropriate aquifer levels.
Stormwater To maintain the total water cycle balance within development areas relative to the pre-development conditions. To protect the built environment from flooding.	Retain natural drainage lines and minimise use of piped drainage systems. Frequent events (≤ 1 yr ARI) retained and infiltrated within property boundaries, using soakwells where possible. Large events (> 1 yr ARI) contained in landscape retention/detention areas, road reserves, POS and linear multiple use corridors. Retain runoff (≤ 100 yr ARI) within the Site.
Groundwater To maintain the total water cycle balance within development areas relative to the pre-development conditions. To protect the built environment from water-logging.	Maintain appropriate recharge characteristics and groundwater levels, and minimise impervious areas. Ensure 1.2m of separation from maximum groundwater levels, including the use of subsoil drainage and importation of fill, where required. Maximise infiltration close to source or high in the catchment.
Water Quality To maintain or improve the surface water and groundwater quality within development areas relative to pre-development conditions.	Install bio-retention areas, sized at $\geq 2\%$ of constructed impervious areas for treatment of frequent (≤ 1 yr ARI) events. Apply a treatment-train approach to flows prior to discharge. Implement non-structural controls, such as education programs.
Protection of Receiving Environments To retain natural drainage systems and protect ecosystem health.	Maintain pre-development hydrological and water quality conditions. Retain seasonal wetlands and vegetation and apply appropriate buffers. No direct drainage to conservation category wetlands.
Public Health and Risk To minimise the public risk, including risk of injury or loss of life to the community.	Prevent flooding (0.3m clearance from 100yrARI water levels to lots), water logging and erosion of waterways/slopes/banks. Immobile stormwater infiltrated within 96hrs to prevent mosquitos. Manage acid sulphate soils and contamination risks.
Social Values To ensure that social aesthetic and cultural values are recognised and maintained when managing stormwater.	Integrate stormwater structures into the landscape and POS. Retain remnant vegetation, where possible. Minimise the use of artificial/piped drainage systems. Conserve Aboriginal Heritage and environmentally sensitive areas.
Further Planning To ensure delivery of best practice stormwater management through planning.	Integrate water management with urban planning and ensure all BUWM (WAPC, 2008) requirements are fulfilled. Apply WSUD approach to road, lot and POS layouts.
Implementation/ Construction To ensure delivery of best practice stormwater management through high quality developed areas in accordance with sustainability and precautionary principles.	Prevent impacts on the hydrological regime during construction. Apply sediment control measures during construction to prevent excessive waterways/slopes/banks erosion. Utilised a non-potable water source for dust-suppression. Monitor water quality, flows, and levels near sensitive environments.
Post-Development To implement stormwater systems that are economically viable in the long term.	Consider the maintenance requirements. Following completion of construction, monitor groundwater and surface water near sensitive environments.

2 Proposed Development

A brief summary of the pre-development land use and proposed development are provided below.

2.1 Land Use

The Site is located within the Shire of Chittering (Figure 1). Lot 2 has been historically cleared and used as a commercial wild flower farm with small section of original bushland still present. It consists of four residences to the south west corner and Rocky Creek is within 1.5km south of Lot 2.

Lot 9001 is densely vegetated and has no current land uses. Surrounding land uses include rural land developments and semi-rural bushlands (Figure 2).

2.2 Development Features

The proposed development features approximately 242 residential lots, ranging in size from 5000m² to 14245m², as shown in Figure 3 and Appendix C. A Conservation Lot (about 20ha) is also proposed in the northern section of Lot 9001. This will contribute towards protection of land identified as the Indicative High Conservation Value Area.

The layout of this development has considered the existing environmental and drainage conditions, as well as surrounding land use and planning constraints.

Public Open Space (POS) which will be partially utilised for drainage is proposed centrally within Lot 2. This area is downslope from Lot 9001 and the majority of Lot 2. Landscaping plans of the Site are provided in Appendix D.

3 Site Characteristics

The pre-development environmental conditions provide opportunities and constraints for water management on the site. A summary of the environmental characteristics are provided in this Section.

3.1 Previous Studies

The environmental characterisation of the Site is based on a desktop assessment, field visit by 360 Environmental staffs and a review of the following documents:

- Lot 2 Reserve Road, Chittering & Surrounds Water Management Strategy (VDM, 2008a);
- Proposed Rural Residential Development, Lot 2 Reserve Road, Chittering: Basic Ecological Assessment (VDM, 2005);
- Proposed Residential Development, Lot 7 Reserve Road, Muchea: Vegetation Survey, Report (VDM, 2008b);
- Lot 7 Reserve Road, Muchea Vegetation Survey (VDM, 2014);
- Chittering Black Cockatoo Assessment (360 Environmental, 2015); and
- Lot 2 Reserve Road & Lot 9001 Rosewood Drive, Chittering Proposed Development Plan Report (TBB, 2015);

3.2 Topography

The Site (approximately 195ha) is located beside the Reserve Road and is 2km west of the Great Northern Highway (Figure 2).

Topography of the Site (based on 10m contours) varies between around 165 meters Above Height Datum (mAHD) in the northern boundary of Lot 9001 and less than 135mAHD in the south eastern corner of Lot 2 (Figure 2). The site generally slopes from north to south.

3.3 Climate

The climate of the south western region of Western Australia is characterised by the Koppen Climate Classification as Dry Subtropical featuring long, hot, dry summers, and mild, rainy winters. The dominate rainfall mechanisms are frontal systems caused by cold fronts associated with low pressure systems that extend across southern Australian between May and October. During the summer months, thunderstorms and ex-tropical cyclones can bring intense rainfall.

The weather station at Marbling Rainfall Station (009024), approximately 8km south east of the site, provides a climate dataset of approximately 78 years (BoM, 2013a). As

demonstrated in Figure 4, there is a variation in the annual totals, ranging between 409mm (2010) and 1,186mm (1955). The data indicates a decreasing trend in annual and winter rainfall totals, particularly since 2000 where the annual average rainfall has decreased from 757mm to 664mm (approximately a 12% decrease). Winter rainfall (May-August) has decreased by 18% during the same period.

Evaporation, as shown in Figure 4, is highest between November and March. A comparison of the mean monthly rainfall and evaporation totals demonstrates that the region is water limited between September and April. Between May and August rainfall exceeds evaporation.

The key rainfall characteristic for hydrological analysis is the Intensity-Frequency-Duration (IFD), a statistic derived from frequency analysis to provide estimates of rainfall intensity for a given duration and return periods. Analysis of rainfall and hydrology in the LWMS is based on IFDs published in Australian Rainfall and Runoff (AR&R1987) (Engineers Australia, 1987) and are summarised in Table 2.

Table 2: Rainfall IFDs for Chittering (BoM, 2013b)

Duration	IFD Rainfall Intensity (mm/hr)				
	1 Year	2 Year	5 Year	10 Year	100 Year
1Hr	15.1	19.6	24.9	28.5	47.5
3Hrs	7.54	9.75	12.2	13.8	22.4
6Hrs	4.87	6.27	7.75	8.75	14
12Hrs	3.14	4.03	4.95	5.57	8.81
24Hrs	2.01	2.57	3.15	3.54	5.54
72hr	0.921	1.18	1.43	1.6	2.49

3.4 Geotechnical

The central tile sheet of the 1: 20,000 Soil/Soil-landscape series mapping (DAF, 2007) indicates that the Site is located within the 222Mb-3, 222Mb-1 and 222Mb-4 soil units (Figure 5). These geological units are described as below:

- 222Mb-3; Mogumber 3 Subsystem - Gently inclined undulating slopes and minor drainage head-waters. Deep grey siliceous or bleached sands.
- 222Mb-1; Mogumber 1 Subsystem - Undulating broad crests and very gentle upper slopes <10% with common lateritic duricrust outcrop and shallow gravelly sands.
- 222Mb-4; Mogumber 4 Subsystem - Gently to moderately inclined slopes <10% with shallow gravelly sands and few areas of lateritic outcrop.

According to this investigation, the soil type at the Site is more consisted of bleached and gravelly sands. Therefore, a conservative design infiltration rate of 5m/day has been

adopted for the Site. This rate account for the natural variation in sands, clogging of the sand around soakwells and soakage basin over time with fines and densification of sand during site preparation works.

A detailed Geotechnical Investigation may be carried out in support of subdivision. The investigation will likely comprise excavation of test pits, permeability tests and laboratory testings. Results will be provided in the UWMP, including the soil profile and permeability rate.

3.5 Groundwater

The underlying aquifers, pre-development groundwater quality and depth of water below the surface require consideration for management of the total water cycle and are discussed below.

3.5.1 Aquifers

The Site is situated in the Eclipse Hill groundwater sub-area. Groundwater resources below this region feature three separate aquifer systems; the Perth Superficial aquifer, the Leederville aquifer and Yarragadee aquifer (DoW, 2014). The shallowest aquifer, the Perth Superficial, consist of variable sequences of fine and medium sand with minor silt and limestone (mainly Bassendean Sand) that interfinger with a sequence of clay and clayey sand towards the foothills of the Gingin and Darling scarps (Guildford Clay) (DoW, 2010). Recharge to the superficial aquifer occurs through direct infiltration of rainfall, which migrates downward to the water table or less permeable layers, at which point groundwater flows laterally to the aquifer. Water is lost from the aquifer through evapotranspiration from wetlands and shallow groundwater areas, to the ocean and downward leakage to the Leederville Aquifer.

The Leederville Aquifer is a major confined aquifer that consists of sandstones, siltstones and shales. It is a major groundwater source for the Perth region. The deeper Yarragadee aquifer is confined and occurs at depths about 450m below ground surface. As with the Leederville, the Yarragadee is a major groundwater source for the Perth region.

3.5.2 Groundwater Levels

The Perth Groundwater Atlas (DoW, 2012) provides the maximum groundwater level covering mostly Perth metropolitan area. These contours do not extend across the Site, with the nearest contour (60mAHD) 1km to the east (Figure 6). Ground water level within the Site is anticipated to be significantly higher than 60mAHD. According to the surface elevation (Section 3.2), there will be a sufficient clearance to groundwater for development across the Site.

The previous water management strategy (VDM, 2008a) indicated that groundwater level was greater than 30m below surface.

3.5.3 Groundwater Quality

No Site specific groundwater monitoring (of the superficial aquifer) has been undertaken, owing to the vegetation on Lot 9001 and depths reported in VDM, 2008a. Groundwater samples were collected at the Department of Water Monitoring Bore 61602501 (Figure 6) in 1981 to determine physiochemical parameters and nutrients (VDM, 2008a). Groundwater quality within the artesian aquifer was being assessed against the ANZECC guidelines and is provided with the results in Table 3.

The groundwater salinity of the artesian aquifer is considered fresh within the Site owing to the range of TDS (DoW, 2012). Table 3 indicates that the artesian aquifer contains a suitable water quality. Most parameters are well below their respective drinking water quality criteria except for large concentration of iron and manganese.

Table 3: Groundwater Monitoring Results

Parameters	ANZECC* (2000)	Pre-Development Monitoring	
		Sample 1	Sample 2
Physical Properties			
pH	6.5 – 8.5	7	6.8
Electrical Conductivity (Us/cm²)	-	560	550
Total Dissolved Solids (mg/L)	500	360	350
Sodium (Na) (mg/L)	69	68	180
Potassium (K) (mg/L)	-	7.6	7.6
Calcium (Ca) (mg/L)	-	7.7	7.9
Manesium (Mg) (mg/L)	-	5.4	5.3
Hardness (as CaCO ₃) (mg/L)	200	41	42
Chloride (Cl) (mg/L)	250	120	120
Fluoride (F) (mg/L)	1.5	0.3	0.3
Arsenic (As) (mg/L)	0.007	< 0.001	< 0.001
Nitrate (NO ₃) (mg/L)	-	< 0.20	< 0.20
Sulphate (mg/L)	250	14	14
Iron, Fe (Soluble) (mg/L)	0.3	6.0	6.3
Aluminum (mg/L)	0.2	0.1	0.1
Manganese (Mn) (mg/L)	0.1	0.1	0.1

*ANZECC & ARMCANZ (2000) guideline values (Lowland Rivers) adopted.

3.6 Surface Water

No surface water features or surface drainage lines exist on the Site owing to the sandy soil and vegetation cover. The Site is located between Yalyal Brook in the north and

Rocky Creek in the south and is not within 100 Year Annual Recurrence Index (ARI) Floodplain development control area.

3.7 Water Resources

The site is located within the Eclipse Hill groundwater subarea of the Gingin Groundwater Area. An Aquifer Allocation Report requested in August 2015 shows that there is approximately 1,248,893kL available in the superficial aquifer (DoW, 2014). There is an existing groundwater Licence's in Lot 2 for the Leederville aquifer with an annual volume of 288,800kl (Table 4).

The site is not within Public Drinking Water Source Areas (PDWSA), or Proclaimed Surface Water Areas.

Table 4: Groundwater License Details

License No.	Duration of License	Authorised Activities
GWL 59907 (2) Riverside Investments Pty Ltd	From 25 March 2007 to 25 March 2017	Taking of water for household purposes
		Irrigation of 0.1 hectares of lawns and
		Irrigation of 2 ha of pasture
		Irrigation of 30.3 ha of native plants
		Water use of ostriches

3.8 Environmental

Several environmental features either influence or are dependent on the total water cycle for this site. A brief summary of these is provided below.

3.8.1 Land Use Change

Aerial photography shows that Lot 2 was vegetated prior to 1979. Between 1979 and 1983, Site clearing was started to make way for commercial wild flower farm. The Rosewood Ramble was built east of Lot 2 between 2000 and 2005.

Lot 9001 has always been densely vegetated without any significant changes in the land use type. Rosewood Ramble was extended to the southern section of Lot 9001 after 2008 (Figure 7).

3.8.2 Aboriginal Heritage

The Government of Western Australia's State Heritage Office has not identified any areas of Aboriginal or European heritage within the site. A search of the Department of Aboriginal Affairs (DAA), Aboriginal Heritage Inquiry System (AHIS) identified that the closest aboriginal site is about 2km west of the Site (DAA, 2014).

3.8.3 Flora and Fauna

VDM undertook a Basic Ecological Assessment for Lot 2 during 2005 that included assessing the flora, vegetation and fauna habitat within the Site (VDM, 2005). The assessment identified 48 flora taxa.

The assessment found that due to isolation of the existing vegetation, the project area is unlikely to provide core habitat for significant fauna species and does not have any functional role as a corridor or linkage for significant flora or fauna.

No currently listed conservation-significant flora species or communities pursuant to the Western Australian Wildlife Conservation Act 1950 or the Commonwealth EPBC Act were recorded during any of the biological surveys.

360 Environmental undertook a Black Cockatoo Habitat Assessment during April 2015 (360 Environmental, 2015). The assessment found that the Site offers potential foraging, roosting and breeding habitat for Black Cockatoos. During the survey, no Black Cockatoos were heard or observed in the Site or seen flying over. 151 potential breeding trees were recorded within the project area, none of which contained hollows with suitable dimensions for Black Cockatoo breeding.

3.8.4 Wetlands

The Site is not located within or adjacent to any geomorphic wetlands. Regional mapping identifies the nearest wetland as Chandala Lake a Conservation Category Wetland located over 4.5km northwest of the Site (Figure 8) (DER, 2013).

3.8.5 Acid Sulfate Soils

Regional Acid Sulphate Soil (ASS) mapping indicates the Site is predominately “no known risk” of ASS occurring on the Site within 3m of the natural surface. The nearest “moderate to low risk” area is approximately 2km west (downstream) of the Site.

3.8.6 Contaminated Sites

A search of the DER Contaminated Sites Database identified no record of the site having a contaminated site classification (DER, 2014). The nearest registered contaminated site, registered as “Contaminated - Remediated required” is located 3km south west of the site.

No visual signs of contamination were identified during site investigations by 360 Environmental Scientists. Furthermore, the review of historical imagery did not identify any significant historical causes for concern of contamination, apart from nearby market gardens.

3.9 Summary

Based on the geotechnical, hydrological and environmental information described in Section 3, the site is considered to pose a low level of risk for development, based on the

DoW's Guidance Note 3 (DoW, 2013). The Site conditions fulfil the criteria of >5m depth to groundwater and infiltration on site (5m/day). It does not contain any natural waterways or environmentally sensitive area, and there is adequate groundwater allocation available which supports a low level of risk. The developments will be proposed in a way to retain the flows within the Site boundaries. The strategies for urban water management and implementation have been prepared in consideration to account for the Low level of risk.

A summary of the Site considerations for water management are provided below.

3.9.1 Gap Analysis

Based on the numerous studies for the Site and field work that has been completed to date, there are not considered to be any significant data gaps that would further enhance water management concepts, and design, for the proposed development.

3.9.2 Site Considerations

The desktop assessment and previous investigations have identified a number of constraints and opportunities that require consideration in management of the total water cycle. These are summarised in Table 5.

Table 5: Key Site Considerations

Key Water Management Principles (Adapted from State Planning Policy 2.9, Stormwater Management Manual for WA & Better Urban Water Management).	
<p>Integration of water and land use planning</p> <p>Ensure stormwater management planning is precautionary, recognises inter-generational equity, conservation of biodiversity and ecological integrity</p> <p>Ensure stormwater management is part of total water cycle management</p> <p>Recognise stormwater as a valuable resource and ensure its protection, conservation and reuse</p> <p>Define stormwater quality management objectives in relation to the sustainability of the receiving environment</p> <p>Recognise the need for site specific solutions and implement appropriate non-structural and structural solutions</p> <p>Integrate Stormwater Treatment into the landscape</p> <p>Add value while minimising development costs</p>	
Category	Site Considerations
Water Sustainability To maximise the reuse or stormwater and minimise use of potable water particularly for non-drinking water purposes.	The site currently has a groundwater Licence's for the Leederville aquifer. There is allocation available from the Superficial and Yarragadee Aquifer. The Leederville Aquifer is fully allocated. The Site is not located within any Public Drinking Water Source Areas.
Stormwater To maintain the total water cycle balance within development areas relative to the pre-development conditions. To protect the built environment from flooding.	There are no surface water features (wetlands, waterways or drains) within the Site. There is minimal runoff from the site during high-intensity storm owing to the sandy soil and vegetation cover. The site is suitable for disposal of stormwater through infiltration.
Groundwater To maintain the total water cycle balance within development areas relative to the pre-development conditions. To protect the built environment from water-logging.	According to the Perth maximum groundwater contours and water management strategy (VDM, 2008a) there is sufficient clearance to groundwater for development across the Site. No areas of water-logging were identified on site. Further groundwater data will be provided in the UWMP.
Water Quality To maintain or improve the surface water and groundwater quality within development areas relative to pre-development conditions.	Groundwater samples were collected at the DoW Monitoring Bore (61602501) to determine the groundwater quality of the artesian aquifer. Results indicated that the artesian aquifer contains a suitable water quality with most parameters below their respective drinking water quality criteria; except for iron and manganese exceeding ANZECC guidelines.
Protection of Receiving Environments To retain natural drainage systems and protect ecosystem health.	There are no Bush Forever or Environmentally Sensitive Areas on the Site. The Site is not located within or directly adjacent to any geomorphic wetlands, with the nearest system approximately 4.5km west.
Public Health and Risk To minimise the public risk, including risk of injury or loss of life to the community.	No flooding or water logging was identified. Regional mapping indicates there is no ASS risk. No contaminated sites exist on or within 3km of the site.
Social Values To ensure that social aesthetic and cultural values are recognised and maintained when managing stormwater.	The Site is surrounded by native bush. There are no areas of Aboriginal Heritage on this Site.
Further Planning To ensure delivery of best practice stormwater management through planning.	The guiding water management document for the Site is Lot 2 Reserve Road, Chittering & Surrounds Water Management Strategy (VDM, 2008a) which provides a summary of key water objectives just for Lot 2 in the Site.
Implementation/ Construction To ensure delivery of best practice stormwater management through high quality developed areas in accordance with sustainability and precautionary principles.	The UWMP will need to adjust strategies/plans in the context of the new information. There is sufficient clearance to groundwater to prevent the need for ongoing dewatering.
Post-Development To implement stormwater systems that are economically viable in the long term.	Trees and vegetation on the conservation lot will be retained and the stormwater will be managed separately within its boundary.

4 Water Sustainability Initiatives

The supply of water and sustainable and efficient use within the proposed development, are key components of the LWMS.

4.1 Water Supply

Potable water for households within the development will be supplied from the artesian aquifer (Perth-Leederville Parmelia Aquifer). As discussed in Section 3.7, the Site has a total water entitlement (license to abstract groundwater) of 288,800kL/a from the Leederville Aquifer. Assuming 242 lots on Site, three occupants (per lot) and 60kL/person/year, the total water requirement is 43,560kL. There is sufficient remaining allocation for irrigation and construction activities.

To reduce demand on the deeper aquifer, alternative sources are considered including abstraction from the superficial aquifer and rainwater tanks.

Water efficiency measures will be implemented regardless of the water source or availability (Section 4.2).

The Water Management Strategy prepared by VDM in 2008 (Appendix B) is provided in Table 6.

Table 6: Proposed water supply at the Site

Water Source	Treatment / Storage / Conveyance	Proposed Use
<u>Primary Potable Supply:</u> Artesian Aquifer (Perth-Leederville-Parmelia Aquifer)	Treatment for Iron and Manganese disinfection through chlorine/UV storage at centralised tank, with pressure package for distribution conveyance through reticulated water supply.	Internal drinking water supplies including: <ul style="list-style-type: none"> • bathrooms • Kitchen • Fire Fighting
<u>Secondary Potable Supply:</u> Perth Superficial Aquifer	Separate bores on each lot based on landscaping water requirements. Lots to be installed at householders cost. Caveat of title to ensure minimal landscaping outside house-pad area.	<ul style="list-style-type: none"> • Landscaping
<u>Effluent Disposal:</u> Effluent from households	Treatment through a HDWA approved aerobic treatment system disposal to a sub-surface irrigation system for landscaping.	<ul style="list-style-type: none"> • Landscaping uses
<u>Rainwater:</u> Collection of roof areas	Storage at tanks located at each lot, preferably below ground or designed into house structure potential to be integrated into secondary potable supply.	None-drinking sources including: <ul style="list-style-type: none"> • Toilets • Washing machine • Landscaping

4.2 Water Conservation

The DoW supports sustainable and efficient use of drinking water, including fit-for-purpose and a demonstration of sustainable potable water use. Significant savings in scheme water are possible through conservation measures provided by Water Corporation (2014) and through the Building Codes of Australia.

The implementation of water conservation measures should be promoted as part of any new residential development. Consistent with these measures, households within the development will feature:

- Showerheads installed with a rating better than the minimum WELS 3 Star.
- Taps installed with a rating better than minimum WELS 4 Star.
- Dual flush toilets with a rating better than minimum WELS 4 Star.
- Water using appliances, such as washing machines and dishwashers installed with a rating of WELS 4 Star or better.
- Hot water systems located less than 20m from the point of use and / or a recirculation or heat pump is installed.
- Encourage outdoor design which minimises heat absorption and encourage the use of evaporative vs refrigerated air conditioning.

Conservation measures for ex-household use include:

- Garden designs will incorporate waterwise or endemic plant species.
- Garden beds will be mulched to a minimum of 5cm.
- Garden beds will use dripper or subsurface irrigation systems.
- Grouping of garden plants according to water needs
- Consideration of climatic factors when designing garden beds (e.g. sun and wind exposure)
- Minimal use of lawn areas.

As well as water efficient design, the promotion of water efficient behaviour should also be encouraged, including:

- Familiarisation with optimal tap and device settings;
- Observation and regular checking for leaks and maintenance requirements both indoor and outdoor;
- Use of pool covers;
- Use of fans as an alternative to air conditioning;
- Outdoor design which maximises heat reflection and ventilation

The type of vegetation throughout the development, both within private gardens and POS, significantly influences the water use throughout the development. For the Site, extensive turfed areas are not proposed, with the majority of the POS to be planted with local, native vegetation.

Estimates of water use and potential savings through these measures will be provided in the UWMP, following the finalisation of the lot layouts and sizes.

4.3 Waste Water Management

Waste water from the development will be treated onsite. Effluent from the households will be treated through HDWA approved aerobic treatment systems (VDM, 2008a).

5 Stormwater Management Strategy

The stormwater management strategy has been prepared in accordance with the guiding principles (Section 1.2) and site considerations (Section 3). The strategies preserve and enhance the ecological and social aspects of the Site and provide measures to mitigate the risk of flooding and waterlogging on the development.

5.1 Stormwater Management Concepts

The stormwater management system concepts for development of the Site have been prepared to meet the objectives and principles of BUWM and outlined in Table 1 (Section 1.2) and WSUD. In addition, the proposed conceptual design is consistent with the previous studies (Section 3.1). Specifically the system will retain catchment runoff within the property boundary.

Key elements of the stormwater management conceptual design are:

- Maintain the existing catchment and flow directions from the north to the south of the Site through earthworks and alignment of road networks. A POS area at the centre of Lot 2 will feature drainage infrastructure amongst passive and active POS uses.
- Adopt a treatment train approach to water quality management and protection of receiving environments, including infiltration of frequent events close to source and bio-retention area within the POS.
- Frequent events (≤ 1 yr ARI Event) will be mostly infiltrated within the majority of lots through the use of soakwells, with runoff from roads infiltrated via the road drains and bio-retention basin within the POS.
- Major events (≤ 100 yr ARI Event) will be retained and infiltrated onsite within the POS.
- The basin within the POS will provide aesthetic values for the community and alleviate the need for fenced drainage sumps.
- No direct groundwater management measures (permanent dewatering or control of groundwater levels) are to be implemented owing to the existing clearance to groundwater.

5.2 Stormwater Management System

A major and minor approach to the design of stormwater management systems has been adopted for the Site. The minor system consists of Roads, kerbs and small drains designed to convey runoff up to the 5yr ARI event and ensure serviceability of the road network. The major system consists of roads, POS and drainage basin alignments and provides protection of the community from extreme flooding events (up to the 100yr ARI

event) that exceed the capacity of the minor system. Details of these systems are described below.

5.2.1 Minor System (Frequent Events)

Management of the frequent event (1yr 1hr) is largely related to the protection of receiving environments. Runoff from this event is most likely to mobilise pollutants within the catchment and therefore measures are required to retain and treat this storm event on site.

Installation of soakwells is proposed in all lots owing to the minimum lot area of 5000m² and clearances required from the building footprint. Therefore 1yr 1hr event (approximately 16mm) runoff will be retained within the lot boundary and infiltrated using soakwells. Impervious areas, such as driveways, paving and roofs will be connected directly to the soakwells. Infiltration is supported by the clearance to groundwater at the proposed lots locations (generally >30m) and favourable subsurface conditions (Section 3.4). It is anticipated that the majority of area on the lots will retain trees/vegetation to promote infiltration.

Bio-retention basin within the POS will be installed for runoff from the road reserve in the 1yr 1hr ARI event. This basin will be located at the centre of Lot 2 (Figure 9). This infrastructure will be sized to ensure serviceability of the road network during the 5yr ARI event. Roadside drains will infiltrate water throughout the road network.

5.2.2 Major System (Extreme Events)

The major drainage system will consist of the roads and the drainage basin. Events larger than the 5yr ARI event will be conveyed via the road network to the drainage basin within the POS (Figure 10). In order to determine the requirements for the drainage basin, hydrologic modelling of the site was undertaken with the model XP-Storm.

The following parameters have been used to determine pre-development runoff using the XP-Storm model:

- The catchment (total area of 195ha) for the Site has been defined.
- Rainfall for the Site is based on 1987 IFD Data (Section 3.3).
- A slope value of 0.012 was used.

The post-development scenario for the Site was modelled to determine the basin configuration.

Table 7 outlines the runoff coefficients used in the post-development model. Proposes lots within the Site are fairly large with the minimum area of 5000m². A review on the existing lots in the surroundings indicated that the average building sizes are about 800 and 850m² which would not be more than 20% of the smallest proposed lot area. Knowing that more than 80% of the lots area is permeable, impervious areas are connected directly to the soakwells and rainwater tanks and the buildings are located

within distances of the roads that causes more losses, it would be unlikely to have more than 5% runoff from the Residential R2 lots. A runoff coefficient of 70% has been applied for the roads owing to the existence of permeable drains on both sides of the roads.

It should be noted that these values are conservative estimates and the breakdown of lot densities are estimates only and will be confirmed in the UWMP.

Table 7: Post-Development Runoff Coefficients

Land Use	Area (ha)	Runoff Coefficient	Comment
Lots (Residential R2)	117.3	5%	16mm of initial loss was considered on for lots to account for lot connections to the soakwells.
Lots (Conservation & Rural Conservation)	52.9	0%	No runoff was considered for these lots according to the large permeable areas and also lot connections to the soakwells.
Road Reserve	20.6	70%	Includes road, footpaths and verges.
POS	2.7	10%	The POS was assumed to have the same runoff characteristics prior to-development.

Hydrographs generated in XP-Storm were imported in the PONDS model to determine the infiltration and storage volumes. The PONDS software calculates infiltration areas and volumes, based on the finite-difference groundwater model MODFLOW, developed by the US Geological Survey.

The PONDS mode was configured with the following parameters:

- Water table elevation of 120mAHD (Section 3.5);
- Basin Invert of 150mAHD;
- Infiltration rate of 5m/day (Section 3.4);
- Porosity of 30%;
- Horizontal Hydraulic Conductivity (K_{hor}) of 10m/day (DoW, 2010);
- Conservative base of Superficial Aquifer of 5mAHD (DoW, 2012); and
- Hydrographs generated from XP-Storm.

The stormwater was designed to contain the 5yr and 100yr ARI events within the basin and POS areas. The proposed stormwater management system is presented in Table 8 and Figure 10.

Table 8: Stormwater Management System

Post-Development Catchment		Catchment	
Catchment Area		195ha	
Catchment Breakdown			
Lots (Residential R2)		117.3ha	
Lots (Conservation & Rural Conservation)		52.9ha	
Road Reserve		20.6ha	
POS		2.7ha	
Storage Data			
Type		Retention (Infiltration) Basin	
Side Slopes		1:6 (v:h)	
Base Invert		150mAHD	
Base Area		0.4ha	
5yr ARI Event		100yr ARI Event	
Top Water Level Area	0.56ha	Top Water Level Area	1.56ha
Flood Storage	4457m³	Flood Storage	12042m³
Flood Rise	0.93m	Flood Rise	1.68m
Top Water Level	150.93mAHD	Top Water Level	151.68mAHD
Critical Duration	12hr	Critical Duration	24hr
Time to Empty	12hrs (72hr Event)	Time to Empty	24hrs (72hr Event)

Flow paths for the 1yr, 5yr and 100yr ARI events are shown in Figure 10 and demonstrate areas that are inundated during each event. Similarly, a cross section of the stormwater system is shown with the maximum water levels. The system allows for minimum habitable floor levels to be at least 0.5m above the proposed top water level in the basin.

The proposed basin design is conceptual only. The UWMP will provide the final configuration that may be modified following a review of additional earthwork and road design levels. Associated landscaping and engineering drawings will also be included in the UWMP.

5.3 Groundwater Management

Based on the Perth Groundwater Atlas groundwater contours (Section 3.5.2) there is sufficient clearance between the groundwater and the natural surface across the Site where lots are proposed (Figure 6). No direct measures, including subsoil drainage or lowering of groundwater are proposed for managing groundwater. Final lot levels and

clearance to groundwater will be provided in the UWMP following refinement of the earthwork design.

Where fill is imported, imported granular fill must comply with the material requirements as stated in AS3798: Guidelines on Earthworks for Commercial and Residential Developments (Australian Standard, 2007).

5.4 Protection of Receiving Environments

There are no existing wetlands or waterways within the Site that require ongoing management and the water retention systems are designed to ensure minimal retention times by allowing the water to drain freely through the Site's sandy soils. The downstream receiving environment is the superficial aquifer.

Protection of the superficial aquifer involves managing the post-development use of nutrients and the export of pollutants off site. A treatment train approach, including the use of structural and non-structural controls, will be implemented to achieve this protection.

Non-structural controls are an essential part of the treatment train process as they contribute to the reduction stormwater volumes and pollutants. They differ from structural controls as they are not fixed, permanent infrastructure and can offer relatively inexpensive and flexible approaches (DoW, 2004-2007). Implementation of these non-structural controls occurs during various stages of development

For this site, the following non-structural controls will be implemented:

- Planning: residential lot density, basin location
- Construction: erosion and dust control
- Maintenance: street sweeping, stormwater infrastructure maintenance
- Education: WSUD community education
- Monitoring: pre-development and post-development

Structural controls for the Site will be implemented to retain and infiltrate the frequent (up to 1yr 1hr) events close to source throughout the catchment. Runoff from impervious areas, such as driveways, paving and the roof will be directed to soakwells and bio-retention basin to promote infiltration. This is based on BMPs as outlined in the Stormwater Management Manual of Western Australia (DoW, 2004-2007). Specific targets for improvement in water quality are discussed in Section 6.

6 Implementation Strategy

The success of the water management strategies relies heavily on their implementation throughout all stages of development including further planning, construction and post-development.

6.1 Subdivision Phase

Following approval of the LSP, a Subdivision Application will be submitted. In support of this application, an Urban Water Management Plan will be prepared.

The UWMP will document the final water management plans for this Site. It will include a summary of the site conditions in a number of plans; environmental, geotechnical, surface water, groundwater and Site condition plans.

A key focus of the UWMP will be to provide detail of the final stormwater system design, including engineering drawings of infrastructure, details of control point inverts, and the locations and clearance to groundwater. Further information that is obtained from additional monitoring and details on the final lot density will allow for an analysis of the conceptual designs provided in the LWMS.

The following information will also be provided in the UWMP:

- Details on the roads finished levels and grades, provided in engineering drawings.
- Further detail of the landscaping design, including POS areas and water requirements, and water use sustainability initiatives.
- Design of non-structural controls.
- Measures to mitigate mosquito populations.

6.2 Construction Phase

Water management during the construction phase of the project requires consideration of direct impacts from construction activities and maintaining pre-development hydrological performance prior to completion of the post-development stormwater system.

6.2.1 Abstraction Licensing

Water will be required for construction activities such as dust suppression and dewatering, and for irrigation of POS. The existing licence discussed in Section 3.7 will cover these activities and all abstractions will be carried out in accordance to conditions of this licence.

Dewatering is not considered likely given the separation to groundwater across the Site. However, any dewatering undertaken will occur in a manner consistent with a dewatering licence.

6.2.2 Management of Subdivisional Works

Potential impacts from construction activities related to the water cycle include:

- Nuisance dust generation during bulk earthworks
- Erosion of exposed surfaces
- Inappropriate disposal of waste building material

All of these potential impacts are manageable through appropriate engineering design and appropriate site management practices. Contractors and staff will be notified of the requirement to implement management practices to limit any potential impacts resulting from construction activities.

Timing of the construction activities will be dependent on a number of factors not related to water management. Where possible, the construction schedule should allow for work to be undertaken when impacts on the water cycle will be minimised. For example, excavation work is more appropriate between January and April when groundwater levels are at a minimum.

6.3 Post Development

Following the completion of construction activities, maintenance of the stormwater system and assessment of the system performance will be required to determine whether additional water management measures are required.

6.3.1 Maintenance

Operation and maintenance of the stormwater management system will initially be the responsibility of the developer, until handover of the development to the Shire of Chittering. The following measures will be undertaken to ensure the system functions correctly:

- Removal of debris to prevent blockages
- Assessment of the health of vegetation in the POS and removal and replacement of dead plants where necessary.

6.3.2 Monitoring Program

Water quality objectives are to be managed as per Water Sensitive Urban Design (WSUD) principles and Best Management Practices (BMPs) using bio-retention system in POS area. This is industry standard and as such water quality treatment cannot practicably be expected to be improved upon beyond these design controls.

As stated in Section 3.9, the Site is also considered to be low risk from a surface water, groundwater and environmental management perspective. Therefore any post-development groundwater water quality monitoring program to assess the performance of the stormwater management system is not considered necessary for this Site.

6.4 Roles and Responsibilities

Table 9 details the roles and responsibilities for water management during the subdivision and construction phase of the development and post-development.

Table 9: Roles and Responsibilities

Action	Developer	Shire of Chittering / DoW
Preparation of UWMP	✓	
Assessment / Approval of the UWMP		✓
Construction of Stormwater System	✓	
Construction Landscape & Irrigation System	✓	
Construction Street, kerbs and small drains	✓	
Maintenance & Street Sweeping Prior to Handover	✓	
Maintenance & Street Sweeping Following Handover		✓

7 Conclusion

The key management strategies from the LWMS, discussed in detail in Sections 4 to 7 are summarised in Table 10.

Table 10: Key Management Features

Key Water Management Principles (Adapted from State Planning Policy 2.9, Stormwater Management Manual for WA & Better Urban Water Management).	
<p>Integration of water and land use planning</p> <p>Ensure stormwater management planning is precautionary, recognises inter-generational equity, conservation of biodiversity and ecological integrity</p> <p>Ensure stormwater management is part of total water cycle management</p> <p>Recognise stormwater as a valuable resource and ensure its protection, conservation and reuse</p> <p>Define stormwater quality management objectives in relation to the sustainability of the receiving environment</p> <p>Recognise the need for site specific solutions and implement appropriate non-structural and structural solutions</p> <p>Integrate Stormwater Treatment into the landscape</p> <p>Add value while minimising development costs</p>	
Category	Key Management Features
Water Sustainability To maximise the reuse of stormwater and minimise use of potable water particularly for non-drinking water purposes.	The existing licence to take water from the artesian aquifer is the main source of potable water. The superficial aquifer is the secondary water supply for the Site. Households will adhere to waterwise home guidelines. Local, native waterwise plants will be used in landscaping.
Stormwater To maintain the total water cycle balance within development areas relative to the pre-development conditions. To protect the built environment from flooding.	Existing catchment will be maintained. Frequent events (≤ 1 yr ARI) will be infiltrated through soakwells on lots, road drains and the bio-retention basin within the POS Major events (up to 100yr ARI) will be retained and infiltrated within the POS (Lot 2).
Groundwater To maintain the total water cycle balance within development areas relative to the pre-development conditions. To protect the built environment from water-logging.	No direct measures, subsoil drainage or lowering of groundwater are proposed for managing groundwater across the Site. Imported granular fill must comply with the material requirements as stated in AS3798. Final lot levels and clearance to groundwater will be provided in the UWMP following refinement of any earthwork design.
Water Quality To maintain or improve the surface water and groundwater quality within development areas relative to pre-development conditions.	A treatment train approach to water quality improvement is adopted. Frequent events will be infiltrated close to source by soakwells, drains and bio-retention area. Further measures will be outlined in the UWMP.
Protection of Receiving Environments To retain natural drainage systems and protect ecosystem health.	The treatment train approach (above) will provide water quality improvement measures and protection to receiving environments.
Public Health and Risk To minimise the public risk, including risk of injury or loss of life to the community.	The habitable floor level will be >0.5 m above the 100yr ARI flood level and >1.2 m the maximum groundwater level to prevent water logging. Stormwater will be infiltrated within 96hrs to prevent standing water and mosquito breeding.
Social Values To ensure that social aesthetic and cultural values are recognised and maintained when managing stormwater.	Stormwater structures will be integrated into the POS Design. Remnant vegetation will be retained (where possible).
Further Planning To ensure delivery of best practice stormwater management through planning.	The UWMP will document the final stormwater management strategy incorporating any additional engineering, planning and landscaping requirements.
Implementation/ Construction To ensure delivery of best practice stormwater management through high quality developed areas in accordance with sustainability and precautionary principles.	Direct impacts from construction activities, such as dust, erosion and waste disposal will be managed through appropriate site practices. Where possible, the timing of construction works be undertaken to minimise impacts on the water cycle.
Post-Development To implement stormwater systems that are economically viable in the long term.	No post-development groundwater water quantity or quality monitoring program is considered across the Site.

8 Limitations

This report is produced strictly in accordance with the scope of services set out in the contract or otherwise agreed in accordance with the contract. 360 Environmental makes no representations or warranties in relation to the nature and quality of soil and water other than the visual observation and analytical data in this report.

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Aspects of this report, including the opinions, conclusions and recommendations it contains, are based on the results of the investigation, sampling and testing set out in the contract and otherwise in accordance with normal practices and standards. The investigation, sampling and testing are designed to produce results that represent a reasonable interpretation of the general conditions of the site that is the subject of this report. However, due to the characteristics of the site, including natural variations in site conditions, the results of the investigation, sampling and testing may not accurately represent the actual state of the whole site at all points.

It is important to recognise that site conditions, including the extent and concentration of contaminants, can change with time. This is particularly relevant if this report, including the data, opinions, conclusions and recommendations it contains, are to be used a considerable time after it was prepared. In these circumstances, further investigation of the site may be necessary.

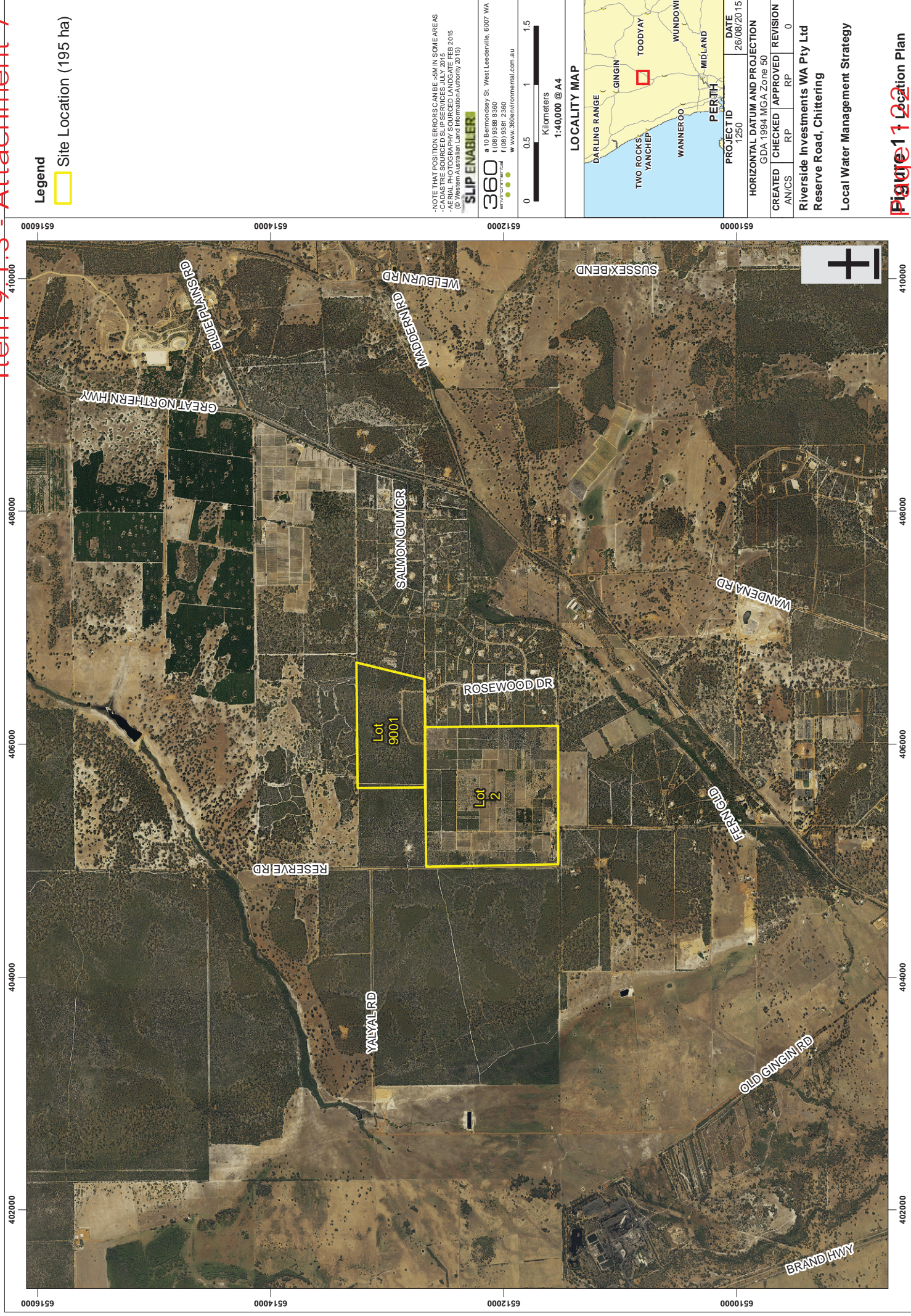
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FIGURES



Legend

 Site Location (195 ha)

-NOTE THAT POSITION ERRORS CAN BE <MIN SOME AREAS
-CADASTRE SOURCED SLIP SERVICES JULY 2015
-AERIAL PHOTOGRAPHY SOURCED LANDGATE FEB 2015
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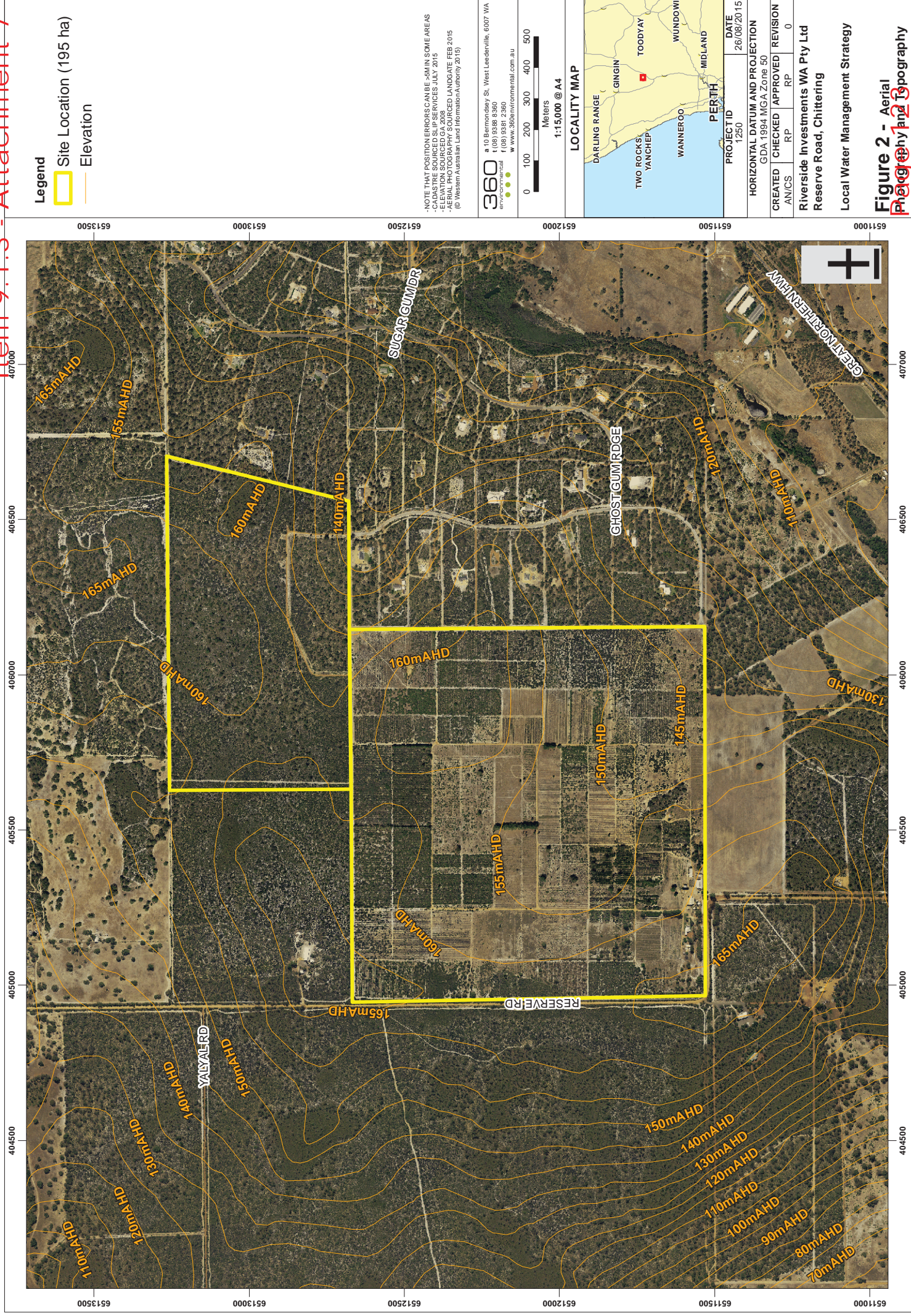
LOCALITY MAP



PROJECT ID	1250	DATE	26/08/2015
HORIZONTAL DATUM AND PROJECTION			
GDA 1994 MGA Zone 50			
CREATED	CHECKED	APPROVED	REVISION
AN/CS	RP	RP	0

Riverside Investments WA Pty Ltd
Reserve Road, Chittering
Local Water Management Strategy

Figure 1.2 Location Plan

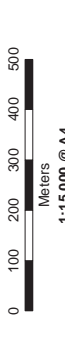


Legend

- Site Location (195 ha)
- Elevation

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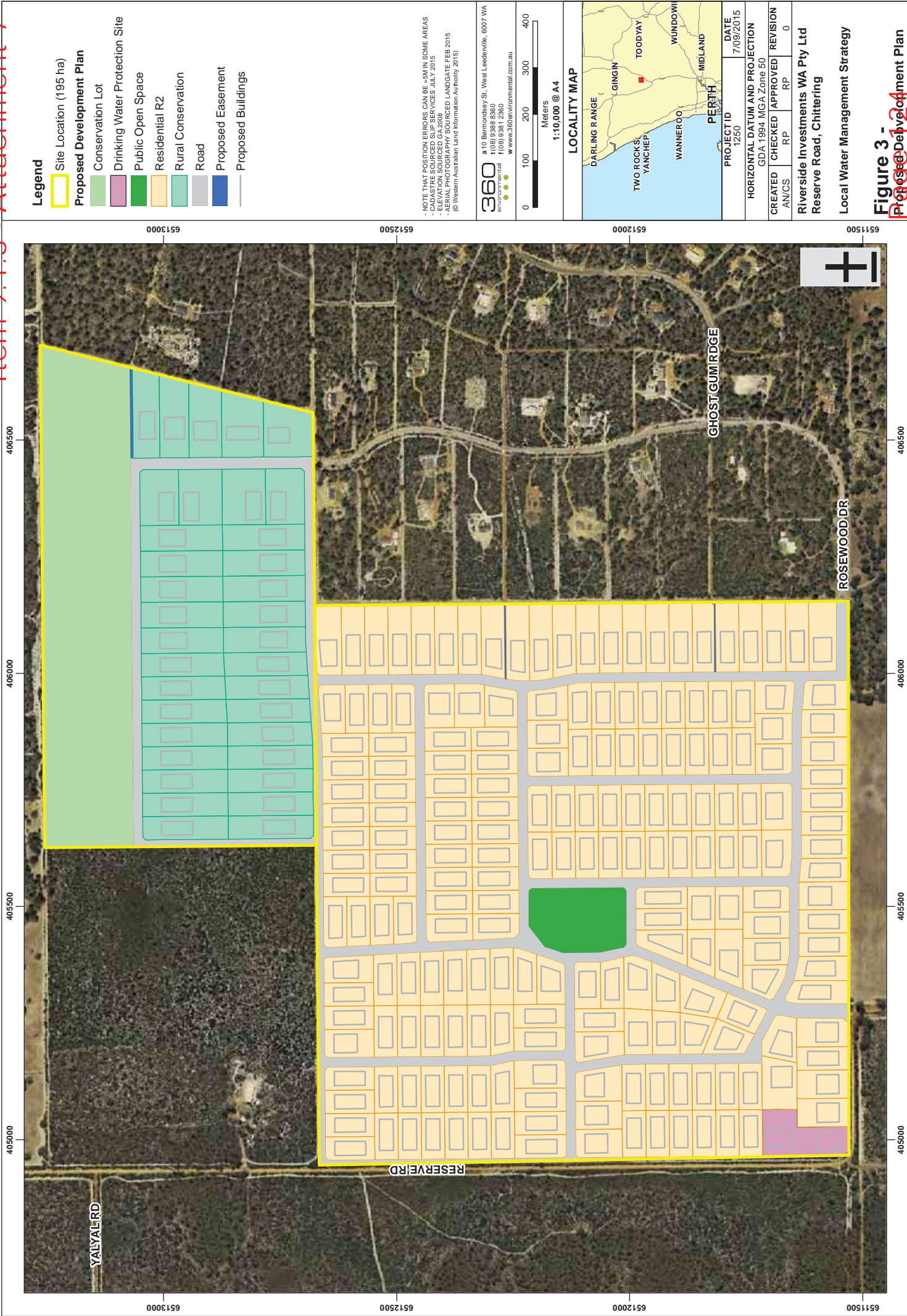
LOCALITY MAP

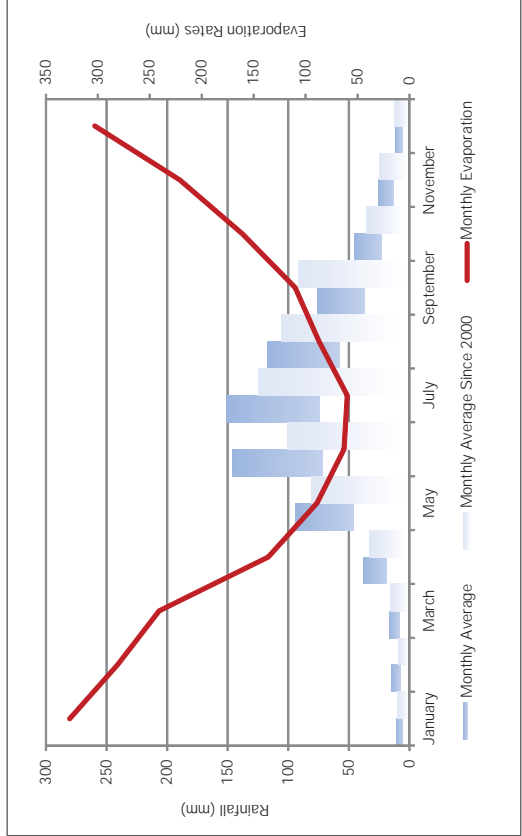
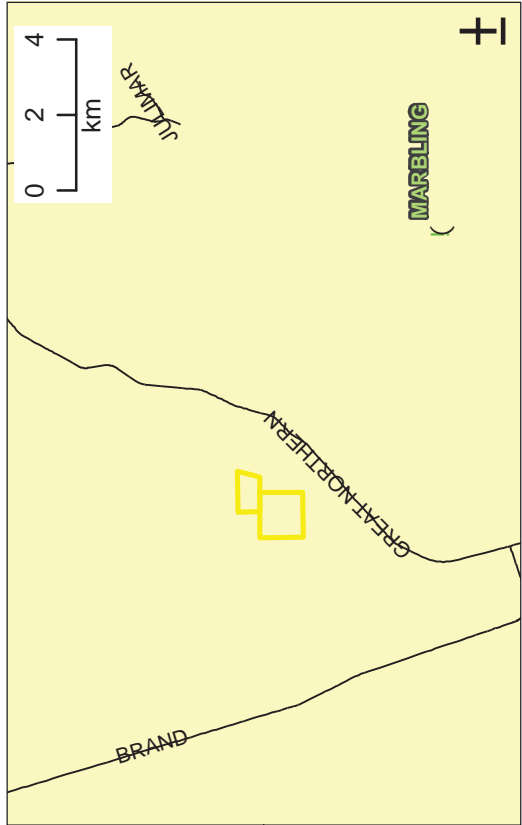
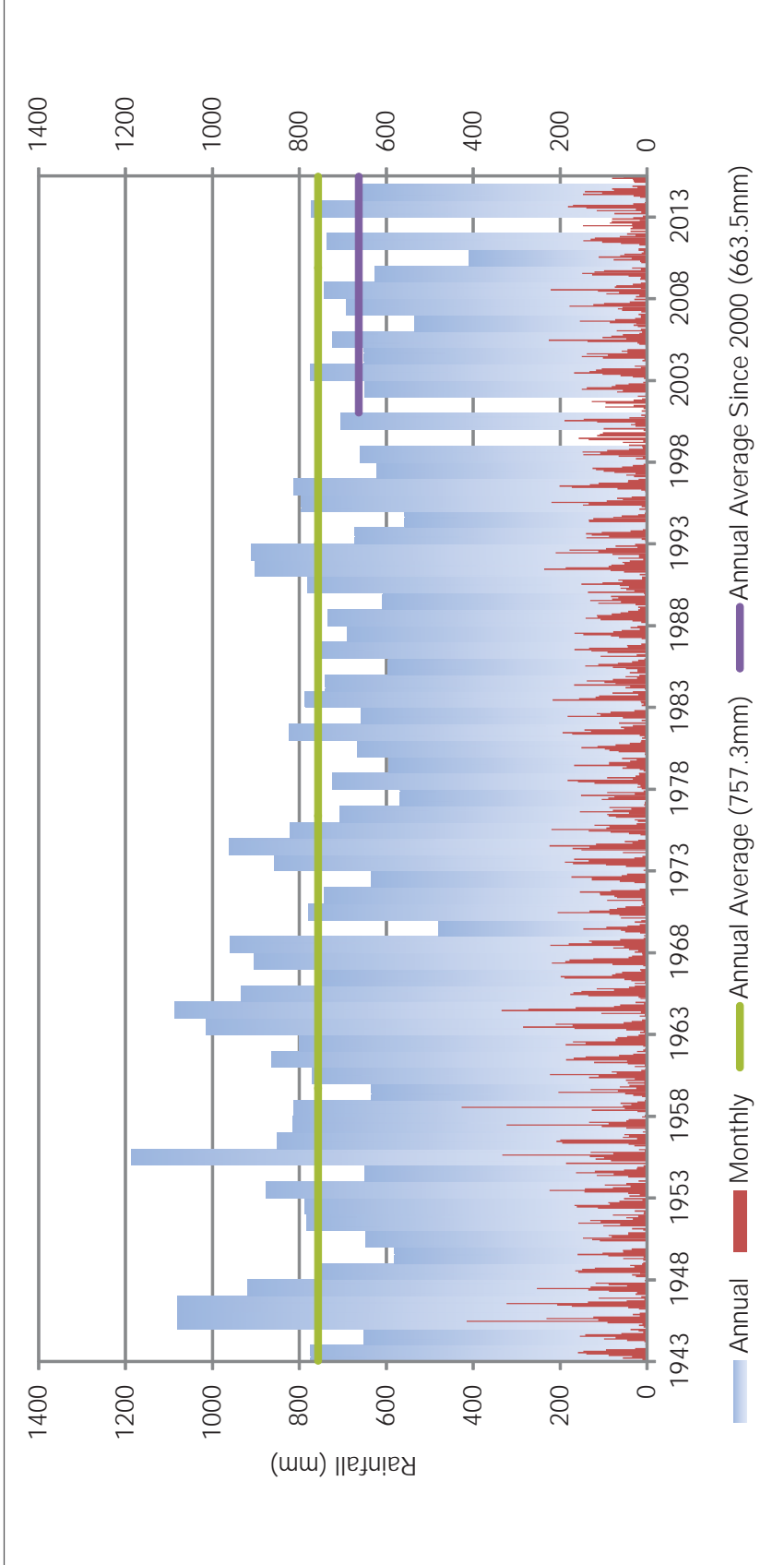


PROJECT ID	1250	DATE	26/08/2015
HORIZONTAL DATUM AND PROJECTION			
GDA 1994 MGA Zone 50			
CREATED	CHECKED	APPROVED	REVISION
AN/CS	RP	RP	0

Riverside Investments WA Pty Ltd
Reserve Road, Chittering
Local Water Management Strategy

Figure 2 - Aerial
Photography and Topography





Legend

- Site Location (195 ha)
- Weather Stations

NOTE THAT POSITION ERRORS CAN BE $\pm 5m$ IN SOME AREAS
- LOCALITY MAP SOURCED FROM LANDGATE 2008
- STREET DIRECTORY MAP SOURCED FROM STREETSMART 2008
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2012
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LOCALITY MAP

GINGIN
EAST BULLSBROOK

PROJECT ID 1250
DATE 27/08/2015
HORIZONTAL DATUM AND PROJECTION GDA 1994 MGA Zone 50
CREATED CS
CHECKED RP
APPROVED TS
REVISION 0

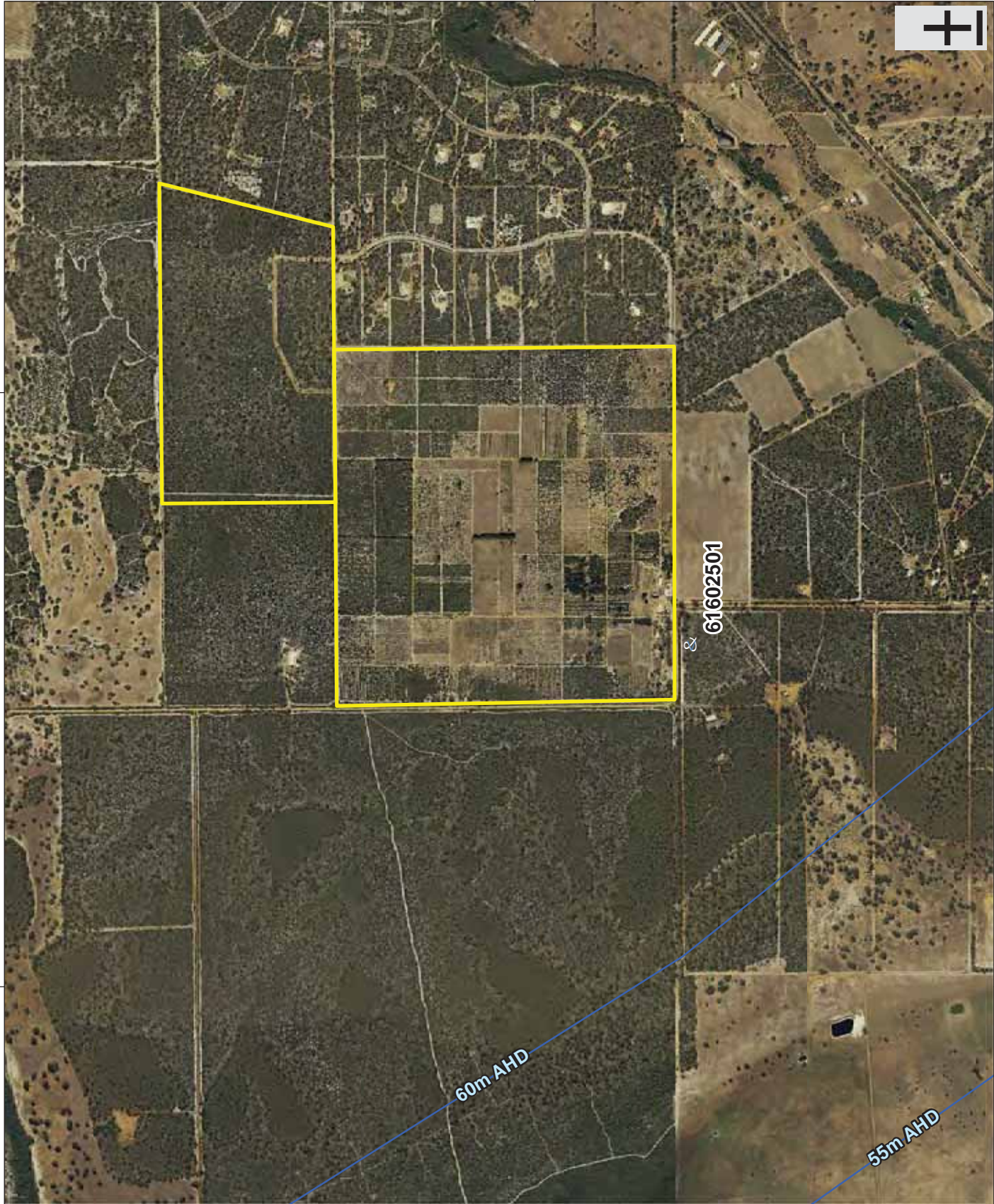
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Local Water Management Strategy

Figure 4 -
Rainfall and Evaporation Data



406000

404000



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Legend

- Site Location (195 ha)
- Groundwater Contour (Min)
- Site Type**
- Groundwater WIN Bore

NOTE:

The Groundwater contours shown in the map are the north eastern boundary of the groundwater mapping.

NOTE THAT POSITION ERRORS CAN BE -5M IN SOME AREAS
- CADASTRE SOURCED SUP SERVICES JULY 2015
- ELEVATION SOURCED GA 2008
- AERIAL PHOTOGRAPHY SOURCED LANDGATE FEB 2015
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LOCALITY MAP



PROJECT ID
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DATE
28/08/2015

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

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RP

REVISION
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Reserve Road, Chittering

Local Water Management Strategy

**Figure 6 -
Groundwater Levels**



-NOTE THAT POSITION ERRORS CAN BE \pm MM IN SOME AREAS
-AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE
VARIOUS YEARS
(C) Western Australian Land Information Authority 2015)

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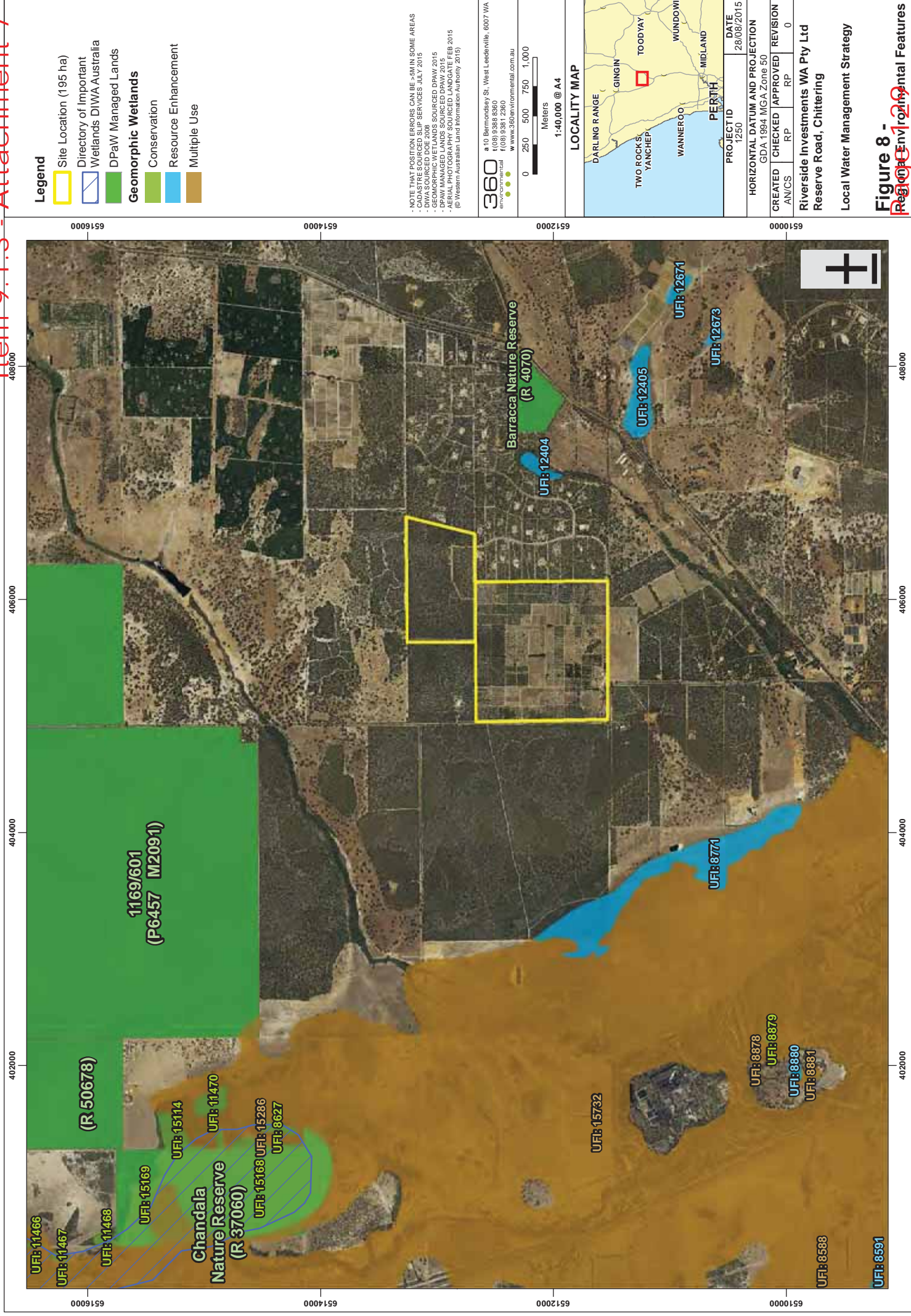
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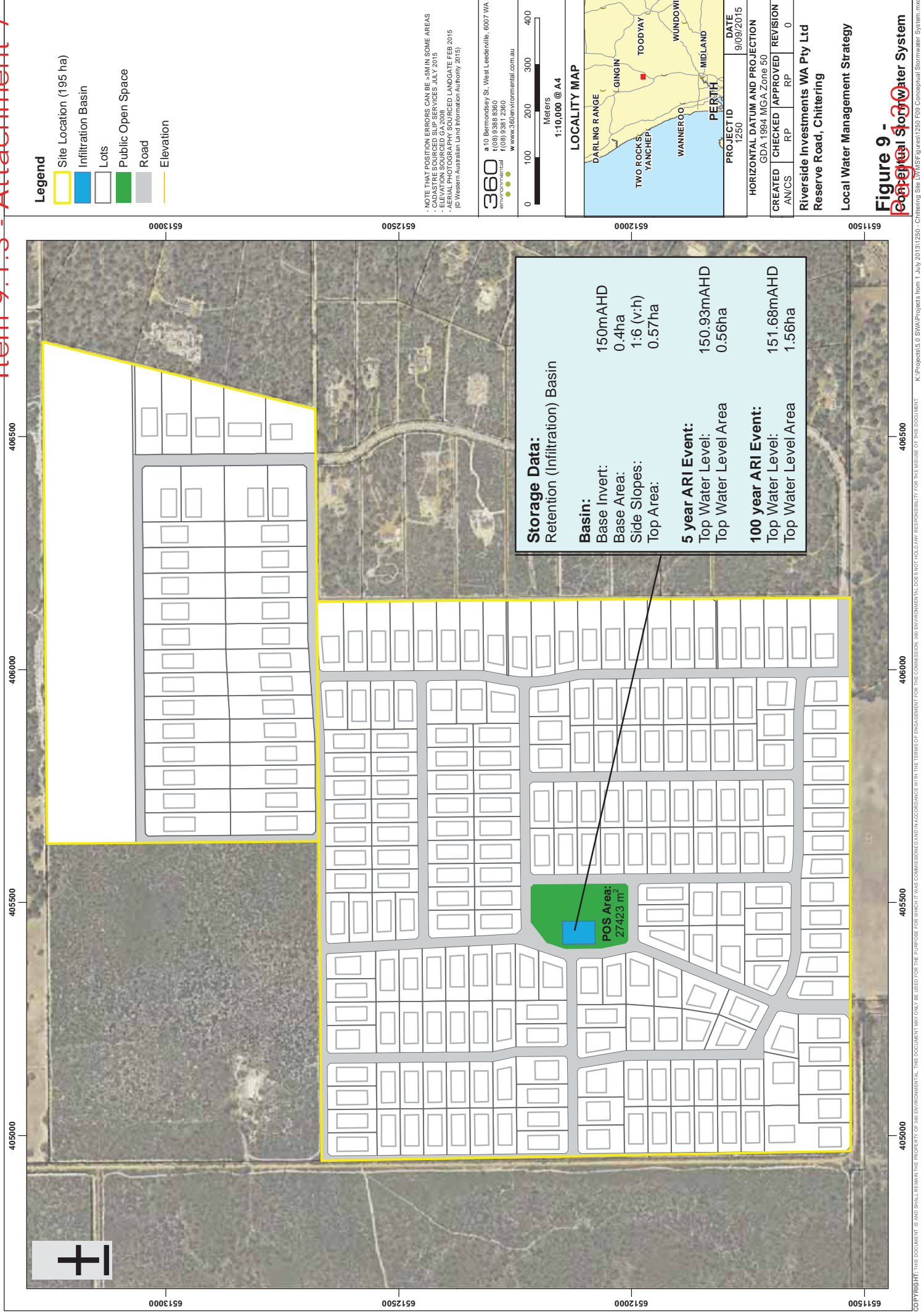
LOCALITY MAP



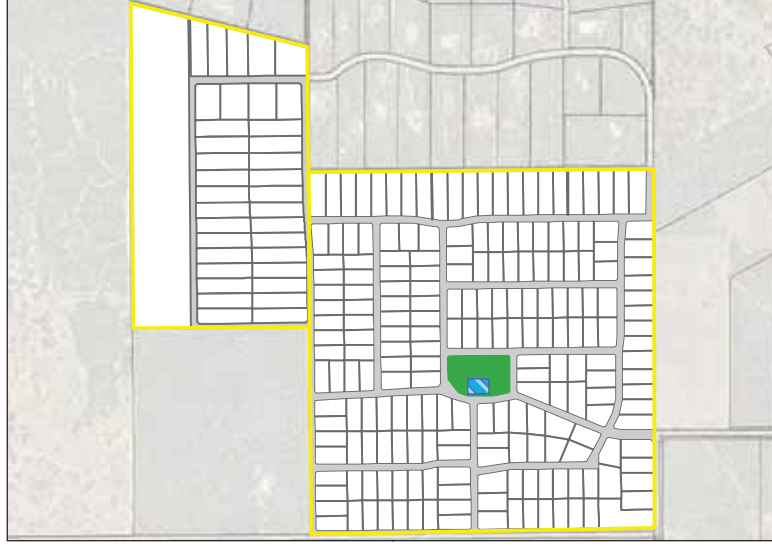
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HORIZONTAL DATUM AND PROJECTION			
GDA 1994 MGA Zone 50			
CREATED	CHECKED	APPROVED	REVISION
CS	AN	AN/RP	0

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Reserve Road, Chittering
Local Water Management Strategy





100 Year ARI Event Plan



- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- CADASTRE SOURCED SLIP SERVICES JULY 2015
- ELEVATION SOURCED GA 2008
- AERIAL PHOTOGRAPHY SOURCED LANDGATE FEB 2015

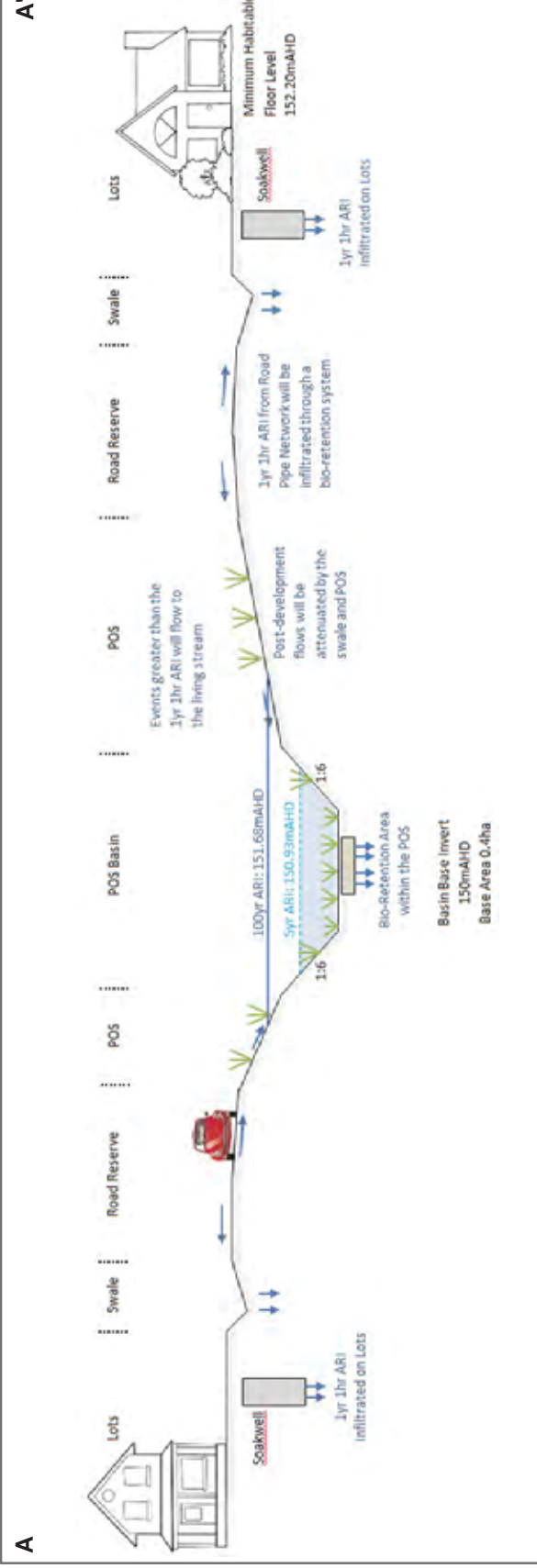
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PROJECT ID	DATE
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HORIZONTAL DATUM AND PROJECTION	
GDA 1994 MGA Zone 50	
CREATED	REVISION
AN/CS	RP
CHECKED	APPROVED
RP	RP
	0

Riverside Investments WA Pty Ltd
Reserve Road, Chittering

Local Water Management Strategy

Figure 10 -



APPENDIX A

Urban Water Management Plan Checklist
Better Urban Water Management (WAPC, 2008)

Local Water Management Strategy Item	Required Deliverable	Deliverable		Comment
		LWMS Reference	Comment	
Executive Summary				
Summary of the development design strategy, outlining how the design objectives are proposed to be met	Table 1 : Design elements and requirements for BMP's and critical control points	Executive Summary	The executive summary is a table of the key points of the proposed Local Water Management Strategy	<input checked="" type="checkbox"/>
Introduction				
Total water cycle management – principles & objectives Planning background Previous Studies		Section 1.1, 1.2 and Table 1	A summary of the guiding documents and design principles are outlined. Specific objectives for the site are summarised in Table 1.	<input checked="" type="checkbox"/>
Proposed Development				
Structure plan, zoning and land use. Key landscape features Previous land Use	Site context plan Structure Plan	Section 2, App B, Figure 3, Figure 7	The proposed LSP is provided in Appendix C with lot, road and POS layouts shown in Figure 3. Historical aerial photos are presented in Figure 7.	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
Landscape- proposed POS areas, POS credits, water source, bore(s),	Landscape Plan	Section 2, Section 4, App B,	POS areas are described in Section 2 and App B, and	<input checked="" type="checkbox"/>

lake details (if applicable), irrigation areas.				water saving measures in Section 4.		
Design Criteria						
Agreed design objectives and source of objective		Section 1, Table 1		Site specific design objectives and criteria are summarised in Table 1.	<input checked="" type="checkbox"/>	
Pre-development environment						
Existing information and more detailed assessments (monitoring). How do the site characteristics affect the design?		Section 3, Table 5		This is presented in Section 3, and key site considerations are summarised in Table 5	<input checked="" type="checkbox"/>	
Site conditions – existing topography. Contours, aerial photo underlay, major physical features	Site condition plan	Section 3.2, Section 3.8.1, Figure 2		A pre-development aerial photo is shown in Figure 2. Existing land use is discussed in Section 3.8.1.	<input checked="" type="checkbox"/>	
Geotechnical – topography, soils including acid sulphate soils and infiltration capacity, test pit locations	Geotechnical Plan	Section 3.4, Section 3.8.5, Figure 5		The geotechnical investigation is summarised in Section 3.4. ASS is discussed in Section 3.8.5.	<input checked="" type="checkbox"/>	
Environmental – areas of significant flora and fauna, wetlands and buffers, waterways and buffers, contaminated sites	Environmental Plan plus supporting data where appropriate	Section 3.8, Figure 8		Figure 8 demonstrates the wetland locations. Other environmental factors are discussed in Section 3.8	<input checked="" type="checkbox"/>	
Surface Water – topography, 100 year floodway and flood fringe areas, water quality of flows entering and leaving (if applicable)	Surface Water Plan	Section 3.6		Section 3.6 described the surface water features.	<input checked="" type="checkbox"/>	

Groundwater – topography, pre development groundwater levels and water quality, test bore locations	Groundwater Plan plus details of groundwater monitoring and testing	Section 3.5, Figure 6	Groundwater monitoring results are discussed in Section 3.5. Water levels are presented in Figure 6.	<input checked="" type="checkbox"/>	
Water use sustainability initiatives					
Water efficiency measures – private and public open spaces including method of enforcement		Section 4.2	Section 4.2 outlines water conservation measures.	<input checked="" type="checkbox"/>	
Water supply (fit-for-purpose strategy), agreed actions and implementation. If non-potable supply, support with water balance		Section 4.1	Water supply options are discussed in Section 4.1.	<input checked="" type="checkbox"/>	
Wastewater management		Section 4.3	Section 4.3 provides the wastewater management strategy.	<input checked="" type="checkbox"/>	
Stormwater management strategy					
Flood protection – peak flow rates, volumes and top water levels at control points, 100 year flow paths and 100 year detentions storage areas	100 year event Plan Long section of critical points	Section 5.1, Section 5.2.2, Figure 9, Figure 10, Table 7, Table 8	The management strategies for the 100yr ARI event are discussed in Section 5.2.2. Table 7, Table 8, Figures 9 and Figures 10 provide the control points and levels.	<input checked="" type="checkbox"/>	
Manage serviceability – storage and retention for the critical 5 year ARI storm events Minor roads should be passable in the 5 year ARI event	5yr event Plan	Section 5.1, Section 5.2.2, Figure 9, Figure 10, Table 8	The 5yr event plan is provided in Figure 10. Table 8 outlines volumes and levels. Section 5.2.2 discusses serviceability.	<input checked="" type="checkbox"/>	

Protect ecology – detention areas for the 1 yr ARI event, areas for water quality treatment and types of (including indicative locations for) agreed structural and non-structural best management practices and treatment trains. Protection of waterways, wetlands (and their buffers), remnant vegetation and ecological linkages	1yr event Plan Typical cross sections	Section 5.1, Section 5.2.1, Section 5.4, Figure 9, Figure 10	Section 5.1 and 5.2.1 outline the stormwater management strategy for the 1yr ARI event. Measures to protect receiving environments are discussed in Section 5.4.	<input checked="" type="checkbox"/>	
Groundwater management strategy					
Post development groundwater levels, fill requirements (including existing and likely final surface levels), outlet controls, and subsoils areas/exclusion zones	Groundwater/subsoil Plan	Section 5.3	Section 5.3 provides the management plans for groundwater.	<input checked="" type="checkbox"/>	
Actions to address acid sulphate soils or contamination		Section 5.3,	The measures to mitigate ASS risk are provided in Section 5.3	<input checked="" type="checkbox"/>	
The next stage – subdivision and urban water management plans					
Content and coverage of future urban water management plans to be completed at subdivision. Include areas where further investigations are required prior to detailed design		Section 6.1	The requirements for the UWMP are outlined in Section 6.1.	<input checked="" type="checkbox"/>	
Monitoring					
Recommended future monitoring plan including timing, frequency, locations and parameters, together with		Section 6.3.2	post-development monitoring is discussed in Section 6.3.2.	<input checked="" type="checkbox"/>	

arrangements for ongoing actions					
Implementation					
Developer Commitments		Section 6	The developer's commitments through subsequent phases of development are discussed in Section 6.	<input checked="" type="checkbox"/>	
Roles, responsibilities, funding for implementation		Section 6.4, Table 9	Table 9 outlines the roles and responsibilities beyond the LWMS.	<input checked="" type="checkbox"/>	
Review		Section 7	Opportunities for review are discussed in Section 6.	<input checked="" type="checkbox"/>	

APPENDIX B

Lot 2 Reserve Road, Chittering and Surrounds Water
Management Strategy (VDM, 2008a)



LOT 2 RESERVE ROAD, CHITTERING AND SURROUNDS WATER MANAGEMENT STRATEGY

Date: 8th September 2008

Introduction

VDM Environmental have been commissioned by Riverside Investments (WA) No. 2 to undertake a water balance and conceptual water model for the proposed land development at Lot 2 Reserve Road, Chittering. The land development has an overall area of approximately 113 hectares, and is proposed to be subdivided into 110 1-hectare lots.

The site has two groundwater supplies; 288,800kl/annum supply from the Leederville-Parmelia aquifer and a 263,700kl/annum supply from the surficial aquifer. It is proposed that the Leederville-Parmelia aquifer be utilised as a domestic water supply for Lot 2 and surrounding development area.

Site Location

The site is located within the local government area of the Shire of Chittering, and is approximately 60 kilometres north of Perth along the Great Northern highway (refer Figure 1: Preliminary Draft Structure Plan). The site has been historically cleared for use as a wildflower farm.

Lot 2 has been used as a commercial wild flower farm with small pockets of original bushland still present. The southern-most portion adjacent to the subject site contains houses, stores, farming equipment and wild flowers.

Surrounding land uses include rural residential lots, rural retreat (native vegetation) and limited horticulture. The native vegetation of the subject site and surrounding area includes areas of dense scrub-heath and Banksia woodland, as well as scattered areas of coastal blackbutt. Plantation stands of Marri, Wandoo, and Red-gums are also evident.

Proposed development Summary

The proposed development is for approximately 100 lots, ranging in size between 500 square metres and 1 hectare. An area of approximately 2 hectares is set aside for Public Open Space. An area for a water supply system is located at the south-west corner of the subdivision.

Chittering Region

The Shire of Chittering is located on the northern boundary of the Perth Metropolitan Area and borders the City of Swan. The Northern and Eastern boundaries are shared with the Shires of Victoria Plains and Toodyay, respectively. To the southwest is the City of Wanneroo and northwest boundary borders the Shire of Gingin.



The shire covers an area of approximately 1,220m², and includes the townships of Bindoon, Muchea and Wannamal (Refer Figure 2: Local Planning Strategy).

Widespread urban land use expansion is limited, due to the Gngangara Mound, Air Force Based and Julimar State Forest located around the shire.

Population Projections

The region has an approximate population of 3,320 (Shire of Chittering website, 2006) with the majority of the population between ages 40 and 59 (www.homepriceguide.com.au). As at 2001, the shire had no formal industrial or light industrial area.

Population projects are speculative and depend upon various elements such as employment, availability of developed land, and essential services (i.e. water supply, power, and telecommunications). The Australian Bureau of Statistics estimated the population growth of Chittering as tabulated below (Table 1).

Table 1. Estimated and Projected Population

(source: Australian Bureau of Statistics & Department for Planning and Infrastructure 1999)

Year	Population No.	Change No.	Change %
1994	2289	-	-
1999	2594	305	13.3
2001 (Actual Data)	2755	161	3.1
2006	3500	745	5.4
2011	5000	1500	8.5
2016	8000	3000	12.5

Planning Information

The Shire of Chittering outlines a range of issues pertaining to regional growth in their local planning strategy (2001 to 2015). In respect to water supplies, the growth rate and future population of the shire is highly dependent on the local surface and groundwater supplies, quantity and quality. Pollution and unplanned use of these resources have the potential to limit its availability, thereby adversely impacting potential economic and population growth.

Currently, the whole of the shire forms part of the 'Swan River and Tributaries Catchment Surface Water Area' proclaimed under the Rights in Water and Irrigation Act (1914). This was gazetted on 3 October 1970.

The following points have been noted from the Shire of Chittering's Local Planning Strategy (2001 – 2015), with particular importance to the proposed development at Lot 2 Reserve Road:

- *Expanding Rural Residential developments in the Shire, more specifically the southern and eastern parts, place additional demands on the ground water for secondary domestic and fire fighting purposes. Existing and planned Rural Residential developments in the area could benefit from a planned/coordinated water supply system.*



- Similarly, the Shire's horticultural and agricultural industry could continue to expand, particularly in the Chittering Valley area, if a planned water supply system is introduced in the area.
- The council will encourage cooperation between relevant service agencies and private operators towards:
 - The development of policy and provision of infrastructure;
 - The utilisation of the available water resources in a sustainable manner; and
 - The distribution of potable and non-potable water supplies to the local community.
- The Water Corporation is proposing to provide a reticulated water scheme to all rural residential areas in the southern part of the shire.
- Any reticulation system for horticultural purposes should also utilise surface catchment and wherever possible 'grey water', to make use of this valuable and scarce resource.

Regional Aquifer Information

Based on geology and geomorphology, the Brockman River Catchment can be divided into four distinct ground water zones (WRC, SLUI2, 2002):

- West of the Darling Fault, the sediments of the Dandaragan Plateau form part of a regional aquifer.
- East of the Darling Fault the crystalline rocks of the Darling Plateau can be subdivided into two fractured-rock ground water zones. Fractured-rock aquifer Zone A is roughly coincidental with the Chittering Metamorphic Belt and the minor valley systems. East of this zone is fractured-rock aquifer Zone B, on the lateritic uplands.
- Traversing both the Dandaragan Plateau and Darling Plateau are alluvial and colluvial deposits that contain the surficial aquifers.

Local Aquifers:

The area is underlain by two aquifers (from surface):

- The Mirrabooka Aquifer (generally a confined or artesian aquifer) at the surface. At Lot 2 this aquifer is unconfined: *the surficial aquifer*.
- The Leederville Aquifer underlies the Mirrabooka Aquifer at depth and is confined or artesian: *the artesian aquifer*.

Both aquifers comprise sand and sandstone formations with the confining layers comprising inter-bedded shales and siltstones (discontinuous in some places) i.e. the Kardinya Shale separates the Mirrabooka Aquifer from the underlying confined Leederville Aquifer. The Mirrabooka aquifer receives recharge by direct precipitation (a gently undulating landscape blanketed by duricrusts and gravels on crests and grey



sands in broad shallow depressions) and consequently water quality is generally good. The Leederville Aquifer receives direct recharge elsewhere (where deep valleys incised to expose the aquifer enabling infiltration from stream flow; recharge estimated at 14,300m³/d, Bulletin 142) but locally recharge comprises leakage from the overlying Mirrabooka Aquifer.

The following information, gleaned from the Perth Groundwater Atlas (2nd Edition, 2004) and Bulletin 142 *Hydrogeology and Groundwater Resources of the Perth Region, WA* (Davidson, 1995), is pertinent to an assessment of the local aquifers pertaining to both water supplies and ground water quality.

- **Surficial:** Mirrabooka Aquifer, unconfined and multi-layered, between ground level (between 140 and 165mAHD) to 110 mbgl (30mAHD) below surface. Ground water contains excellent salinity, expressed in concentrations of Total Dissolved Solids (TDS), of 350mg/L (fresh). Depth to ground water level is unknown. Ground water is expected to drain in a south-easterly direction and then in a south-westerly direction towards the Swan River where it may discharge as stream base flow. The permeability, *k*, and transmissivity, *T* (the product of permeability and saturated aquifer thickness, *b*), of the aquifer is expected to be high.
- **Artesian:** Leederville Aquifer, confined and multi-layered, between 110 mbgl (30mAHD) and 420mbgl (-500mAHD). Ground water contains excellent salinity, expressed in concentrations of Total Dissolved Solids (TDS), of between 250mg/L and 350mg/L (fresh). Depth to ground water level in 1981 was 86.7mAHD (elevation of borehole and depth to ground water level are not recorded on DoE data files); currently the ground water level is at 53.8mAHD (surface elevation assumed at 165mAHD and ground water level 111.2mbgl). Ground water is expected to drain in a westerly direction towards the coast where it may discharge offshore into the ocean as base flow. The permeability, *k*, and transmissivity, *T* (the product of permeability and saturated aquifer thickness, *b*), of the aquifer is expected to be high. The aquifer is estimated to store 120 million m³ in total with elastic or confined storage of about 20 million m³.

Aquifer Vulnerability

The unconsolidated sandy aquifers are vulnerable to ground water contamination due their high permeability and poor attenuation characteristics. However, since the ground water level is deeper than 30m below surface and in the presence of thick shale units (>30m) having a low permeability, the area may be regarded as having a very low vulnerability to contamination from agricultural, industrial and urban activities.

The site is regarded as having a moderately high risk with regard to on-site effluent disposal (the risk of degradation of land can be overcome with careful planning however) and no risk with regard to salinity due to the large permeability of the sandy soils that facilitate rapid drainage.



Recharge

Infiltration of rainfall results in recharging of the ground water regime. All recharge contribute to aquifer throughflow (Bulletin 142). The area has a Mediterranean climate and receives some 800mm per annum (90% between April and October). Potential annual evaporation is 1,800mm (exceeded by rain between May and August). Recharge, as a percentage of the mean annual precipitation (MAP = 800mm), has been estimated (Bulletin 142) as:

- Between 7.3% and 8.5% to between 13% (tritium dating) and 22% (chloride balancing).
- Between 36% and 40% across areas with where market gardens exist.
- Between 15% and 20% net which equates to some 118mm/a or 161,259m³/a across Lot 2.

Groundwater License Information

At the time of purchase of Lot 2, the site had 2 groundwater licences; one licence for the Parmelia-Leederville, with a second licence for the Surficial aquifer. During the development process, it was found that no surficial bores were located on the subject site. The Department of Water has provided an Exploratory Licence (CAW No. 163070 (1)) for the surficial aquifer for 273,600 kl/annum. The site has a current groundwater licence for the Perth-Leederville-Parmelia aquifer for an annual volume of 288,800kl. This is documented in Table 2.

Table 2. Details of Water Licence

Licence No.	GWL 59907 (2)		
Licensee(s)	Riverside Investments (WA) Pty Ltd		
Description of Water Source	Gingin Perth-Leederville-Parmelia	Annual Water Entitlement	288800 kl
Location of Water Source	Lot 2 on Diagram 52612 – Volume/Folio 1481/704 – Lot 2 Reserve Road, Chittering		
Authorised Activities	Taking of Water for	Location of Activity Lot 2 on Diagram 52612 – Volume/Folio 1481/704 – Lot 2 Reserve Road, Chittering	
	Household Purposes		
	Irrigation of 0.1 hectares of lawns and gardens		
	Irrigation of 2 ha of pasture		
	Irrigation of 30.3 ha of native plants		
	Water use for ostriches		
Duration of License	From 25 March 2007 to 25 March 2017		

Ground Water Protection and Beneficial Use

Lot 2 Reserve Road is not located within the Swan Coastal Plain Underground Water Pollution Control Area (UWPCA) and Public Water Supply Area (PWSA) controlled by



the Department of Environment i.e. a Priority 3 public water supply ground water catchment area declared over land where water supply must co-exist with other land uses. Boreholes for domestic use and irrigation are subject to licensing.

Beneficial use of ground water in the area includes abstraction for domestic and agricultural (irrigation) water supplies from the superficial and confined aquifers.

There is one existing borehole (2004-0940) within a 1km radius from Lot 2 but several within a 2km radius from the site, particularly to the south and south-east. Most of these penetrate the superficial Mirrabooka Aquifer only.

Borehole Testing

Discharge testing (refer Appendix A: Borehole Test Data) of existing Borehole 20025333 (Leederville Artesian Aquifer) indicated that this borehole, in its current condition with the existing equipment, is capable of delivering **4.0 l/s for at least 12 hours per day**. It has been reported by K.S. Black (WA) Pty Ltd that the condition of both the borehole and equipment are unsatisfactory and that the borehole should be capable of yielding at least 11.0 l/s (estimate based on existing equipment and infrastructure). The volume of water that can be delivered by existing infrastructure is thus estimated at:

- Minimum (4.0L/s) 172.8kL/12hr-d i.e. 63,072kL/a or 22% of the licensed allocation of the artesian aquifer;
- Maximum (11.0L/s) 475.2kL/d i.e. 173,448kL/a or 60% of the licensed allocation of the artesian aquifer provided extensive replacement of existing equipment and rehabilitation of the borehole screen is undertaken.

To abstract the full licensed entitlements from both aquifers, boreholes capable of yielding:

- | | |
|---------------------------------|-----------------------|
| ▪ Mirrabooka Surficial Aquifer: | 17.4L/s for 12 hr-day |
| ▪ Leederville Artesian Aquifer: | 18.3L/s for 12 hr-day |
| | will be required. |

Expected Water Usage

Water usage values are based on the *Water Corporation's Alternative Supply Water Use Model (2007)* (refer Table 3).

Table 3. Demand Management Application
 (source: *Water Corporation's Alternative Supply Water Use Model, 2007*)

Household Use	Estimate	Units	Source	Water Use
Garden Irrigation*	0.002	kL/m ² /day	Water Corporation	Irrigation
Shower	0.050	kL/person/day	Diversity Australia	Drinking Water
Kitchen Sink	0.008	kL/person/day	Diversity Australia	Drinking Water
Bathroom Basin	0.006	kL/person/day	Diversity Australia	Drinking Water
Dishwasher	0.003	kL/person/day	Diversity Australia	Drinking Water
Bath	0.001	kL/person/day	Diversity Australia	Drinking Water
Laundry Trough	0.004	kL/person/day	Diversity Australia	Drinking Water
Leaks	0.029	kL/household/day	Diversity Australia	Drinking Water
Pool	0.020	kL/household/day	Diversity Australia	Drinking Water
Spa	0.002	kL/household/day	Diversity Australia	Drinking Water
Car Washing	0.002	kL/household/day	Diversity Australia	Drinking Water
Evaporative cooling	0.006	kL/household/day	Diversity Australia	Drinking Water
Other	0.004	kL/household/day	Diversity Australia	Drinking Water
Toilet	0.033	kL/person/day	Diversity Australia	Non-Drinking Water
Washing Machine	0.042	kL/person/day	Diversity Australia	Non-Drinking Water

*-based on 10mm x 9 applications x 8 months/365.25 days

Borehole Water Quality

Bacteriological testing by PathWest Laboratory WA indicated water from artesian Borehole 20025333 does not have total coliform, *Faecal* (Thermotolerant) Coliforms and/or *Escherichia coli* bacteria.

Hydrochemical analysis by SGS on samples of water was obtained at the start and close (after 9 hours) of the constant-rate discharge test (refer Appendix B).

The samples were free of sediment, turbidity, odour and colour.

From the borehole data it is evident that the artesian aquifer contains ground water of an excellent quality albeit slightly acidic. Future selections for equipment and fittings have to take due cognisance of the acidity of ground water and the concentrations of the metals iron and manganese. Most analytes are well below their respective drinking water quality criteria except for large concentrations of iron and manganese.

Table 4. Water Quality Information from bore 20025333

Item	Units	Sample 1	Sample 2	ADWG Guidelines	Notes
pH	pH units	7	6.8	6.5-8.5	
Conductivity @ 25oC	Us/cm2	560	550		
Total Dissolved Solids (calculated at NaCl)	mg/L	360	350	500	
Sodium, Na	mg/L	69	68	180	
Potassium, K	mg/L	7.6	7.6		
Calcium, Ca	mg/L	7.7	7.9		
Magnesium, Mg	mg/L	5.4	5.3		
Hardness (as CaCO3)	mg/L	41	42	200	
Iron, Fe (soluble)	mg/L	6	6.3	0.3	
Chloride, Cl	mg/L	120	120	250	
Bicarbonate, HCO3	mg/L	40	40		
Sulphate	mg/L	14	14	250	
Nitrate, NO3	mg/L	<0.2	<0.2		
Flouride, F	mg/L	0.3	0.3	1.5	
Free cyanide	mg/L	<0.01	<0.01	0.08	
Aluminium, Al	mg/L	0.1	0.1	0.2	
Arsenic, As	mg/L	<0.001	<0.001	0.007	
Manganese, Mn	mg/L	0.1	0.1	0.1	
Lead, Pb	mg/L	<0.005	<0.005	0.002	
Cadmium, Cd	mg/L	<0.001	<0.001	0.002	
Feacal Thermotolerant Coliforms	CFU/100ml	0	0	0	
Total Colifroms	CFU/100ml	0	0	0	

Water Supply Assessment

Western Australian Planning Commission (WAPC) Planning Advice 18195 dated 8 September 2005 provided the following planning advice pertaining to water supplies:

- The site is zoned Rural Residential under the Shire of Chittering Town Planning Scheme No. 6 with the northern portion (most, if not all, of the 101.66ha, Portion A, acquired by Riverside Investments WA Pty Ltd, RI) of Lot 2 incorporated in a vegetation protection area. Town Planning Scheme No. 6 specifies that:
A minimum lot size less than 40,000m² without a reticulated water supply is unlikely to be supported because of the requirements of the WAPC Statement of Planning Policy 2.5.
- Under the Rural Residential zoning, the following development requirements pertaining to water resources, apply:
 - Submission of a subdivision application including a development plan containing catchment management recommendations, the listing of any facilities that purchasers of the sub-divided land are required to provide e.g.



potable water supplies, waste disposal, etc., areas where septic tanks can be provided and location of any water courses.

- All residential buildings must include the provision for the storage of water in tanks not less than 120,000 litres in capacity. However, in consultation with the Shire of Chittering, a more desirable size of 50,000 litres has been proposed.
- The construction of dams or extraction of any surface water is not permitted without approval by the Waters and Rivers Commission.
- Appropriate effluent disposal is to be installed to the satisfaction of the Shire and Health Department.
- Clause 5.3.2 of the Statement of Planning Policy 2.5 states that residential lot sizes are to range from 10,000m² to 40,000m² depending on local conditions and the mandatory provision of reticulated potable water supply to an appropriate standard.

It seems thus that if a potable water supply is available (see Licences of Waters and Rivers Pertaining the assessment of reticulated water supplies to lots 10,000m² in size, the current criteria for regulated water supplies (in terms of the Operating Licence of the Water Corporation) are:

- Plan and design all long-term sources, treatment plants, disinfection systems and distribution/reticulation systems to deliver THM concentrations of less than 100 µg/L (Note: Australian Drinking Water Guideline is 250 µg/L)
- Plan and design systems to supply a maximum flow rate of 4kL/day to each property with a flow rate control device on each service connection to limit the maximum flow to 2.8L/min. Pressure (head) at the service connection should not be lower than 15m for 3 hrs/day and no lower than 2m at any time.
- All customers are to provide their own storage facility to store at least two peak days' water needs.
- Health related quality criteria are subject to negotiation between the Corporation, any land developer and the customer. No criteria are applicable to aesthetic quality. Only chemicals approved by the Department of Health may be added to drinking water. Only materials which comply with AS 4020 or which have been approved by the Department of Health may contact drinking water.



Proposed Water Management Strategy

The proposed development of Lot 2 Reserve Road in Chittering will require an adequate and reliable supply of potable water to the individual lots throughout the subdivision. To be taken into consideration is the water balance of the water usage as well the necessary treatment measures for the potable water and wastewater effluent.

Lot 2 has a total water entitlement (licences to abstract ground water) of 288,800kL/a, with an exploratory licence currently in place for an additional 273,600kl/annum. Two boreholes in the south-western corner of the property penetrate the Perth-Leederville-Parmelia aquifer. Surficial water from the development is recharged through ground infiltration of rainfall, which is captured within the encompassing Brockman Catchment area, a sub-catchment of the larger Avon River Catchment.

The proposed water supply for the development is as follows:

Water Source	Treatment / Storage / Conveyance	Proposed Use
<u>PRIMARY POTABLE SUPPLY</u> Artesian Aquifer (Perth-Leederville-Parmelia Aquifer)	Treatment for Iron and Manganese Disinfection through chlorine/UV Storage at centralised tank, with pressure package for distribution Conveyance through reticulated water supply	Internal drinking water supplies including: <ul style="list-style-type: none"> • Bathrooms • Kitchen • Fire Fighting
<u>SECONDARY POTABLE SUPPLY:</u> Surficial Aquifer (Mirrabooka)	Separate bores on each lot based on landscaping water requirements. Lots to be installed at householders cost. Caveat of title to ensure minimal landscaping outside house-pad area.	<ul style="list-style-type: none"> • Landscaping
<u>EFFLUENT DISPOSAL:</u> Effluent from households	Treatment through a HDWA approved aerobic treatment system Disposal to a sub-surface irrigation system for landscaping	<ul style="list-style-type: none"> • Landscaping uses
<u>RAINWATER:</u> Collection off roof areas	Storage at tanks located at each lot, preferably below ground or designed into house structure Potential to be integrated into secondary potable supply	Non-drinking sources, including: <ul style="list-style-type: none"> • Toilets • Washing Machine • Landscaping

Based on the proposed water usage above, and the allocation rates provided in Table 2, the following expected water usage rates are proposed (based on **2,790 persons per lot**, 2001 ABS Census):

Table 5. Annual Water Usage for Lot 2 Reserve Road, Chittering

	Option 1 – water usage with no demand management (no rainwater tanks)		Option 2 – water usage with demand management + rainwater tanks		Option 3 - Water usage no demand management ¹	
	Per person usage	Total Household Usage	Per person usage	Total Household Usage	Per person usage	Total Household Usage
	kL/person/annum	kL/household/annum	kL/person/annum	kL/household/annum	kL/person/annum	kL/household/annum
In-house – Primary Potable Supply	61.89	172.68	34.52	96.30	56.58	201.48
In-house – non-potable Supply	0	0	27.38	76.38	0	0
Expected Effluent Production (for landscaping)	54.16	151.11	54.16	151.11	56.58	190.90
Additional Water for Landscaping ²	259.82	724.89	259.82	724.89	38.33 ³	106.95

NOTES:

¹ – Based on values provided by the *Domestic Water Use Study In Perth, Western Australia (1998- 2001)*, Water Corporation

² - From groundwater bores in surficial aquifer. Bores will be installed by the householder dependent on expected water usage requirements. These values are based on a water utilisation in the house pad area only, with an impervious area of 40%.

³ – Value based on household average less cottage value of persons (2.79 persons per house).

It can be seen from the above that the water requirements are reasonable in comparison to the water availability. Effluent production was based on all in-house water usage passing through an effluent treatment facility. Additional water for landscaping was based on the expected landscaping water use rates from Table 3, less effluent production. Note that the values provided are worst-case situations (i.e. total irrigation of remaining lot area). Therefore, additional water for landscaping can be reduced (and in some cases removed) through suitable water-wise planting of landscaped areas.

Figure 3 illustrates a generalised schematic of the water supply and re-use models for individual lots within the proposed development.

Expected Total Lots

A preliminary estimate of the total number of lots from the water supply was estimated for the available water supply. These values are shown in Table 6 below.



Table 6. Expected total lots from Water supply at Lot 2 Reserve Road, Chittering

Water Supply Option	Water Usage Rate (kl/household/day)	Water Usage Rate (kl/household/year)	Number of lots serviced, Demand management No. Lots (No. Persons) ¹
Option 1 – water usage with no demand management (no rainwater tanks)	0.473	172.68	1,334 (3,722)
Option 2 – water usage with demand management + rainwater tanks	0.264	96.30	2,392 (6,675)
Option 3 - Water usage no demand management	0.552	201.48	1,144 (3,190)

¹ – at 1-hectare lots

Appendix C provides general layouts of the water service areas based on the three options provided in Table 6.

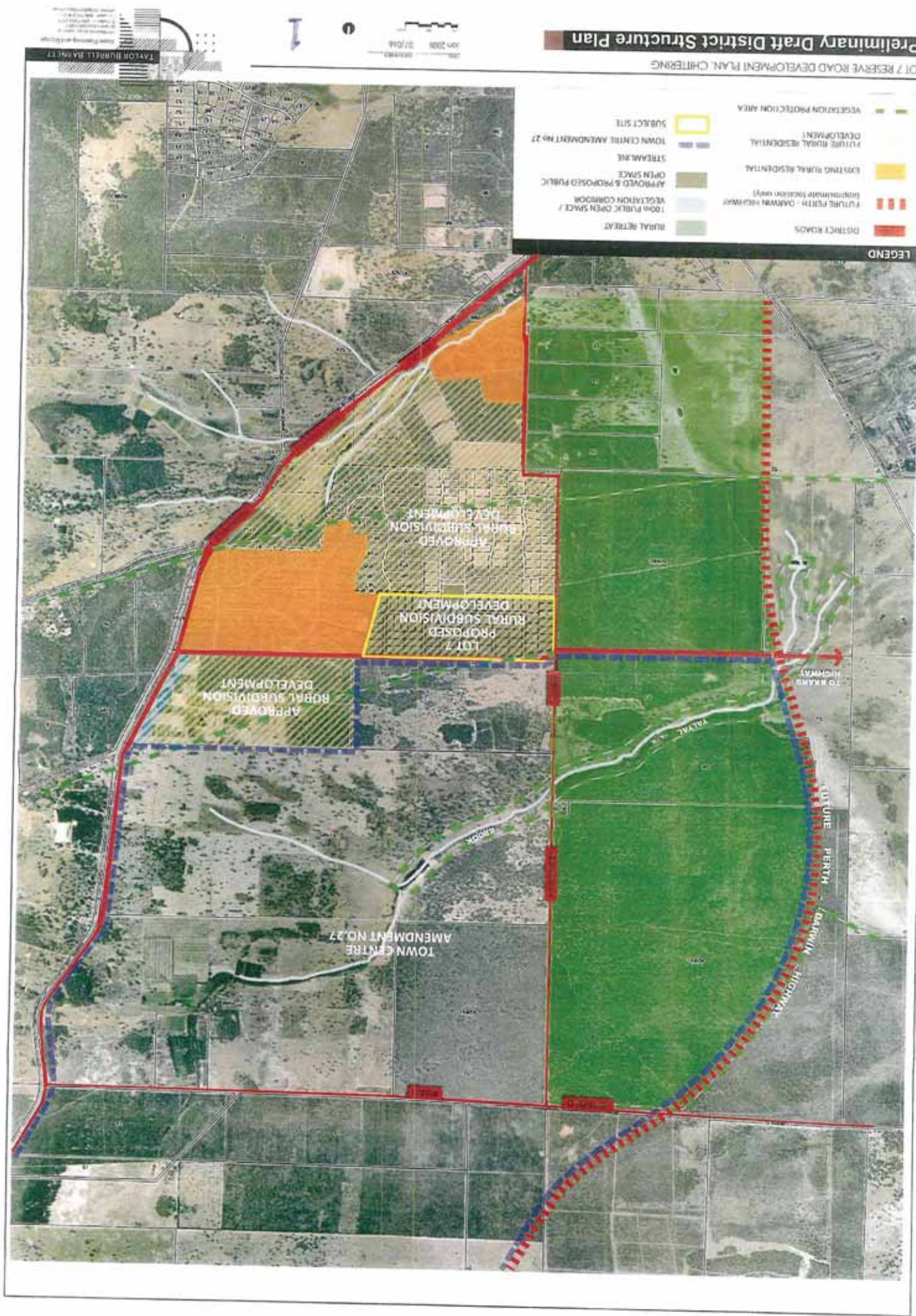
VDM ENVIRONMENTAL

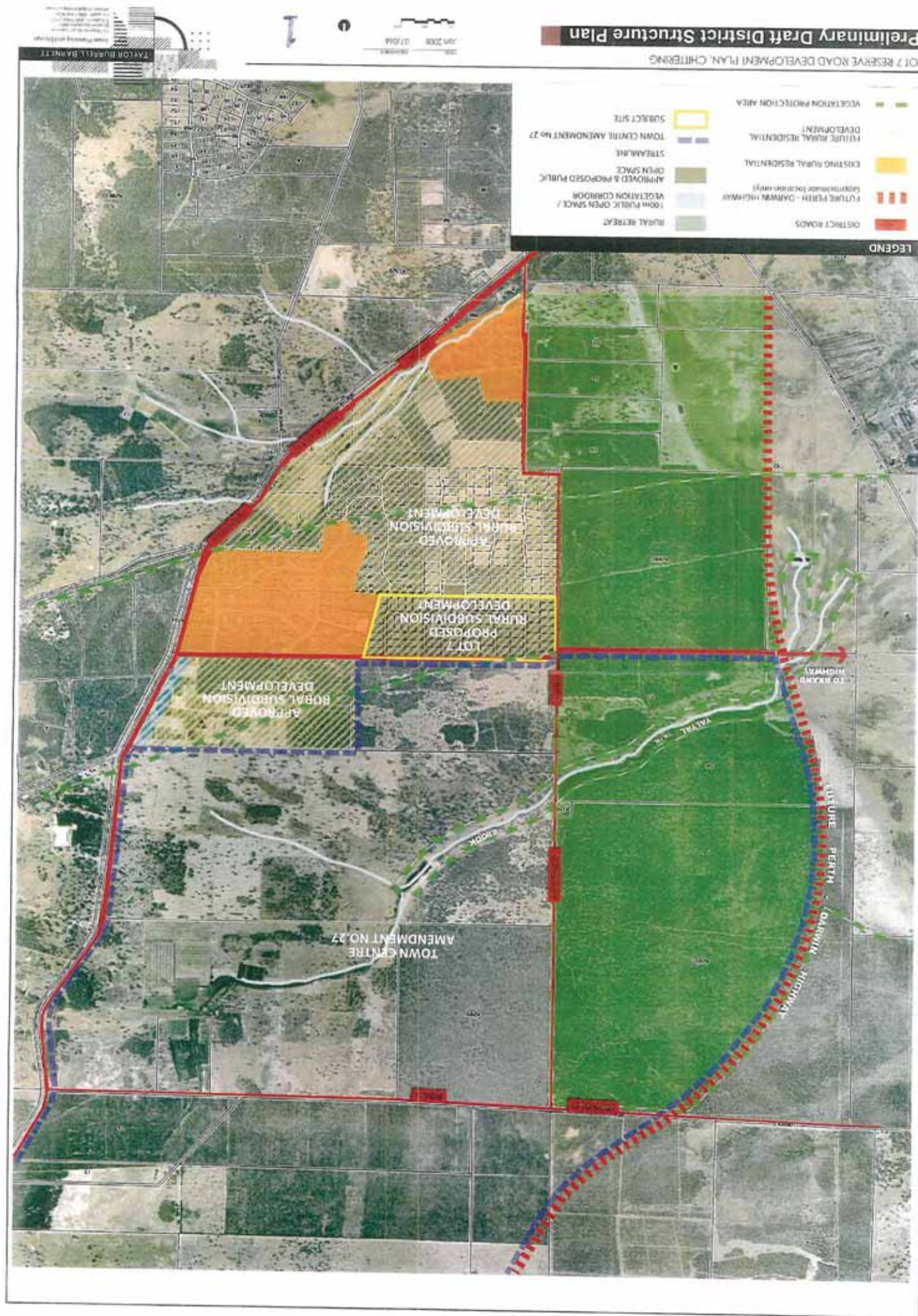
Rhys Houlihan
Senior Environmental Engineer

Cc: Andrew Van Der Meer, Riverside Investments (WA) No. 2 Pty Ltd
Enzo Biagioni-Froudast, Riverside Investments (WA) No. 2 Pty Ltd
Karen Wright, Taylor Burrell Barnett



FIGURES





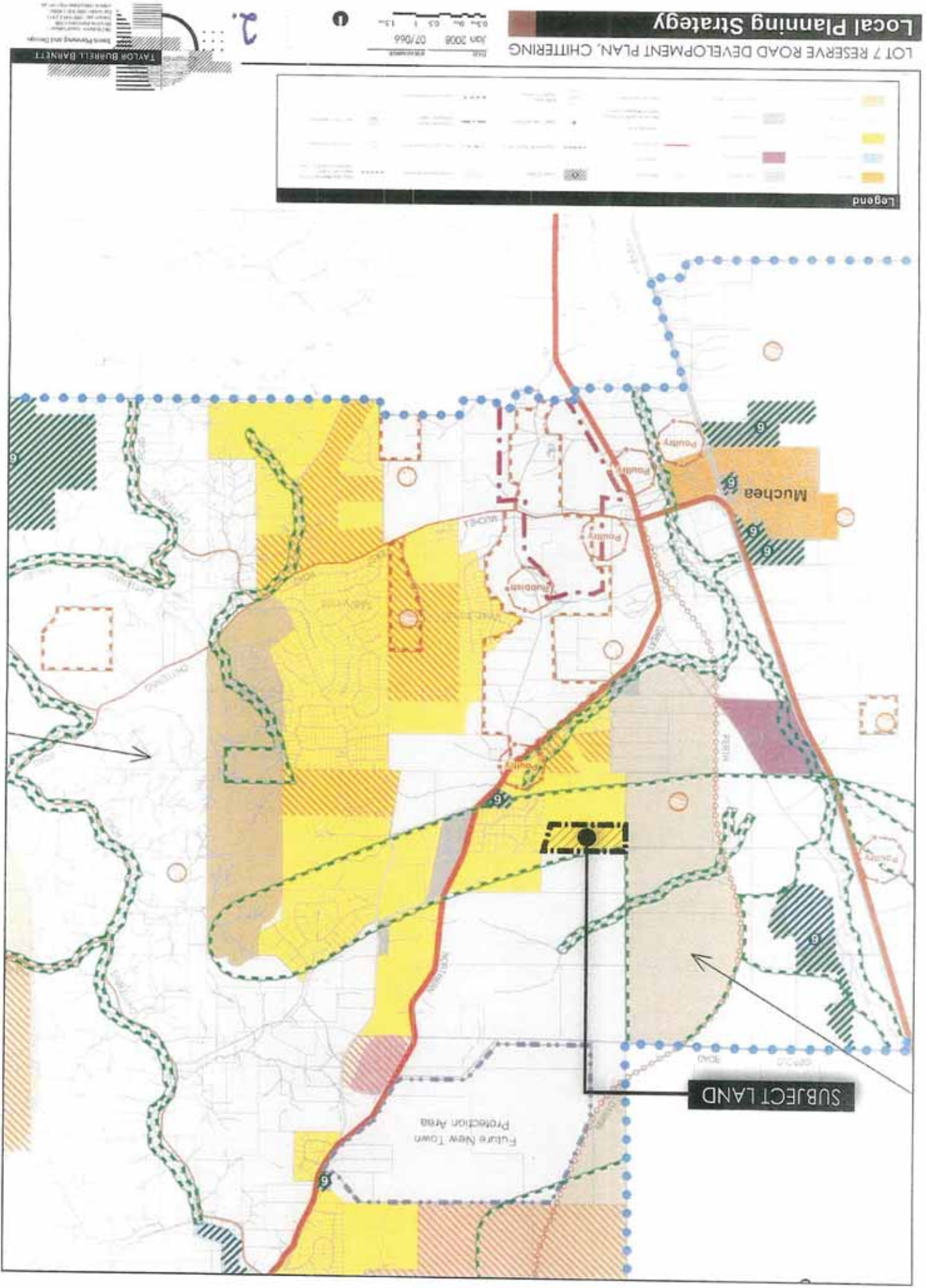
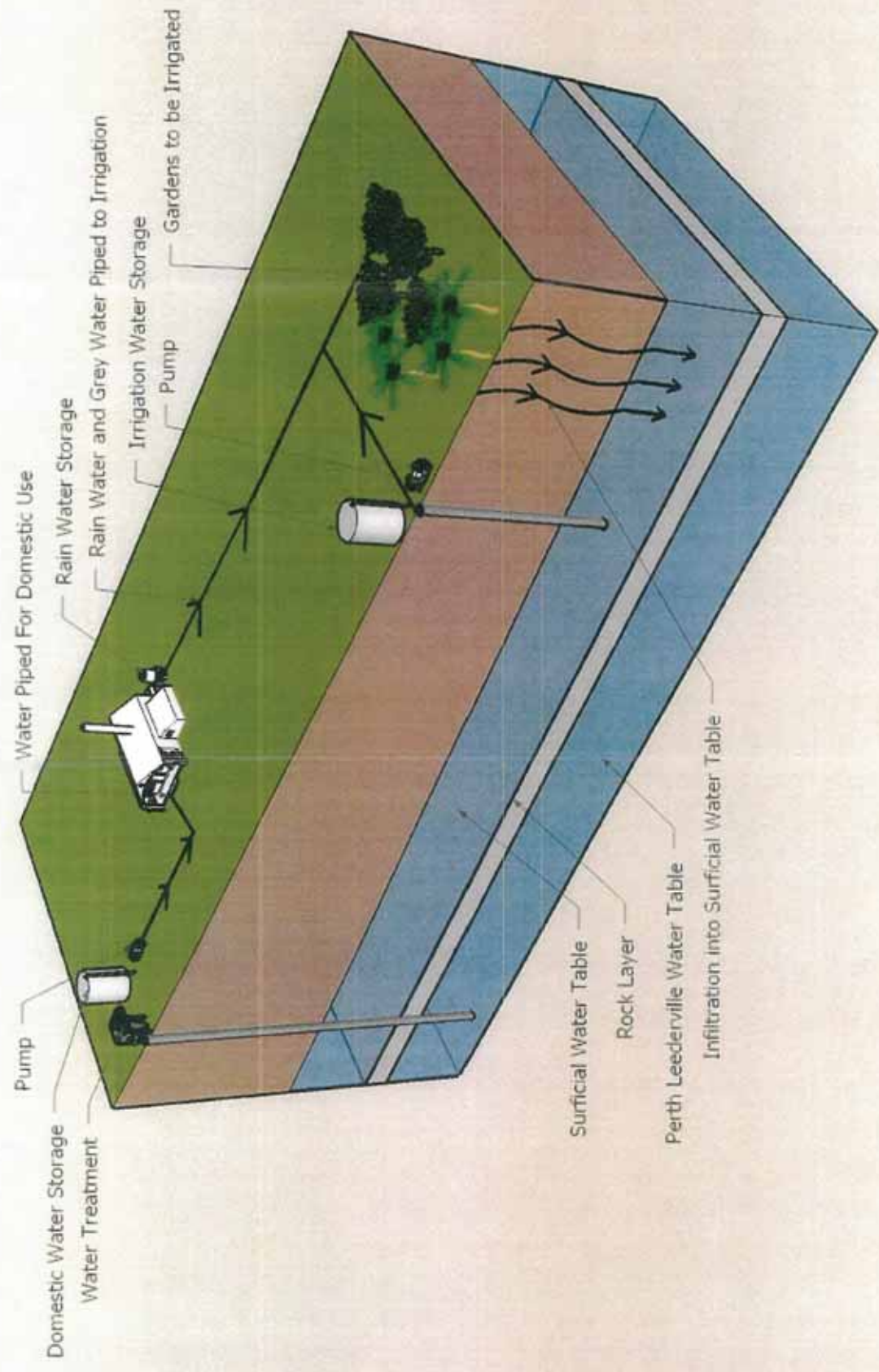
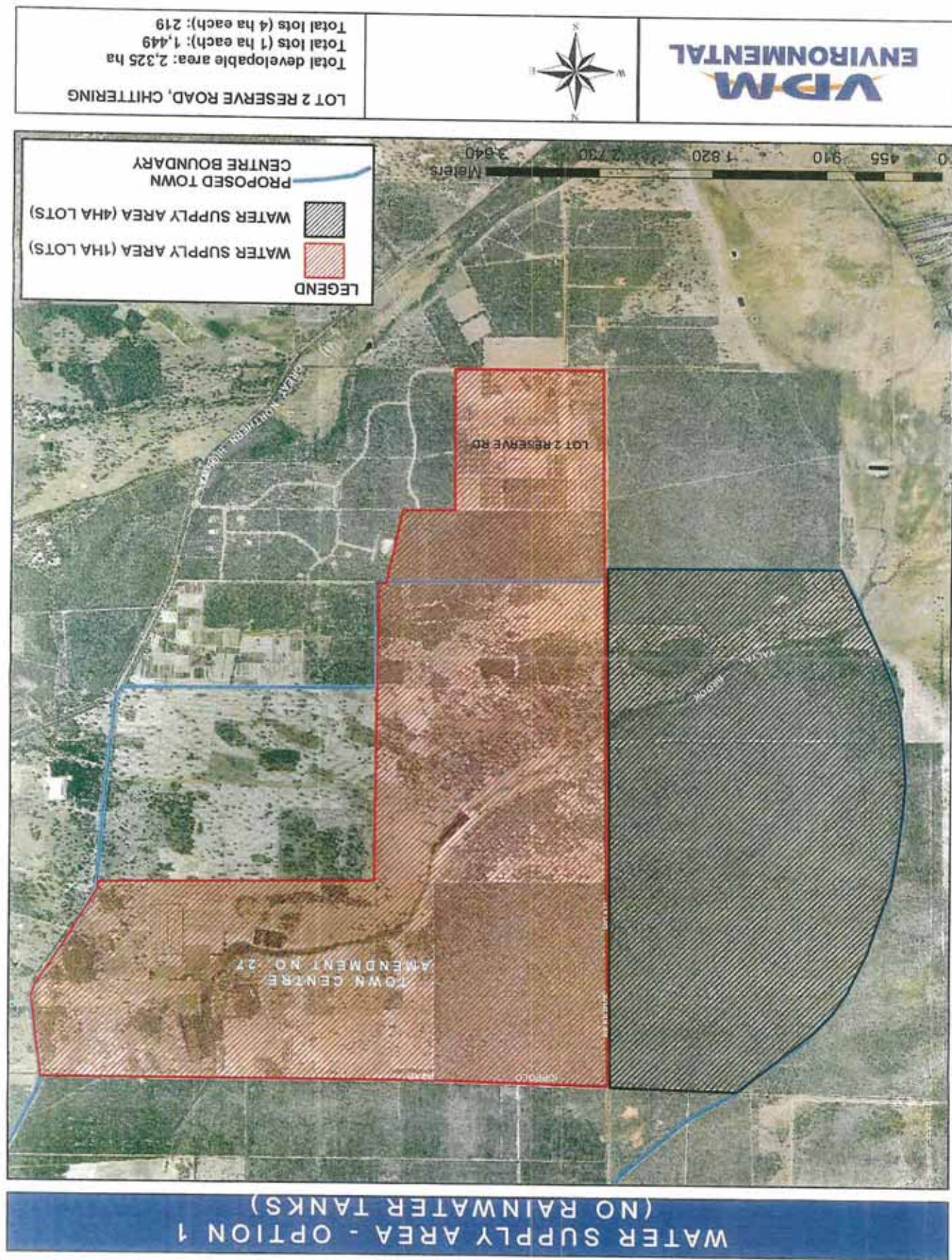
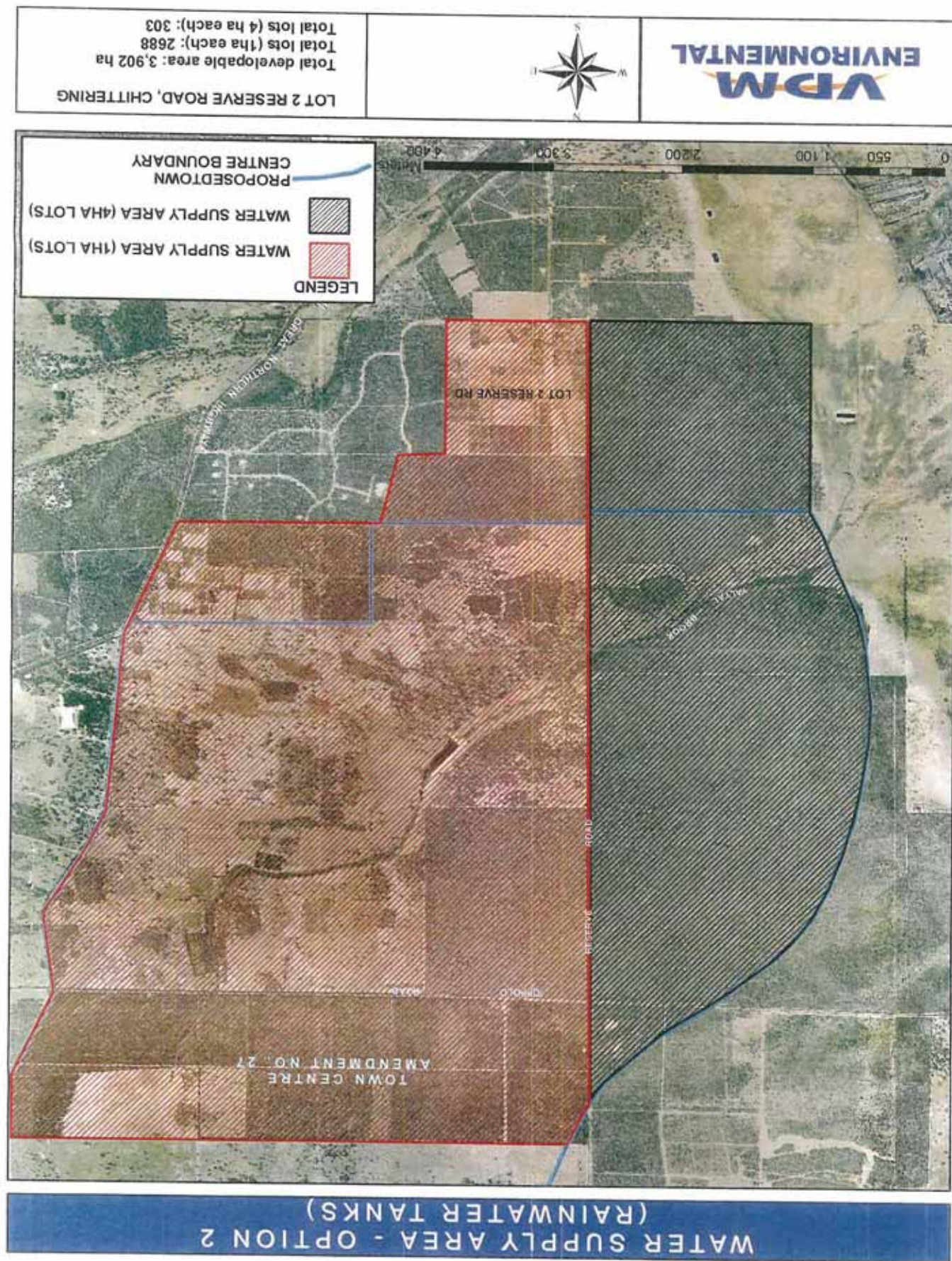
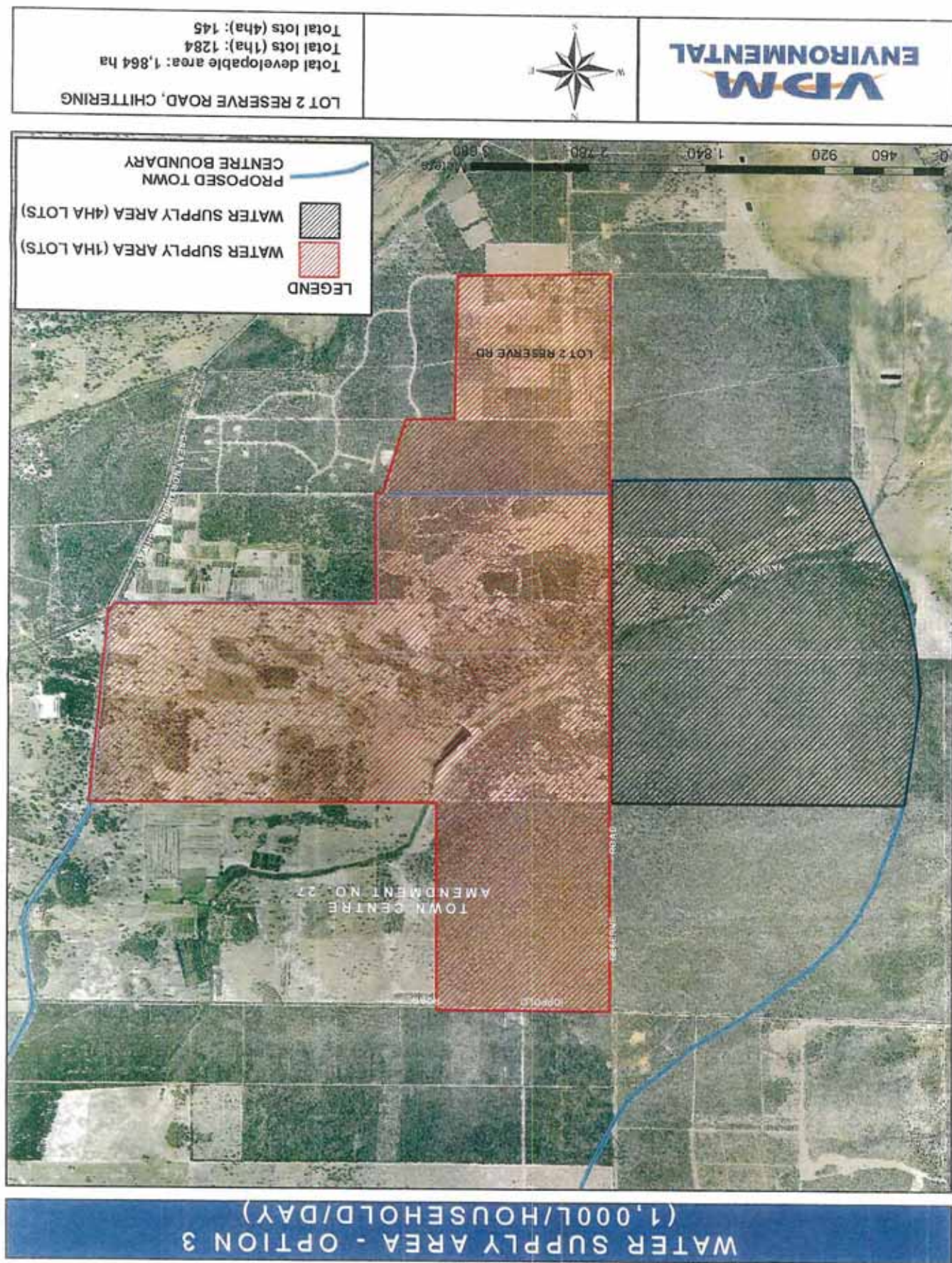


FIGURE 3.











APPENDIX



Appendix A

Borehole Test Data

Subject Site: Lot 2 Reserve Road, Chittering

WIN Site Id	20025333
AWRC Reference	61602501
AWRC Context Name	SWAN COASTAL CATCHMENT 616
AWRC Name	FLORATECH NO 1
AQWABase Reference	2034-1-NE-0104
AQWABase Name	FLORATECH NO 1
Zone	50
Easting	405153.00
Northing	6511488.00
Latitude	-31.527633211
Longitude	116.000966206
Geographic Datum	Geodetic Datum of Australia 1994
Geographic Assessment Method	GDA94 Conversion (Accuracy of 0.05 - 0.9m)
Land District	Swan
Location Map Code	2034-1
1:250,000 Map Code	SH50-14
Location Address	RESERVE RD M2000
Sketch Indicator	N
Geophysical Log Indicator	Y
Route Number	()
River Basin	616 - Swan Coastal
Owning Authority	Floratechnics
Comments	Geophysical log supplied. Approximate salinity from electric log: <ul style="list-style-type: none">• 78-84m: 700mg/L.• 228-246m: 1,200mg/L.• 234-240m: 600mg/L. Final yield 1,012m ³ /day. Maximum drawdown 10.10m. Full recovery in 30 mins. after 1.5 hrs development. Salinity 600mg/L; after 2hrs 320mg/L; after 2 days 230mg/L. Final pumped sample: 280mg/L.
Drill Method	ROTARY DRILL
Water Supply (m ³ /day)	1012.00
TDS (mg/L)	280.00
Water Level (mAHD)	86.730
Top of Screen (m)	225.700
Bottom of Screen (m)	240.900

Depth (no units given)	Stratigraphy	Lithology		
		1	2	3
0.000 – 73.750	Quaternary/Tertiary	Sand	Clay	Laterite
73.750 – 106.680	Cretaceous Sediments	Grit	Sand	None
106.680 – 188.970	Possible Leederville Formation	Shale	Sandy	Carbonaceous
188.970 – 259.080	Leederville Formation	Silt, Silty	Sand	Siltstone



Appendix B

Water Quality Analysis

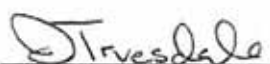


LABORATORY REPORT COVERSHEET

DATE: 28 December 2005
TO: VDM Group
 41 Stuart Street
 NORTHBRIDGE WA 6003
ATTENTION: Ms Gemma Connolly
YOUR REFERENCE: Reserve Rd Chittering
OUR REFERENCE: 93469
SAMPLES RECEIVED: 15/12/05
SAMPLES/QUANTITY: 3 Waters

The above samples were received intact and analysed according to your instructions. Unless otherwise stated, solid samples are reported on a dry weight basis and liquid samples as received.

Microbiological testwork was subcontracted to ProMicro, Hillarys, report nos. P0534542-44 (NATA 2651).


JANICE TRUESDALE
 Manager Perth



WORLD RECOGNISED
ACCREDITATION

NATA Endorsed Test Report

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CLIENT: VDM Group
PROJECT: Reserve Rd Chittering

OUR REFERENCE: 93469

LABORATORY REPORT

Re: Trans Samples 15/12/2005

This report uses the "Australian Drinking Water Guidelines, 1996" issued by the National Health and Medical Research Council (NHMRC) and the Agriculture and Resource Management Council of Australia and New Zealand to interpret the analytical data.

Although the Heterotrophic Plate Count (HPC) is not a testing requirement for potability, high numbers of bacteria may alter the taste and odour of the water. As a guideline, counts of <500/mL for untreated water are desirable, although counts higher than this, if free from the presence of coliforms are not considered to be necessarily a health hazard. The presence of high numbers of non-coliform bacteria (>1000/mL) may also cause an underestimation in the count of coliform bacteria.

The most common parameters that influence the quality of drinking water have been analysed. The possibility of other contaminants being present however should be ascertained from your local health surveyor. If it is suspected that contamination from specific sources may be present, additional analysis may be necessary. We also recommend regular testing for potability especially when water supply conditions change.

From the tests undertaken, the water sample appears to be good quality drinking water.

pH

The pH limits are set for the reasons that follow as taken from Australian Drinking Water Guidelines, 1996: "Based on the need to reduce corrosion and encrustation in pipes and fittings, the pH of drinking-water should be between 6.5 and 8.5. New concrete tanks and cement-mortar lined pipes can significantly increase pH and a value up to 9.2 may be tolerated provided monitoring indicates no deterioration in microbiological quality." Waters with pH values greater than 11 or less than 4 may adversely affect health but there are currently insufficient data to set health guidelines.



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Page 2 of 6

CLIENT: VDM Group
PROJECT: Reserve Rd Chittering

OUR REFERENCE: 93469

LABORATORY REPORT

Re: S1 and S2 Sampled 15/12/2005

This report uses the "Australian Drinking Water Guidelines, 1996" issued by the National Health and Medical Research Council (NHMRC) and the Agriculture and Resource Management Council of Australia and New Zealand to interpret the analytical data.

Although the Heterotrophic Plate Count (HPC) is not a testing requirement for potability, high numbers of bacteria may alter the taste and odour of the water. As a guideline, counts of <500/ml for untreated water are desirable, although counts higher than this, if free from the presence of coliforms are not considered to be necessarily a health hazard. The presence of high numbers of non-coliform bacteria (>1000/mL) may also cause an underestimation in the count of coliform bacteria.

Testing indicates the water sample exceeds either the NHMRC Health or Aesthetic related guidelines and therefore is not good quality drinking water. The cause of the following exceptions should be investigated:

Iron

The level of iron present in the water will cause staining and may impart a metallic taste to the water.

Your local health surveyor may be able to recommend appropriate treatment of the water. Once any treatment has been performed, we recommend the water be resubmitted for potability testing.



NATA Endorsed Test Report

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NATA Accredited laboratory No. 2562 (1705)

SGS
CLIENT: VDM Group
PROJECT: Reserve Rd Chittering

OUR REFERENCE: 93469

LABORATORY REPORT

Your Reference Our Reference Date Sampled Type of Sample	Units	Australian Drinking Water Guidelines 2004	Trans 93469-1 15/12/2005 Water	S1 93469-2 15/12/2005 Water	S2 93469-3 15/12/2005 Water
Potability					
pH	pH Units	6.5 - 8.5	6.6	7.0	6.8
Conductivity @25°C	µS/cm	1500	<2	560	550
Total Dissolved Solids (calc as NaCl)	mg/L	1000	<5	360	350
Sodium, Na	mg/L	180	<0.5	69	68
Potassium, K	mg/L		<0.5	7.6	7.6
Calcium, Ca	mg/L		<0.5	7.7	7.9
Magnesium, Mg	mg/L		<0.5	5.4	5.3
Hardness (as CaCO ₃)	mg/L	200	<5	41	42
Iron, Fe (soluble)	mg/L	0.3	<0.05	6.0	6.3
Chloride, Cl	mg/L	250	<1	120	120
Bicarbonate, HCO ₃	mg/L		5	40	40
Sulphate, SO ₄	mg/L	500	<1	14	14
Nitrate, NO ₃	mg/L	50	<0.2	<0.2	<0.2
Fluoride, F	mg/L	1.5	<0.1	0.3	0.3
Free Cyanide	mg/L	0.08	<0.01	<0.01	<0.01
Aluminium, Al	mg/L	0.2	0.1	0.1	<0.1
Arsenic, As	mg/L	0.007	<0.001	<0.001	<0.001
Manganese, Mn	mg/L	0.5	<0.05	0.10	0.10
Lead, Pb	mg/L	0.01	<0.005	<0.005	<0.005
Cadmium, Cd	mg/L	0.002	<0.001	<0.001	<0.001
Faecal (Thermotolerant) Coliforms	CFU/100mL	0	0	0	0
Total Coliforms	CFU/100 mL		0	0	0
Heterotrophic Plate Count @ 21°C	CFU/mL		1,300	3(Est)	6(Est)
Heterotrophic Plate Count @ 37°C	CFU/mL		540	3(Est)	3(Est)
Sediment	n/a		None	None	None
Odour	n/a		None	None	None
Colour	n/a		None	None	None
Turbidity	n/a		None	None	None



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NATA Accredited laboratory No. 2562 (1705)

CLIENT: VDM Group
PROJECT: Reserve Rd Chittering

OUR REFERENCE: 93469

LABORATORY REPORT

TEST PARAMETERS	UNITS	LOR	METHOD
Potability			
pH	pH Units		PEI-001
Conductivity @25°C	µS/cm	2	PEI-032
Total Dissolved Solids (calc as NaCl)	mg/L	5	PEI-032
Sodium, Na	mg/L	0.5	PEM-001
Potassium, K	mg/L	0.5	PEM-001
Calcium, Ca	mg/L	0.5	PEM-002
Magnesium, Mg	mg/L	0.5	PEM-002
Hardness (as CaCO ₃)	mg/L	5	
Iron, Fe (soluble)	mg/L	0.05	PEM-001
Chloride, Cl	mg/L	1	PEI-020
Bicarbonate, HCO ₃	mg/L	5	PEI-006
Sulphate, SO ₄	mg/L	1	PEI-020
Nitrate, NO ₃	mg/L	0.2	PEI-020
Fluoride, F	mg/L	0.1	PEI-027
Free Cyanide	mg/L	0.01	PEI-023
Aluminium, Al	mg/L	0.1	PEM-002
Arsenic, As	mg/L	0.001	PEM-004
Manganese, Mn	mg/L	0.05	PEM-001
Lead, Pb	mg/L	0.005	PEM-003
Cadmium, Cd	mg/L	0.001	PEM-003
Faecal (Thermotolerant) Coliforms	CFU/100mL	0	PM4.3
Total Coliforms	CFU/100 mL	0	PM4.2
Heterotrophic Plate Count @ 21°C	CFU/mL	1	PM4.1
Heterotrophic Plate Count @ 37°C	CFU/mL	1	PM4.1
Sediment	n/a		
Odour	n/a		
Colour	n/a		
Turbidity	n/a		

CLIENT: VDM Group
PROJECT: Reserve Rd Chittering

OUR REFERENCE: 93469

LABORATORY REPORT

NOTES:

LOR - Limit of Reporting.

Where no Guideline is indicated, no guideline value has been set.

In accordance with the Australian Standard methods for Membrane Filtration, if the colony count per plate is outside the range of 20-80, the result derived from this must be shown as an estimation. The reason for this is statistical.

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NATA Endorsed Test Report

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Appendix C

Water Supply Areas

1.1 Household Use	Estimate	Units	Source	Water Use	Notes
Garden Irrigation	0.002	kL/m ² /day	Water Corporation	Irrigation	10mm @ approx 8 months / 365.25 days
Shower	0.050	kL/person/day	Diversity Australia	Drinking Water	
Kitchen sink	0.008	kL/person/day	Diversity Australia	Drinking Water	
Bathroom basin	0.006	kL/person/day	Diversity Australia	Drinking Water	
Dishwasher	0.003	kL/person/day	Diversity Australia	Drinking Water	
Bath	0.001	kL/person/day	Diversity Australia	Drinking Water	
Laundry trough	0.004	kL/person/day	Diversity Australia	Drinking Water	
Leaks	0.029	kL/household/day	Diversity Australia	Drinking Water	
Pool	0.020	kL/household/day	Diversity Australia	Drinking Water	
Spa	0.002	kL/household/day	Diversity Australia	Drinking Water	
Car Washing	0.002	kL/household/day	Diversity Australia	Drinking Water	
Evaporative cooling	0.006	kL/household/day	Diversity Australia	Drinking Water	
Other	0.004	kL/household/day	Diversity Australia	Drinking Water	
Toilet	0.033	kL/person/day	Diversity Australia	Non-Drinking Water	
Washing machine	0.042	kL/person/day	Diversity Australia	Non-Drinking Water	
	0.209	0.201	0.004		
	0.414				

1.2 Household Type	Estimate	Units	Source	Notes
Traditional	2.790	Average # of Residents	2001 ABS Census	
Terraced	1.730	Average # of Residents	2001 ABS Census	
Cottage	1.810	Average # of Residents	2001 ABS Census	
Apartment	1.480	Average # of Residents	2001 ABS Census	
Lifestyle	2.790	Average # of Residents	2001 ABS Census	

1. Rainwater

1.1 Rainfall Collection	Estimate	Units	Source	Notes
Average Annual Rainfall	700	mm/m ² /year	Estimate	Metre area only
Rain collection	24	mm/m ² /year	http://enhealth.nhp.gov.au/council/pubs/documents/rainwater_tanks.pdf	For evaporation, roof wetting, etc
Efficiency factor	80%	%	Estimate	Conversion of rainfall to rain capture

1.2 Storage capacity	Estimate	Units	Source	Notes
Traditional	2.000	kL/household	Estimate	Total capacity per household
Terraced	2.000	kL/household	Estimate	Total capacity per household
Cottage	2.000	kL/household	Estimate	Total capacity per household
Apartment	5.000	kL/lot	Estimate	Total capacity per lot
Lifestyle	10.000	kL/household	Estimate	Total capacity per household
Schools	10.000	kL/household	Estimate	Total capacity per school
Proportion used for Irrigation (Residential)	0.50	%	Estimate	The remainder is then allocated to Non-drinking water use
Proportion used for Irrigation (Schools)	0.50	%	Estimate	The remainder is then allocated to Non-drinking water use

1.3 Percentage of lot that is roofing	Estimate	Units	Source	Notes
Traditional	50	%	Estimate	
Terraced	50	%	Estimate	
Cottage	50	%	Estimate	
Apartment	50	%	Estimate	
Lifestyle	25	%	Estimate	
Schools	10	%	Estimate	

* - council has recommended 20kL per household.

LOT 2 RESERVE ROAD, CHITTERING - WATER REQUIREMENTS

			kl/person/annum	kl/household/annum
INHOUSE USAGE PER LOT (POTABLE WATER) - LIFESTYLE	0.264	kl/household/day		
EXHOUSE WATER USAGE - from rainwater tank/bore/ATU no pot	0.000	kl/household/day		
	0.264	kl/household/day	34.52	96.30
NON-POTABLE (RAINWATER TANK)	0.209	kl/household/day	27.38	76.38
TOTAL USAGE	0.473	kl/household/day	61.89	172.68
TOTAL WATER SUPPLY	288000	kl/annum		
LOSSES THROUGH WATER TREATMENT PLANT	20%			
	230400	kl/annum	130.8243728	
no. lots, no rainwater tanks (option 1)	1,334	lots		3,722.64
no. lots, rainwater tanks (option 2)	2,392	lots		6,675.07
@ 552L/household per day (option 3)	1,144	lots		3,190.47

Notes:

Input data based on information provided by the Water Corporation's alternate water supply water use model spreadsheet.
All lots at 1 hectare each

Allowance for road reserves	10%
Allowance for Public Open Space	10%

TOTAL LAND REQUIREMENTS

no. lots, no rainwater tanks (option 1)	1,668	lots
no. lots, rainwater tanks (option 2)	2,991	lots
@ 1,000L/household per day (option 3)	1,429	lots

Effluent Production	0.414	kl/household/day
	54.16	kl/person/annum
	151.11	kl/household/annum

additional landscaping requirements	0.002	kl/m2/day
expected house pad area	2000	m2
expected pervious area (i.e. Houses, sheds, etc)	60%	
water requiring area	1200	m2
water requirements	876	kl/household/annum

TOTALS	876	kl/household/annum
less effluent production	151.11	kl/household/annum
Irrigation bore requirements	724.89	kl/household/annum
	259.82	kl/person/year

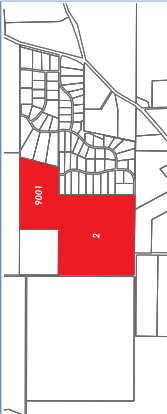
number of lots from surficial bore	377.44
------------------------------------	--------

Option 3 - Domestic Water Use Study

Inhouse Usage	155	L/person/day
	56.68	kl/person/year
	552	L/household/day
	201.48	kl/household/year
Exhouse Usage	707	L/household/day
	258.055	kl/household/year
	151.11	
	106.945	kl/household/year
	38.33154122	

APPENDIX C

Development Plan (TBB, 2015)



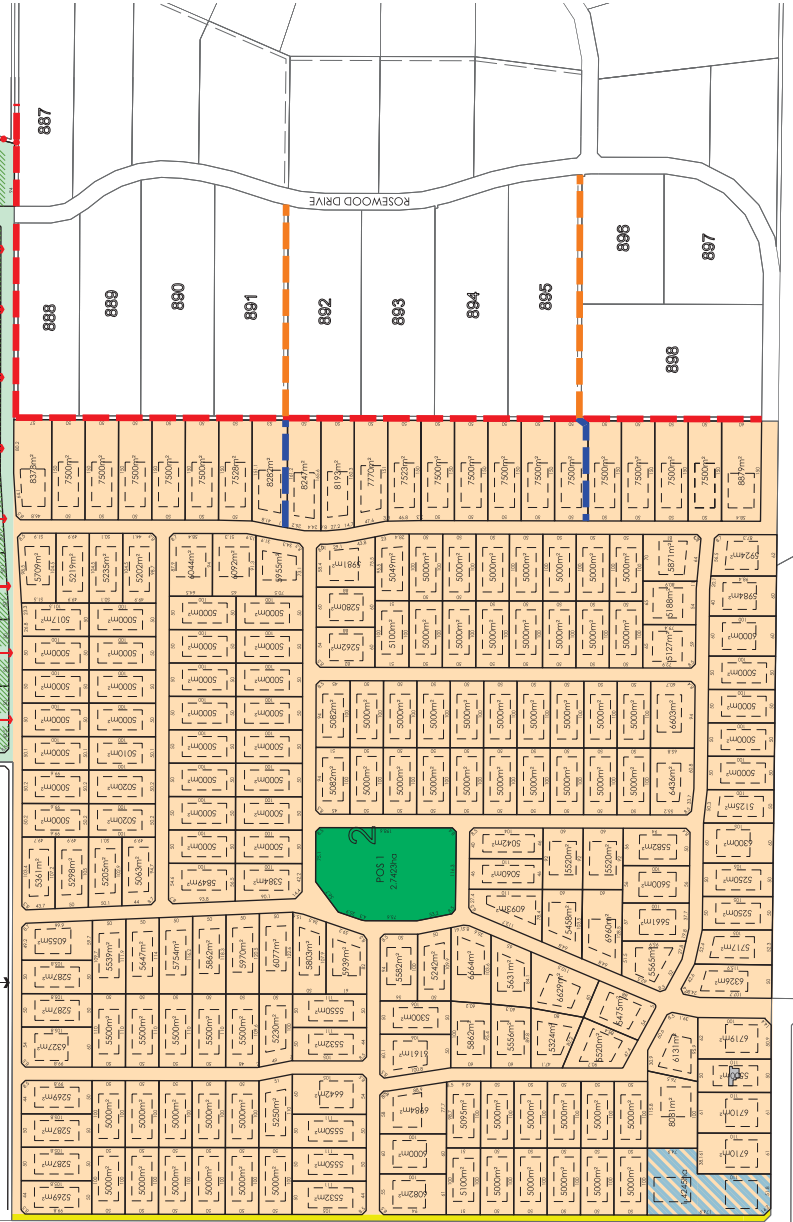
LOT SUMMARY TABLE

Size	LOT YIELD		LOT AREA	
	No.	%	Average	% of
1500m ² - 5000m ²	83	34.30%	5000m ²	27.46%
5001m ² - 10000m ²	151	62.40%	6650m ²	66.45%
10001m ² +	8	3.31%	11509m ²	6.09%
Sub Total	242			
Conservation Lot	1			
Total Number of Lots	243			
TOTAL LOTS - EXCLUDES DRINKING WATER PROTECTION SITE				

FUTURE SUBDIVISION BY OTHERS

9000

SHARED ROAD - PORTION OF ROAD RESERVE LOCATED WITHIN LOT 9000, BALANCE TO BE CEDED ON DEVELOPMENT OF LOT 9000.



M2002

NOTES

The Development Plan is prepared in accordance with the Shire of Chittering Town Planning Scheme No. 6 and shall be endorsed by the Shire of Chittering and the Western Australian Planning Commission.

Subdivision and development shall be generally in accordance with the approved Development Plan, the provisions of the Shire of Chittering Town Planning Scheme No. 6 (including Schedule 12 Rural Conservation) and Local Planning Policies. Where the provisions of the approved Development Plan and the Scheme are inconsistent, the provisions of the Development Plan and Schedule 12 shall prevail.

DEVELOPMENT PLAN REQUIREMENTS

1. Development Requirements and Lot Sizes:
In considering development and subdivision of the land, the requirements of the Shire of Chittering Town Planning Scheme No. 6 for the Rural Conservation and Residential RZ Zones apply, unless otherwise provided for within the Development Plan.

2. Vegetation Retention:
Areas indicated on the Development Plan for Vegetation Retention shall be limited to a maximum 2500m² area, and shall achieve minimum 20m separation to other areas for Vegetation Retention and/or buildings.

3. Vegetation Management:
Vegetation management is permitted outside of the designated building envelope specified for each lot on the Development Plan, where those trees are assessed, presented danger to life or property, or require removal / maintenance as specified within the approved Fire Management Plan.

4. Indicative Building Envelopes
All development including buildings, water tanks and waste disposal systems, is to be contained within the indicative building envelope, which shall not exceed 2500m² in area. The indicative building envelope shall be approved by the Shire prior to subdivision, and shall comply with the provisions of the Scheme, the requirements of the Development Plan and the approved Fire Management Plan.

5. Minimum Building Envelope Subdivisions
The following minimum building envelope setbacks (from the cadastral boundary) shall be applied for the Residential RZ and Rural Conservation Zones:

Minimum Building Envelope Subdivisions	
Front	20m
Side	10m
Rear	10m

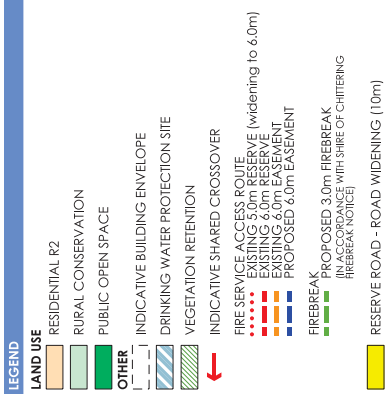
6. Indicative Building Envelope Subdivisions - Rural Conservation Lots
For the Rural Conservation Lots located west of Rosewood Drive that are in a north-south orientation, buildings shall achieve a minimum 10 metre setback measured from the front boundary of the Building Envelope to any building.

7. The Conservation Lot is to be developed for the purposes of accommodating one (1) single house with ancillary outbuildings, within the prescribed building envelope for the lot, and will be subject to the management measures and requirements of the covenants for the site.

Indicative Building Envelope Subdivisions - Rural Conservation Lots	
Front	20m
Side	10m
Rear	10m

8. The Conservation Lot is to be developed for the purposes of accommodating one (1) single house with ancillary outbuildings, within the prescribed building envelope for the lot, and will be subject to the management measures and requirements of the covenants for the site.

9. The Conservation Lot is to be developed for the purposes of accommodating one (1) single house with ancillary outbuildings, within the prescribed building envelope for the lot, and will be subject to the management measures and requirements of the covenants for the site.



8. Crossovers:
The construction of a crossover to each Residential R2 lot and the Conservation Lot is to be in accordance with Council's specifications.

9. Potable Water:
A reticulated potable water supply will be provided and available for fire fighting purposes.

10. Land Management:
The maintenance of any drainage swales, easements, fire breaks/Fire Service Access Routes and Vegetation re-vegetation areas on private property is the responsibility of the owner/occupier of the respective lot.

11. Bore, Dams and Water Courses:
The siting of bores, construction of dams and extraction of surface water is not permitted without prior approval from the Shire and/or any relevant government/service authority.

12. Fire Control:
A Fire Management Plan has been prepared by ICS Group and shall apply to the development and ongoing use of the land. Fire Service Access Routes shall be provided in accordance with the Development Plan.

13. Permitted Uses:
The permissibility of uses shall be:

Permitted Uses	
Bed and Breakfast (B)	Single House (P)
Home Business (B)	Ancillary Accommodation (D)
Single House (P)	Industry - Cottage (H)
	Public Utility (D)

For any use that may result in degradation of land or water resources or nuisance to neighbours, a management plan may be required as a condition of development approval.

14. Public Open Space:
Land identified as Public Open Space on the Development Plan shall be credited free of cost to the Shire of Chittering at subdivision.

15. Drinking Water Source Protection Site:
Land identified to contain the potable water supply infrastructure and associated facilities and will be registered as a Potable (P) water source site.

16. Hauling of Lumber:
The hauling of lumber is not permitted.

17. Non-infective Materials:
All buildings shall be constructed of non-infective materials.

18. Effluent Disposal:
All lots shall be provided with Aerobic Treatment Units (ATUs) with inherent retention capability for the disposal of effluent.

19. Vendor Responsibility:
The developer/vendor shall inform prospective purchasers of the lot, in writing, of the provisions of the Council's Town Planning Scheme relating to the management of the lot, as specified in the Development Plan, Fire Management Plan and Covenants (as applicable).

ADOPTED FOR PRELIMINARY APPROVAL by resolution of the Shire of Chittering at the Ordinary Meeting of the Council held on the _____ day of _____, 2015.

ADOPTED FOR FINAL APPROVAL by resolution of the Shire of Chittering at the Ordinary Meeting of the Council held on the _____ day of _____, 2015 and the seat of the Municipality was pursuant to that resolution hereunto affixed in the presence of:

SHIRE PRESIDENT _____

CHIEF EXECUTIVE OFFICER _____

Date: _____
And resolution of the Western Australian Planning Commission on the: _____

Date: _____ Chairman: _____

LEGEND

INDICATIVE AREA FOR VEGETATION RETENTION

INDICATIVE BUILDING ENVELOPE

10m MINIMUM FRONT SETBACK WITHIN INDICATIVE BUILDING ENVELOPE

POTENTIAL 20m SEPARATION TO HOUSE

INDICATIVE CROSSOVER LOCATION

BALANCE PORTION OF ROAD WIDENING, FUTURE CEDING FROM LOT 9000 AT TIME OF DEVELOPMENT

VEGETATION RETENTION NOTES

1. Conservation Lot:
The indicative area for Vegetation Retention on the Conservation Lot is defined by the following requirements:

- 3m wide firebreak for western and northern boundaries;
- 1m wide offset on eastern boundary for widening for a 6.0m Fire Service Access Route;
- Easement for a 6.0m Fire Service Access Route on southern boundary;
- 20m potential separation for house.

2. Rural Conservation Lot Building Envelope setbacks:
For Rural Conservation Lots in a north-south orientation and west of Rosewood Drive shall require a 10m minimum front setback for buildings, measured from the front boundary of the Building Envelope.

3. Rural Conservation Lots – Areas for Vegetation Retention
Areas identified for Vegetation Retention are indicative and the size of these areas can be subject to change. Areas of vegetation retention shall have a maximum land area of 2,500m². Areas for Vegetation Retention shall achieve a minimum 20m separation to houses, other areas of Vegetation Retention and areas of vegetation in adjacent subdivisions. The size of areas for Vegetation Retention would be determined by the future siting and layout of houses within the Indicative Building Envelopes.

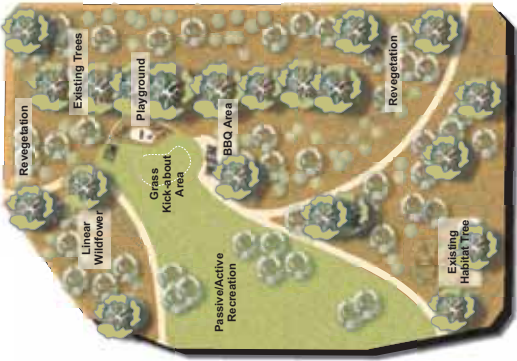
4. Indicative areas for Vegetation Retention illustrate the minimum possible extent, taking into account a scenario where all building envelopes are developed in such a manner that the 20m separation area is required to be taken from the edges of the indicative Building Envelopes.

5. Crossover Locations:
Indicative Crossover Locations are either shared between two lots or are an alternative crossover for a single lot. Crossover locations may still require 20m separation areas to be maintained and managed in accordance with the requirements of the Fire Management Plan.

5

APPENDIX D

Landscape Masterplan (UDLA, 2015)



1 Central Park

The central park area is to make use of the existing mature stand of Eucalypts as a backdrop to nestle in resident park amenity such as: shade structure(s), junior and senior play equipment focusing on adventure play, a large lawn area for picnicking, BBQ facilities, toilet and water fountain conveniences, lighting, ball and pet play on an active lawn as a contrast to the more arid endemic vegetation. The central park will be organised spatially through the use of desire lines that cross the park providing not only cross access however a circuitous route within the park. The larger areas encourage local planting as a strong suggestion of the sites original landscape woodland.



Landscape Intent

The Lot 2 Reserve Road and Lot 9001 Rosewood Drive Landscape Masterplan borrows cues from the sites unique woodland ecology and recent use as a native flower farm



2 Entry & Roads

The entry to Lot 2 from Reserve Road proposes strong formerly planted rows of native wildflowers with specimens transplanted from the site. These rows of flowers can be used by future and surrounding residents for cut specimens or purely for their seasonal striking colour and a reminder of the sites recent history.

Road Easements - The development road easements for both Lots 2 and 9001 are proposed to make the most of the lineal corridor open space by offsetting a non-kerbed rural styled pavement. A one-way cross fall on the road aims to follow the natural fall of the land to an enclosed swale system. These lineal swales will embody WSUD principles and act as a rain gardens infiltrating water run-off close to source. The swale is to be planted with endemic planting between residential crossovers. Residential crossovers will join the swales through a simple culvert and pipe system, to be terminated by another crossover as required.



Note: Existing trees within Lot 2 and Lot 9001 will be retained where possible where the trees are not required for removal for fire management, clearing for roads, building works or vehicle access requirements.

Vegetation Management Strategy

The landscape architectural (spatial design) recommendation for residential lots is primarily influenced by maintaining 'sense of place', including retention of the integrity of the rural bushland setting. However, this is conversely and equally strongly influenced by State fire management regulations. The approach taken here is to limit bushland planting to no less than 20m from residences, with areas of remnant or re-planted vegetation to be no more than 2,500m² in size. Guided by this simplified description of the fire management regulations, the masterplan, detail plans and elevations indicate planting opportunities for residents for both Lots 2 and Lot 9001.

LOT 2 RESERVE ROAD AND LOT 9001 ROSEWOOD DRIVE, CHITTERING LANDSCAPE MASTERPLAN

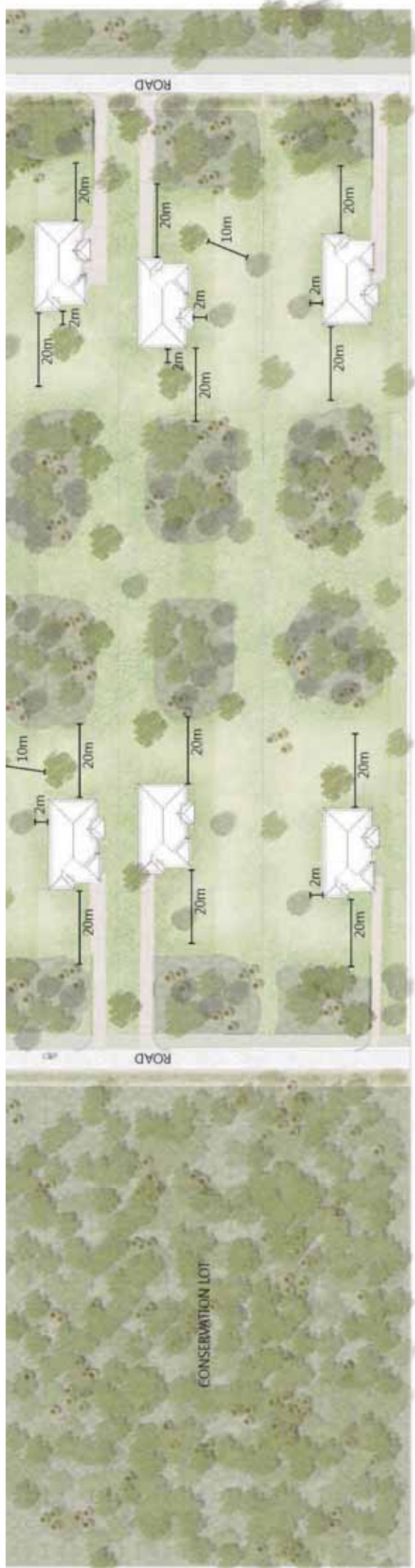
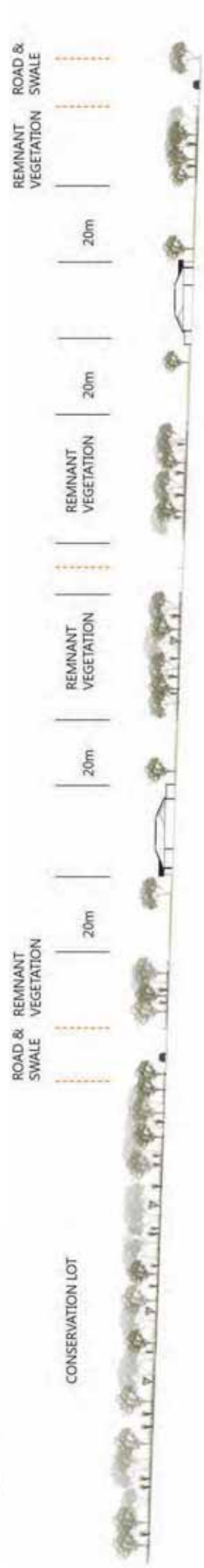
CHITTERING RESERVE ROAD
INDICATIVE PLAN & SECTION BB
SCALE: 1:1500 AT A3

LOT BOUNDARY
20m SEPERATION

Fire Protection Zone - Maintained 100mm Height

Low Water Use & Non-Weed Turf Species
Zoysia japonica - Empire Zoysia
Sir Walter Buffalo

Native Species
Lepidosperma longitudinale
Lomandra micrantha
Lomandra preissii
Microlema stipoides
Nemcia reticulata
Neurachne alopecuroides
Stipa compressa



Northern
Vegetation
Corridor

Central
Vegetation
Corridor

Southern
Vegetation
Corridor

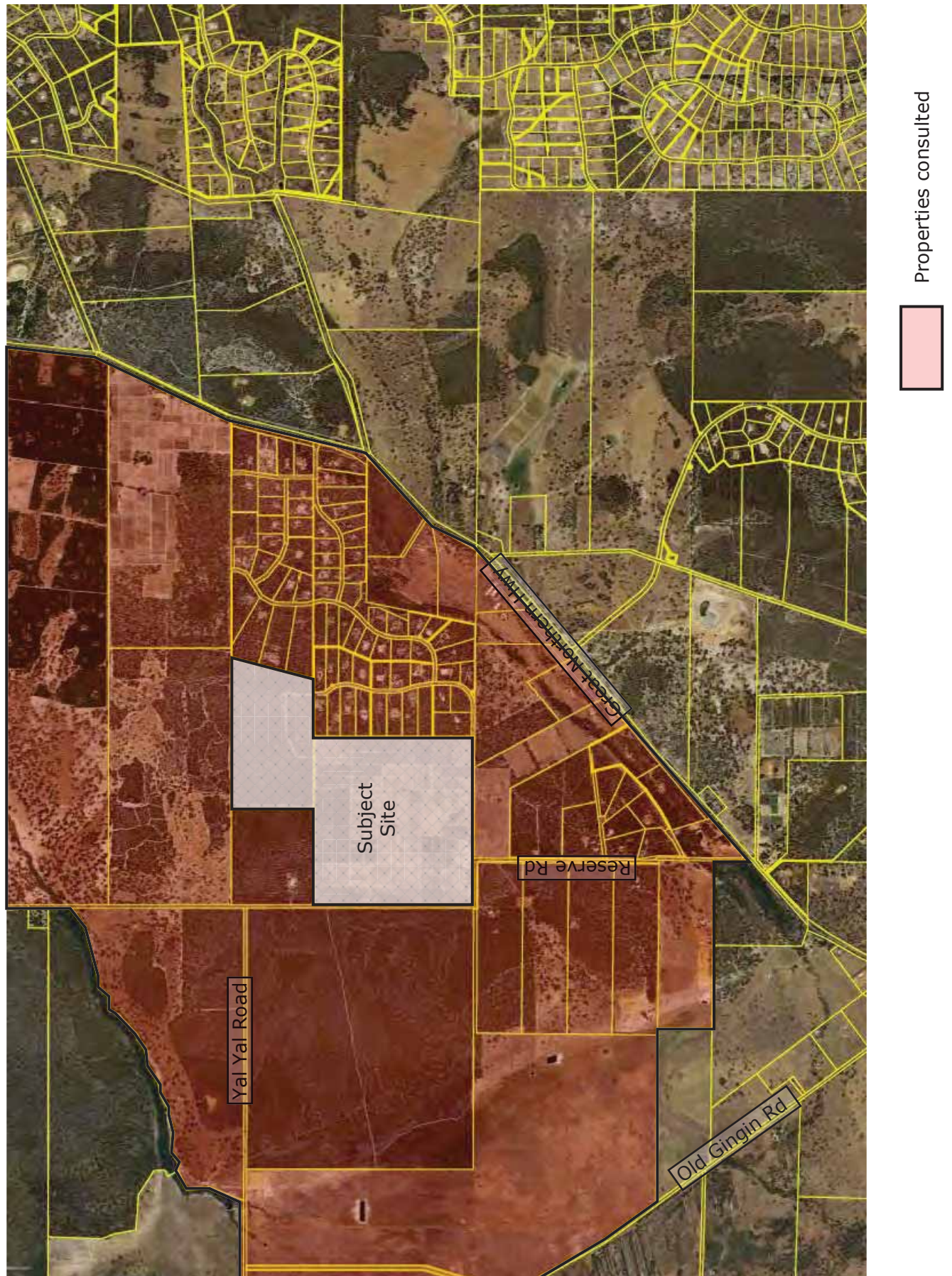
more than 100mm in height. Retention of existing trees are allowed however canopies are required to be 10m apart. Within the fire management zones it is import that topsoil and vegetation roots are not removed during the slashing/clearing process so that the sandy soil exposure is limited. The large conservation lot in Lot 9001 will only require slashing to maintain the area between the house and existing vegetation. Within the smaller conservation lots it is recommended that limited site slashing is undertaken to maintain landscape integrity within this conservation lot and that future residents can take advantage of living within a modified Jarrah Woodland landscape.

Lot 9001 Vegetation Management
Due to the conservation value of Lot 9001, a large parcel of land has been left untouched to the north of this site to provide a strong flora/fauna corridor. In addition the residential lots proposed for this development have been separated to provide green link corridors through the built form. The northern corridor provides a buffer to the conservation lot, with a central corridor allowing a visual and ecological break between residents. A southern corridor provides remnant vegetation and visual woodland buffer to the front of the development and a buffer to the adjoining development.

Fire management requires areas to be slashed to maintain low fuel areas in the separation zones within the smaller conservation lots of Lot 9001. Vegetation/soil management requires these areas to be immediately established with non-invasive drought resistant pasture/lawn or native herbaceous cover and maintained to no



LOT 2 RESERVE ROAD AND LOT 9001 ROSEWOOD DRIVE, CHITTERING
LOT 9001 VEGETATION MANAGEMENT



Proposed Development Plan

LOT 2 RESERVE ROAD & LOT 9001 ROSEWOOD DRIVE, CHITTERING



Prepared By:
On Behalf Of:

Taylor Burrell Barnett
Riverside Investments WA No 2 Pty Ltd

DOCUMENT STATUS

05/096		Revision	Reviewer	Date Issued
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		1	ST	April 2015

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1 INTRODUCTION

This report has been prepared by Taylor Burrell Barnett as an outline for a proposed Development Plan, prepared in accordance with:

- Clause 5.8.1 of the Shire of Chittering Town Planning Scheme No. 6 pertaining to a Development Plan for the Rural Conservation Zone; and
- Clause 5.1 d) of LPP No. 32 *Development Plans*.

This report is prepared on behalf of Riverside Investments WA No 2 Pty Ltd, the owners of Lots 2 Reserve Road and Lot 9001 Rosewood Drive, Chittering (the subject site). The application, which has an area of 195.1486 ha, proposes the creation of 247 lots ranging in size from 5,000m² to 20.39 ha, and public open space and a site for drinking water protection and infrastructure.

This report has also been prepared to support a Scheme Amendment Request to be considered concurrent to the Development Plan.

1.1 BACKGROUND

Proposals for development of the subject site were progressed between 2007 and 2009 to facilitate development consistent with the 'Rural Residential' Zoning, as outlined below:

- The Shire of Chittering endorsed a Development Plan and Fire Management Plan for Lot 2 Reserve Road on 17 December 2007.
- An Application for Subdivision Approval for Lot 2 Reserve Road was given conditional approval by the Commission on the 20 December 2011 (WAPC Ref: 145031) to facilitate the creation of 110 new single residential lots, and public open space. Lot sizes ranged from 7,503m² to 4 ha, with an average lot size of 1.0417 ha. This subdivision approval remains valid until 20 December 2015.
- The WAPC granted approval to the Lot 7 (now Lot 9001) Development Plan in June 2009. A subdivision approval was granted in March 2009 and again in April 2013 to facilitate the creation of 45 lots with an average lot size of 1.0 ha.
- An Application for Subdivision Approval for Lot 9001 Rosewood Drive was granted conditional approval by the Commission on 8 July 2013 (WAPC Ref: 147754) to facilitate the creation of 45 new single residential lots, and public open space. Lot sizes ranged from 1 ha to 1.25 ha, with an average lot size of 1.04 ha. This subdivision approval remains valid until 8 July 2017.

In all, valid subdivision approvals are currently in place for creating 155 lots, albeit in a more traditional rural residential development outcome, with limited opportunities for retaining remnant vegetation particularly within Lot 9001.

Water Corporation had previously agreed to be the Water Service Provider to the approved development. With the withdrawal of Water Corporation, the landowners and their associates have committed to now applying for a Water Service Provider Licence and constructing a water treatment plant. This involves considerable investment and risk, and changes the financial risk and cost per lot significantly for the landowners.

Development of the subject site has not yet proceeded in accordance with these approvals whilst investigations regarding the provision of a water supply have progressed. These investigations have raised concern about the viability of the current proposals proceeding given the cost associated with establishing a reticulated water supply system.

Further, at the time the Development Plan of Lot 9001 was approved, the Shire had not published its Conservation requirements for Lot 9001. The potential development of the Muchea Employment Node also requires potable water, so the scale of the water treatment plant for this development is now larger than previously envisaged. More recent discussions with the officers of the Department of Planning have indicated an opportunity to investigate increasing the density due to the establishment of the Muchea Employment Node immediately south of the subject site, which is currently remote from a workforce population. This proposal seeks to address the requirements to supply water to the Employment Node, increase the potential residential population in close proximity to the Employment Node, protect the conservation area on Lot 9001, and deliver a viable development within an approved planning framework, as detailed below.

1.2 LEGAL DESCRIPTION

The legal description of the lots included within the subject site is outlined in **Table 1** below and are illustrated in **Figure 1** and **Figure 2**.

TABLE 1 LAND OWNERSHIP DETAILS

LOT NO	VOLUME/FOLIO	OWNER	AREA
Lot 2 (No. 200) Reserve Road, Chittering	1481/704 Lot 2 on Diagram 52612	Riverside Investments (WA) No 2 Pty Ltd	136.6642 ha
Lot 9001 (No. 356) Rosewood Drive, Chittering	2713-537 Lot 9001 on Plan 60794	Riverside Investments WA No. 2 Pty Ltd	58.4844 ha
TOTAL			195.1486 ha

Copies of the Certificates of Title are in **Appendix A**.

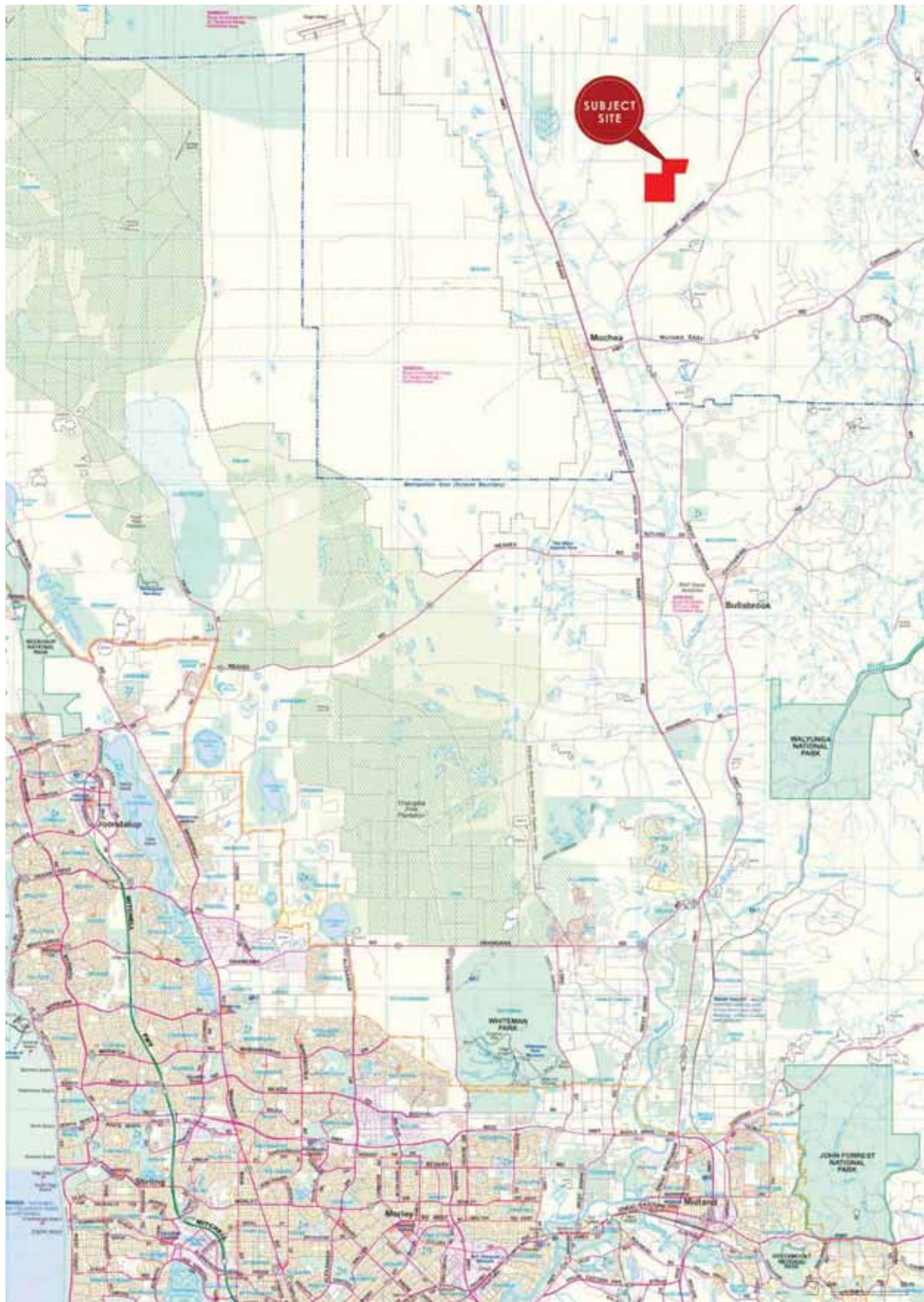


FIGURE 1 LOCATION PLAN

2 STATUTORY PLANNING CONTEXT

2.1 STATE GOVERNMENT

2.1.1 STATE PLANNING POLICY NO. 3.0: URBAN GROWTH AND SETTLEMENT

SPP 3 guides the planning of urban settlements that require additional guidance through growth strategies and subsequently Local Planning Strategies.

2.1.2 STATE PLANNING POLICY NO. 3.7: PLANNING FOR BUSHFIRE RISK MANAGEMENT

On 1 May 2014, the Department of Planning released the draft SPP 3.7 *Planning for Bushfire Risk Management* and the draft *Planning for Bushfire Risk Management Guidelines* for public consultation. At the time, the Department advised that it anticipated that the new SPP and *Guidelines* would be finalised and adopted in late 2014.

In August 2014, the Department of Planning released the proposed *Planning and Development (Bushfire Risk Management) Regulations 2014*. At the time, the Department advised that it anticipated that the *Regulations* would be gazetted in late 2014 and that they will take effect on 1 May 2015.

At the time of writing, the draft SPP and *Guidelines*, as well as the proposed *Regulations* are still under review and changes are expected to be made before these documents are finalised. In the interim, the bushfire protection planning documents which currently apply to new developments are:

- SPP 3.4 *Natural Hazards and Disasters* (WAPC 2006); and
- *Planning for Bush Fire Protection Guidelines* (Edition 2, WAPC & FESA 2010).
- The *Australian Standard for the Construction of buildings in bushfire-prone areas* AS3959 applies in areas which have been formally designated as bushfire-prone areas.

SPP 3.7 is expected to be changed before it is finalised. SPP 3.7 assists in reducing the risk of bushfire to people, property and infrastructure by encouraging a conservative approach to strategic planning, subdivision, development and other planning decisions proposed in bushfire-prone areas. Specifically it:

- addresses the land use planning elements of the Keelty report;
- elevates bushfire issues to be addressed by the highest level of planning policy available, giving it clear status and effect in the land use planning policy framework;
- emphasises the need to consider bushfire management measures in strategic level policy documents, including regional and local planning schemes, sub-regional and local planning strategies and structure plans, as well as during statutory planning processes for subdivision and development applications; and
- seeks to achieve the consistent implementation of bushfire management measures across the community.

PLANNING FOR BUSH FIRE RISK MANAGEMENT GUIDELINES

Planning for Bush Fire Risk Management Guidelines have also been prepared and are designed to supplement the objectives and policy measures established in SPP 3.7, to assist in their interpretation and provide advice on how bushfire risk is to be addressed when designing or assessing a proposal within a bushfire-prone area. The guidelines are draft and it is expected that changes will be made to these before they are finalised.

2.1.3 DC2.2 RESIDENTIAL SUBDIVISION

DC 2.2 addresses requirements for the subdivision of land into residential lots. The policy facilitates the supply of residential lots of a wide range of sizes and shapes which reflect the statutory provisions of local planning schemes, the availability of reticulated sewer and the need for frontage to public roads. Clause 3.3.3 of the policy outlines exceptions to the requirement to provide sewerage connections to lots, as follows:

Large lot subdivision which does not involve the creation of lots less than 2,000m², or density development exceeding R5, providing the responsible authorities are satisfied that no significant detriment to the environment is likely and there is no further opportunity for subdivision without sewerage.

In this instance, the Development Plan proposes lot sizes to the equivalent of 'R2' in the Residential Design Codes, compliant with DC 2.2.

Clause 3.3.5 requires:

Where the WAPC is prepared to approve new residential lots without sewerage, it will need to be satisfied that a minimum unencumbered area of 150m² of suitable shape is available for each dwelling for the installation of a suitable on-site effluent disposal system.

In this instance, the Development Plan proposes Building Envelopes up to a maximum of 2,000m², compliant with the Scheme. This size of building envelope would be suitable for on-site effluent disposal systems being installed.

2.1.4 PLANNING BULLETIN 64: ACID SULFATE SOILS

The purpose of the Planning Bulletin 64 is to provide advice and guidance on matters which should be taken into account in the rezoning, subdivision and development of land which contains acid sulphate soils. This is not a consideration for this site (refer **section 4.4**).

2.1.5 MUCHEA EMPLOYMENT NODE STRUCTURE PLAN (AUGUST 2011)

Prepared by the Department of Planning in August 2011, the *Muchea Employment Node Structure Plan* provides a 20 year land use planning framework for serviced based uses such as transport, livestock, fabrication, warehousing, wholesaling and general commercial use. Originally identified as a future industrial area in the *North-East Corridor Extension Strategy* (WAPC, July 2003), it was recognised as having potential as an industrial area that could take advantage of long-term transport opportunities offered by the proposed Perth-Darwin National highway. The *Muchea Employment Node Structure Plan* area is located approximately 2km east of the Muchea Town Centre and approximately 6km south of the subject site.

Development has been identified to meet forecast development requirements until 2030, with an anticipated level of employment generated by uses in the site during the 20 year time period in the order of 1,000 persons.

Given constraints associated with the Muchea Employment Node such as fragmented ownership, the availability of industrial land closer to the metropolitan area, environmental factors, the presence of basic raw materials and the requirement to service the land prior to subdivision, implementation of the structure plan and achieving development within the node may be complex and protracted. In the interim, in recognition of the current shortage of industrial land in the Shire of Chittering, local demand for industrial land may be satisfied through developing existing subdivided land on Muchea East Road and the Great Northern Highway.

It is recognised that the Muchea Employment Node should be supported by a local workforce. Population growth within the Shire is seen as an important contributor towards ensuring jobs are taken up by residents, with new lots within the Development Plan assisting in attracting new residents to the area.

2.2 LOCAL GOVERNMENT

2.2.1 LOCAL PLANNING STRATEGY

A draft revision of the Local Planning Strategy, prepared by Rowe Group on behalf of the Shire, aims to update the Local Planning Strategy that was adopted by the WAPC in 2004. The updated Strategy is a result of reviewing Rural Residential, Rural Small Holdings and Rural Retreat subdivision and development.

Lot 2 Reserve Road was identified for rural residential development (refer **Figure 3**). Through discussions with Shire Officers and the Department of Planning, there is an expressed desire for development density to be increased given the cleared nature of Lot 2 to support the landowner's ability to provide reticulated water supply to the development, given its proximity to established townsites such as Muchea, and the future Muchea Employment Node.

For Lot 9001, section 9.10.1 of the updated Strategy outlines matters for consideration for rezoning land to 'Rural Conservation', as follows:

- 1) An environmental investigation, including survey, has been undertaken for the Lot, refer **section 4.2** and **Appendix B**.
- 2) This report and Development Plan (refer) is prepared in accordance with the Scheme provisions. The Development Plan considers the extent of vegetation types and Indicative High Conservation Value Areas, the impact of implementing Bushfire requirements, the interface between development and vegetation, the recommendations of the Local Biodiversity Strategy (refer **section 2.2.2**), the addition of a conservation covenant on the Conservation Lot, and the impacts on immediately adjoining land.
- 3) The proposed lot sizes are guided by minimum lot sizes of 5,000m² for clustering development whilst proposing one Conservation Lot for contributing towards protection of land identified within the Indicative High Conservation Value Area.

Lot 9001 is identified within an Indicative High Conservation Value Area within the Local Planning Strategy, refer **Figure 3**. The Development Plan recognises this in the form of one 20 ha Conservation Lot. The Lot is proposed to be covenanted for conservation, with the remainder of Lot 9001 for a mix of lot sizes, consistent with the Residential R2 zone.

The Development Plan addresses the relevant aims of the Local Planning Strategy, and approaches the development of the land for a mix of lot sizes that are reflective of the land capabilities as well as the feasibility and viability for the provision of necessary infrastructure such as reticulated water supply. Overall, the Strategy supports appropriate rural residential development in specific areas of the Shire, whilst land within areas of Indicative High Conservation Value Areas being identified for Rural Conservation. The Strategy aims to promote rural residential where appropriate, including unit housing for families and aged persons (Rowe Group 2014, 18). To manage the demand for rural residential opportunities by encouraging such development to be sited in specific areas where appropriate services can be provided, a sense of community can be encouraged, and land capability, fire hazard avoidance and environmental considerations can be appropriately achieved. In so doing, it encourages the consolidation of development in an effort to efficiently utilise services and promote liveable communities.

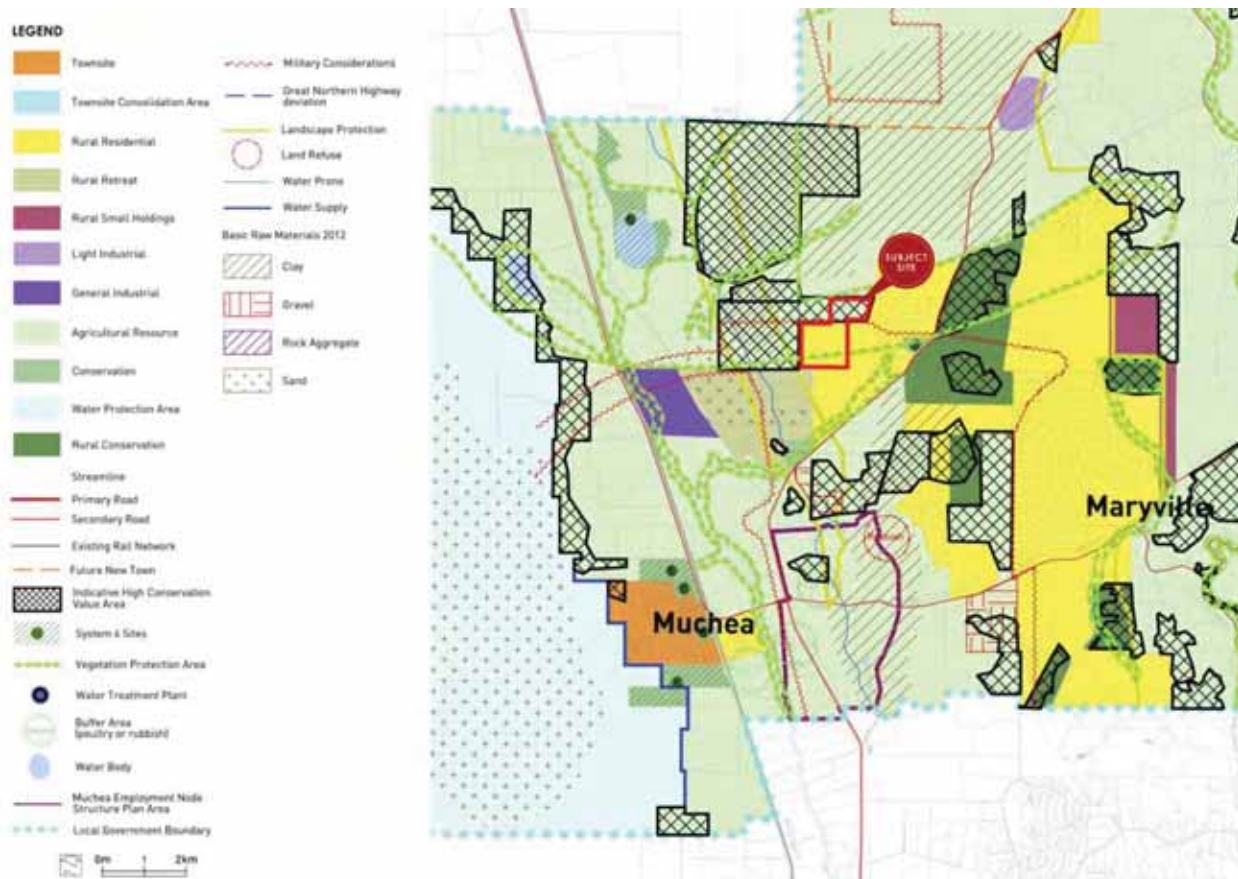


FIGURE 3 EXTRACT OF SHIRE OF CHITTERING DRAFT LOCAL PLANNING STRATEGY
(Source: Rowe Group 2014)

2.2.2 LOCAL BIODIVERSITY STRATEGY

The Shire of Chittering Local Biodiversity Strategy was adopted in 2010. The subject site is located within the 'Lower Chittering Precinct' which aims to:

- Protect 1,038 hectares and retain an additional 1,450 hectares.
- Encourage vegetation retention through alternative structure plan design.
- Increase protection of vegetation on local government land.
- Support 'Land for Wildlife' or similar program participants, consider land use planning decisions on such properties.

Lot 2 Reserve Road is not identified in the Local Biodiversity Strategy. Lot 9001 Rosewood Drive is identified within the 'Mogumber Complex – South' vegetation complex, which has regional significance due to being under-protected. Lot 9001 is within the Indicative High Conservation Value Area 5.10 within the Lower Chittering Precinct, as per Figure 7 of the Local Biodiversity Strategy (**Figure 4** below). Lot 9001 is identified as a Local Natural Area 'High Constraint Level', presumably due to existing planning decisions such as the currently valid subdivision approval and Development Plan.

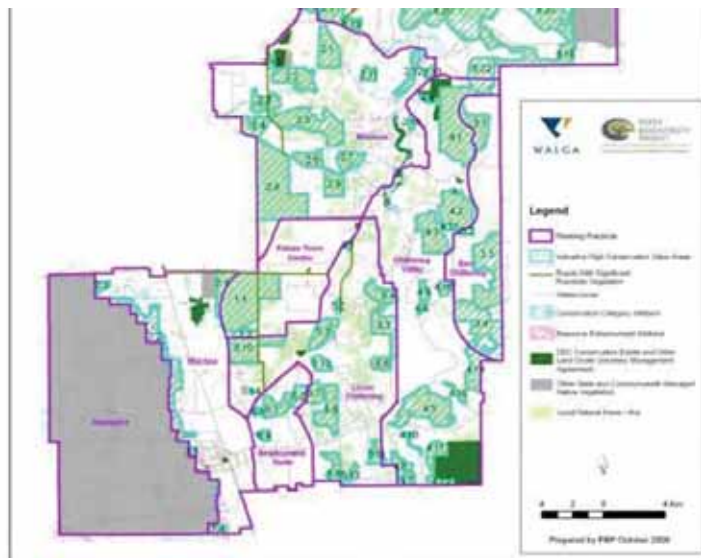


FIGURE 7: INDICATIVE HIGH CONSERVATION VALUE AREAS IN THE SHIRE OF CHITTERING

FIGURE 4 EXTRACT OF FIGURE 7 FROM LOCAL BIODIVERSITY STRATEGY
(Source: *Shire of Chittering 2010*).

Lot 9001 was subject to a Development Plan and approved subdivision design that sought to create rural residential lots ranging from 7,502m² to 1.18 hectares over the whole site. This has been reconsidered in this Development Plan with the result of retaining approximately 20 hectares of remnant vegetation on Lot 9001, representing approximately 34 percent of the site. Within this area, remnant vegetation includes *Xanthorrhoea* – *Eucalyptus* woodland, *Adenanthos* woodland and *Banksia* – *Eucalyptus* woodland. The remainder of Lot 9001 is proposed to be subdivided into lots with building envelopes of maximum 2,000m² to minimise clearing.

The subdivision design contributes towards protecting native vegetation via the creation of one 20 hectare Conservation Lot, use of conservation covenants on the lot, and retaining native vegetation where possible outside of building envelopes.

The Indicative High Conservation Value Area 5.10 (IHCVA 5.10) is identified to have 389.6 ha of remaining vegetation, with a target for protection of 324 ha (or 83.16% of remaining vegetation).

Table 5.1 of the Local Biodiversity Strategy identifies that 58 ha of vegetation within IHCVA 5.10 as “potential loss of vegetation due existing planning decisions”. Lot 9001 Rosewood Drive has a land area of 58.484 ha, and it is considered the 58 ha took into account the “existing planning decisions” including the currently valid subdivision approval (WAPC Ref: 147754) and Development Plan for Lot 9001.

The Conservation Lot comprises an area of 20.3993 ha, including one building envelope up to 2,000m² (subject to DPAW requirements), access and crossovers, and a combination of 3.0m wide Firebreaks along the northern and western boundaries, and a 6.0m Fire Service Access Routes along the southern boundary. Vegetation will be managed in accordance with the Fire Management Plan. Taking into account clearing for Fire breaks, Fire Service Access Routes, driveways and building envelopes, it is anticipated that approximately 19.8ha of the Conservation Lot could be managed to contain remnant vegetation.

This would result in 34% (19.8ha) of the previous 58ha of potential lost vegetation being returned for Conservation within the Conservation Lot. This percentage omits the vegetation that may be managed and retained within other lots within Lot 9001 Rosewood Drive. Importantly, this land is likely to result in a lower potential loss of vegetation due to existing planning decisions, by reducing the extent of new lots, roads and development across Lot 9001. This is a more favourable biodiversity outcome in comparison to the extent of vegetation loss that would otherwise be experienced under the existing Development Plan and current subdivision approval.

2.2.3 TOWN PLANNING SCHEME NO. 6

EXISTING ZONING

The subject land is currently zoned ‘Rural Residential’ under the Shire of Chittering Town Planning Scheme No. 6, refer **Figure 5**. The objectives of the ‘Rural Residential’ zone are:

“To designate areas where rural residential developments can be accommodated without detriment to the environment or the rural character of the area.

To meet the demand for a rural lifestyle on small lots, generally in excess of 1 hectare.

To maintain and enhance the rural character and amenity of the locality.”

The Shire of Chittering Town Planning Scheme No. 6 was gazetted on 30 November 2004. Scheme Amendment 8 was gazetted on 30 January 2009, which increased the minimum lot size for the Rural Residential Zone from ‘5,000m²’ to ‘1 hectare’.

Lot 2 Reserve Road is identified as being within a Military Consideration Special Control Area (SCA). Dwellings within the SCA should address noise attenuation measures associated with aircraft noise sourced from the RAAF Air Base Pearce and its flight paths. Lot 9001 Rosewood Drive is beyond the extent of the Military Consideration SCA.

The Zoning Table (Schedule 2 of the Scheme) specifies the following uses as permissible, discretionary or discretionary uses subject to advertising within the Rural Residential Zone. All other uses are not permitted.

- Ancillary Accommodation – D use
- Arts and Crafts Centre – D use
- Bed and Breakfast – D use
- Child Care Premises – A use
- Civic Use – D use
- Community Purpose – D use
- Convenience Store – A use
- Family Daycare – D use
- Home Business – D use
- Industry – Cottage – A use
- Plant Nursery – D use
- Public Utility – D use
- Residential Building – A use
- Rural Pursuit – D use
- Single House – P use
- Stable – D use
- Telecommunications Infrastructure – A use
- Wayside Stall – D use

PROPOSED ZONING

The Development Plan is prepared and incumbent upon the consideration of the Scheme Amendment Request for rezoning the land from 'Rural Residential' to the 'Residential R2' and 'Rural Conservation' zones.

The 'Rural Conservation' zone is proposed for Lot 9001, comprising one 20 hectare Conservation Lot, and lots ranging between 5,250m² and 1.0845ha. This zoning is consistent with the Strategic aims for retaining vegetation within a corridor in the Indicative High Conservation Value Area. The 'Rural Conservation' Zone objectives are:

- To maximise the long-term protection and management of significant environment values.
- To minimise the fragmentation of, and where deemed relevant, promote ecological linkages between, these values.
- To ensure that development is compatible, sympathetic and integrated with these values.
- To create lot/s that are of sufficient size to sustain the long-term protection and management of these values.
- Encourage innovative subdivision design, such as consolidated cluster style development, that maximises the long-term protection and management of these values.

The 'Residential R2' Zone is proposed for lots contained within Lot 2 Reserve Road. This zoning facilitates lot sizes from 5,000m² however the Development Plan demonstrates a range of lot sizes up to 8,879m². The Residential R2 zone objectives are:

- To designate areas for low density residential development in a rural setting, in which natural environmental values are conserved as far as possible.
- To meet the demand for lifestyle lots with a minimum lot size of 5,000m².
- To ensure development is sited and designated to achieve an integrated and harmonious character within each estate.

SCHEME PROVISIONS

The Zoning Table specifies the following uses within the Rural Conservation Zone and the Residential R2 Zone. All other uses are not permitted and have been excluded from the table below.

TABLE 2 TOWN PLANNING SCHEME NO. 6 LAND USE PERMISSIBILITY FOR RURAL CONSERVATION AND RESIDENTIAL R2 ZONES

Land Use	Rural Conservation Zone	Residential R2 Zone
Aged Persons Accommodation	X	A
Bed and Breakfast	D	A
Child Care Premises	X	A
Civic Use	X	D
Community Purpose	X	D
Family Daycare	X	A
Home Business	D	A
Office	X	D
Residential Building	X	A
Single House	P	P

ADDITIONAL USES – RESIDENTIAL R2 ZONE

Having regard to the existing Rural Residential zoning, it is proposed that Additional Uses be incorporated into the Development Plan for the 'Residential R2' zoned lots on Lot 2 Reserve Road, to also include:

- Ancillary Accommodation – D use
- Industry – Cottage – A use
- Public Utility – D use



FIGURE 5 SHIRE OF CHITTERING TOWN PLANNING SCHEME NO. 6

2.2.4 LOCAL PLANNING POLICY MANUAL

LOCAL PLANNING POLICY NO. 16: ROADS AND DRAINAGE

LPP 16 indicates preferred road reserve widths. Given the layout and nature of the subdivision design, and in consultation with the Shire's officers, road reserve widths of 20 metres are proposed. This road reserve width accommodates suitable road pavement, with swale or road-side drainage to either side where necessary; alternatively, collection, storage and reticulation of stormwater to public open space may be undertaken. Landscaping and vegetation may be incorporated/retained within the road reserves.

Where existing roads are extended into the development the existing road reservation widths have been continued.

The proposed road reserves are consistent with the urban road reserve width in the Policy. The Shire's Executive Managers for Development Services and Engineering Technical Services and are in support of the proposed road reserve widths, which will be designed and constructed in accordance with the Shire's Subdivision Guidelines.

A 10 metre road widening to Reserve Road is proposed to increase the road width to 30 metres, consistent with clause 5.1.2 c) of the LPP 16, and the southern portion of Reserve Road.

LOCAL PLANNING POLICY NO. 18: SETBACKS

Setbacks proposed in the Development Plan for building envelopes reflect the LPP 18 policy requirements for 20m to roads, 20m to rear and 15m to side boundaries for the Conservation Lot only.

Setbacks for Residential R2 zoned lots and the remainder of Rural Conservation zoned lots are consistent with the setback requirements of the Residential Design Codes.

LOCAL PLANNING POLICY NO. 21: FIRE MANAGEMENT PLANS

The objectives of the LPP 21 *Fire Management Plans* are to protect life and property and to maintain the rural character of the Shire. The Policy contains requirements and information in relation to:

- private property owners and occupiers' responsibilities for fire safety;
- fire service access routes;
- individual firebreaks;
- general fire hazard reduction;
- water supply; and
- fire management plans.

LPP 21 requires fire management plans. The following comments are made in response to the Policy:

- A Fire Management Plan has been prepared in support of the Development Plan and has regard to the formatting requirements of the Policy.
- Lots of a land area less than 2 ha do not require individual firebreaks but are required to follow General Fire Hazard reduction measures.
- Fire Service Access Routes are proposed as indicated on the Development Plan.
- 3m Fire breaks are proposed along the northern and west boundary of the Conservation Lot.
- 6m wide Fire Service Access Routes are proposed along the southern boundary of the Conservation Lot.

LOCAL PLANNING POLICY NO. 22: FENCES

LPP 22 requires the following in relation to general fencing requirements in all Zones:

- As a condition of planning consent the Council may require fencing to exclude the keeping of animals and poultry and the cultivation of crops, vines and fruit from watercourses, areas liable to flooding and/or land where soil erosion or other land degradation may occur;
- The erection of any fence or gate to prevent access to a strategic fire break is prohibited (see also Local Planning Policy No. 21: Fire Management Plans);
- Applications for planning consent for fences may be dealt with by the Chief Executive Officer under delegation issued by Council in accordance with Section 5.42 of the *Local Government Act*; and
- Planning consent is not required for the repair or replacement of an existing fence.

LOCAL PLANNING POLICY NO. 26: WASTE MANAGEMENT

LPP 26 requires the following in relation to waste management in the Residential R2 Zone:

- It is Council's intention within the foreseeable future that:
 - there shall be no kerbside waste collection within Agricultural Resource, Light Industrial and Special Use Zones;

- there may be kerbside waste collection within Townsite and Rural Residential Zones.
- There shall be public landfills available for local waste disposal, with access to Shire residents on presentation of a tip pass.
- Local waste products shall be disposed of within the Shire only at public landfills or on-site, to the satisfaction of Council's Environmental Health Officer.
- Recycling facilities shall be provided at public landfills to assist in minimising waste generation.

LOCAL PLANNING POLICY NO. 28: POS DEDICATION ON REZONING

Consistent with the LPP 28, land is proposed to be ceded free of cost as public open space, within the Residential R2 zone. This land will be maintained by the Shire in the future as public open space.

LOCAL PLANNING POLICY NO. 32: DEVELOPMENT PLAN

LPP 32 requires a Development Plan to be prepared and submitted to Council for approval, as specified by Council. This report and Plan is prepared having regard to the information to be shown, as outlined in LPP 32 and the Scheme.

LPP 32 requires the endorsement of a Development Plan prior to subdivision of land.

3 LOCATIONAL CONTEXT

3.1 REGIONAL CONTEXT

The site is situated in the rapidly growing North-East region approximately 50km north of Perth, 2.5km north of the Great Northern Highway and 22km south of the Bindoon townsite, and 40km south of Gingin, as shown in **Figure 6**. The Midland sub-regional centre is located some 40 km immediately south of the subject site and provides an extensive range of commercial, retail and service opportunities. The Joondalup City Centre is located 35 km to the west and also provides comprehensive shopping and easy access to services including employment opportunities.

Regional education facilities within close proximity to the site include Gingin District High School (Primary-Yr10) and Toodyay District High School (Primary-Yr10). The subject site also benefits from key health facilities located at Joondalup Private Hospital, Swan District Hospital Campus (Midland) and Northam Regional Hospital.

The site is well connected to existing and planned regional movement networks such as Great Northern Highway, Brand Highway and the future Perth-Darwin Highway.

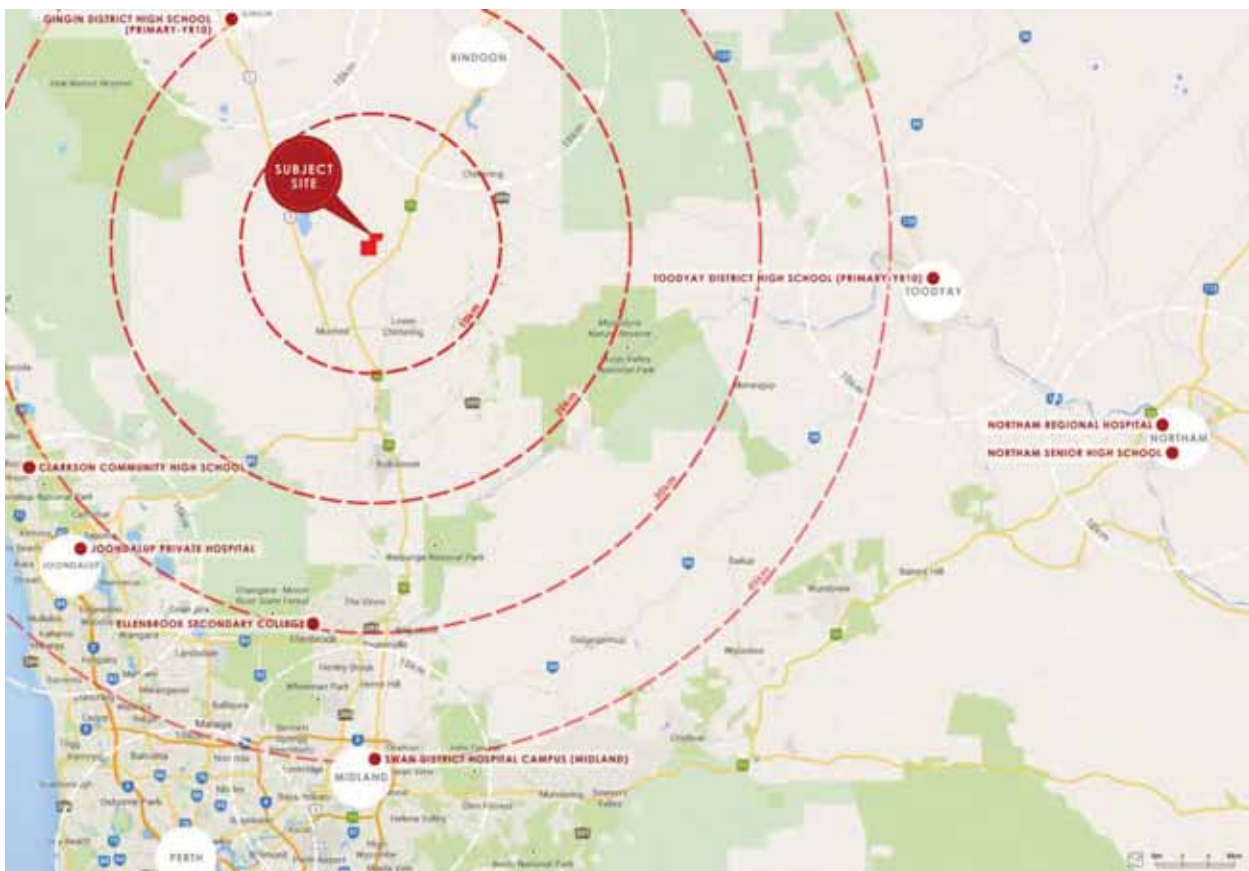


FIGURE 6 REGIONAL CONTEXT PLAN

3.2 DISTRICT CONTEXT

The site is located on the western side of Great Northern Highway between Chittering and Muchea, refer **Figure 7**. Bullsbrook, located approximately 20km to the south, is the largest centre within close proximity to the site.

A number of private and public schools operate within the surrounding context. Education facilities within a 20km radius include Gingin District High School (Primary-Yr10), Bindoon Primary School and Immaculate Heart College (Private, Kindergarten-Yr6). Toodyay District High School (Primary-Yr10) is located 45km east of the subject site.

The site is also serviced by a number of health facilities located within a 20km radius at Gingin Medical Centre, Bindoon Medical Centre and Bullsbrook Family Medical Centre.

Local conveniences are provided at the Muchea IGA X-Press (within 10km from the site), Bullsbrook IGA, Bindoon IGA and Gingin IGA X-Press.

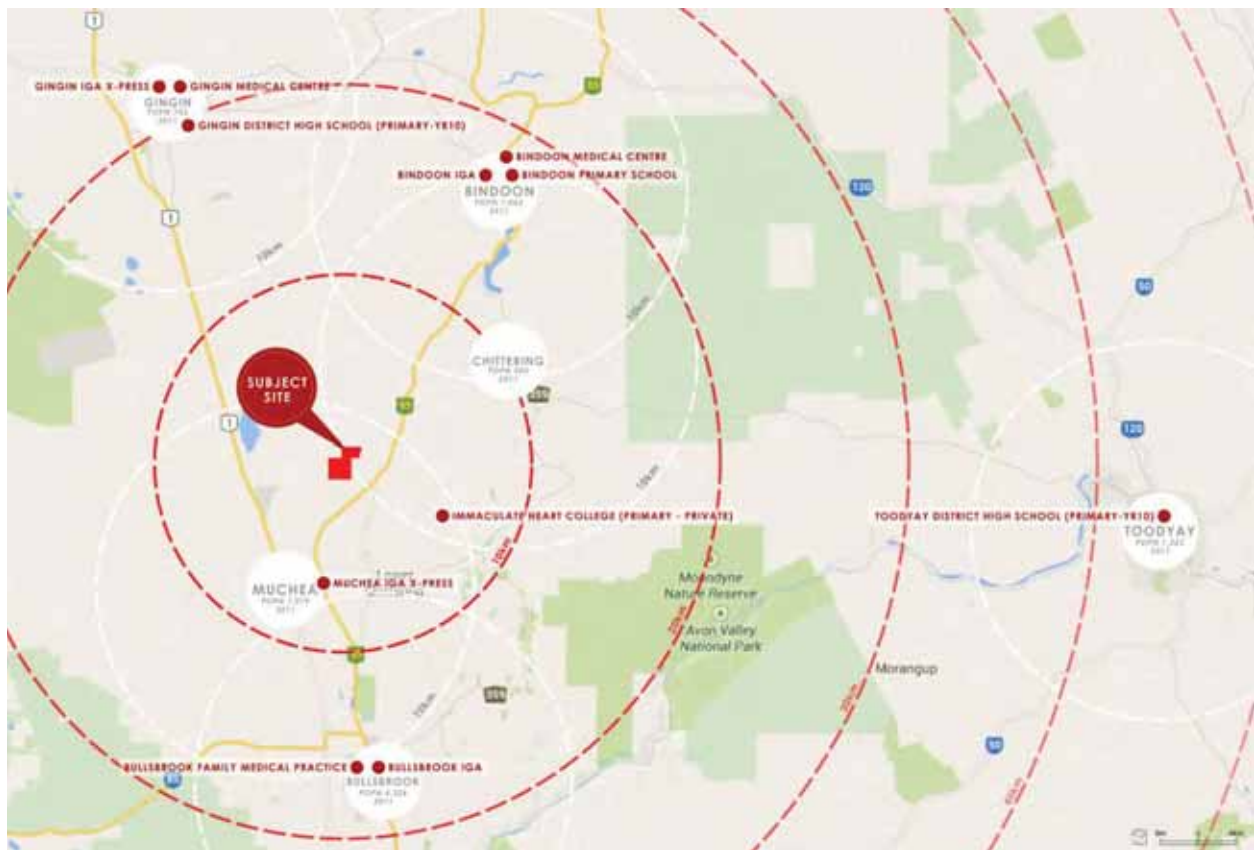


FIGURE 7 DISTRICT CONTEXT PLAN

3.3 LOCAL CONTEXT

The subject site is located on Reserve Road within the Shire of Chittering, approximately 50 km north of Perth, 2.5 km north of the Great Northern Highway and 22 km south of the Bindoon town site, refer **Figure 1**.

Within the site's immediate context, the subject site is bounded to the north and east by land zoned 'Rural Residential' (refer **Figure 5**). The land to the east is currently being developed in accordance with this zoning. The land to the north, west and south of the site is zoned as 'Agricultural Resource' and identified as Rural Retreat in Council's Local Planning Strategy (refer **Figure 3**). There is an existing dwelling and improvements located on the site.

The above reaffirms the strong relationship the site has with the existing regional, district and local context in support of the Development Plan and Scheme amendment. Having regard to existing and future strategic infrastructure and activity within the region, **Figure 6** and **Figure 7** demonstrate that the site is part of, and is well connected with, the regional framework.

There is an existing dwelling and improvements located on the site, refer **Figure 2**. These will be retained as part of the proposal.

3.4 ACCESS

Access to the subject land is provided via Great Northern Highway, Reserve Road and Rosewood Drive. Reserve Road extends along the entire western boundary of the site. One kilometre of the southern portion of Reserve Road is constructed to a bitumen finish with the balance comprising gravel. The future Perth-Darwin highway is located to the west of the subject land. The site is therefore well located with strong road linkages and accessibility, both north and south.

4 ENVIRONMENT

4.1 SITE DESCRIPTION

The subject site is situated on the Dandaragan Plateau east of the Darling Scarp, in the Brockman River Catchment. The subject site occurs on low sand hills with slopes gently to the east, with topography varying from approximately 140m to 165m AHD.

The free draining sandy soils show no evidence of definable watercourses or streamlines. Rocky Creek to the south is the only nearby watercourse and any runoff would be by means of dissipated flows through the porous soils and percolation into the water table, which flows in a southerly direction to Rocky Creek and then to Ellen Brook systems.

For Lot 9001, **Table 3** indicates the Land Management Units:

TABLE 3 LAND MANAGEMENT UNITS AT LOT 9001 ROSEWOOD DRIVE (BESSELL-BROWNE UNPUB).

Unit	Name	Description	Soils
222MB_1	Mogumber 1 Subsystem	Undulating broad crests and very gentle upper slopes <10% with common lateritic duricrust outcrop and shallow gravelly sands. Low woodland and shrubland of <i>E. tottiana</i> and <i>Acacia</i> spp.	Shallow gravelly sands
222Mb_2	Mogumber 4 Subsystem	Gently to moderately inclined slopes <10% with shallow gravelly sands and few areas of lateritic outcrop. Low woodland with some <i>C. calophylla</i> and <i>E. marginata</i> also with <i>E. tottiana</i> , <i>Dryandra</i> spp. and <i>Acacia</i> spp.	Shallow gravelly sands
222MB_3	Mogumber 3 Subsystem	Gently inclined undulating slopes and minor drainage head-waters. Deep grey siliceous or bleached sands. Low woodland and shrubland of <i>C. calophylla</i> and <i>Acacia</i> spp.	Deep grey siliceous or bleached sands
222Mb11	Mogumber 11 Subsystem	Drainage depressions in gently sloping (<10%) plain. Duplex brown and yellow duplex soils that are often gravelly. Low woodland of <i>C. calophylla</i> and <i>E. wandoo</i> with the occasional <i>E. marginata</i> , <i>Banksia</i> and <i>Allocasuarina</i> spp.	Duplex brown and yellow duplex soils that are often gravelly.

Lot 2 Reserve Road, with the exception of some stands of vegetation, has been cleared of native vegetation for floriculture, in particular native flower production. A brick and tile dwelling and associated farming infrastructure, which includes a shade house, packing sheds, water tanks and reticulation are located in the south west corner of the property. Water is currently supplied to the site by means of an artesian bore and superficial aquifer.

4.2 VEGETATION

4.2.1 ENVIRONMENTAL PEER REVIEW – 360 ENVIRONMENT

360 Environment has been engaged by Riverside Investments to address environmental matters associated with the subject land, and in particular consider comments raised by the Chittering Landcare Group. A copy of the correspondence can be found in **Appendix B** and a summary of the advice is outlined below:

- 360 Environmental notes that Black Cockatoo species were not identified as potentially using the site in the VDM reports. These species are listed as having conservation significance at the State and Federal levels. A report is currently being prepared to address whether the development area contains Black Cockatoo foraging and breeding habitat and how much would be cleared by the proposed development. A determination will then be made to determine if it is necessary to provide a referral in accordance with the Federal EPBCT Act once the results of the assessment are known. At this stage it is not considered that the presence of Black Cockatoo habitat will be of significance as the environmental approval process at the state and Federal levels allow for the offsetting of any impacts by the acquisition of other suitable land for conservation purposes.
- 360 Environment notes that the development is in the Ellenbrook sub-catchment of the Swan - Avon Lower Swan Catchment, however consider that this observation by VDM has no implications with regard to the adequacy of the findings of the VDM report.
- The flora survey was conducted in either December 2005 or September/October 2007 depending on which part of the document is being read. VDM's environmental vegetation survey is dated January 2008, refer Appendix C.
- 360 Environment has performed database searches as part of its review and it was found that none of the flora species listed in the 2005 and 2008 VDM reports is currently considered of conservation significance.

4.2.2 SURVEYS

A basic ecological assessment was undertaken for Lot 2 Reserve Road by Belleng VDM Pty Ltd in December 2005. The report recommendations are reflected in the preparation of the Development Plan. A full copy of the report is appended in **Appendix D** and a summary of the findings are outlined below.

- The existing vegetation on site comprises a mosaic of planted vegetation, due to the use of the site as a plant nursery, which is highly disturbed by non-declared weedy grasses.
- There were no species of state, federal or local fauna identified on the site and it was also established that there were no significant habitat species identified during the basic fauna survey. There was the identification of one mature Blackbutt on the southern boundary of the site which may provide habitat for native fauna, however, it is considered that given the isolation of the tree from surrounding areas it is unlikely to be used as habitat for the fauna expected to occur in the area.
- There were no wetlands, water bodies or drainage lines within the site.

A Vegetation Survey was undertaken by VDM Environmental in September and October 2007 for Lot 9001 Rosewood Drive. A full copy of the report is appended in **Appendix C** and a summary of the findings are outlined below.

- Two System 6 Vegetation Complexes occur on the property; both are extensive in the Muchea sandplain area and neither is considered to be under immediate threat.
- No Threatened Ecological Communities were identified at Lot 9001.
- A number of declared rare flora and conservation priorities species are located in the vicinity of Lot 9001, however these were not identified on the site during the flora survey.
- There was no indication of Dieback.
- Extant native vegetation consists of *Corymbia calophylla* – *Eucalyptus marginata* – *Banksia* sps dominated woodlands with a variable open to closed understorey consisting of numerous woody shrubs and herbaceous species. Stands of tall *Adenanthos cygnorum* shrubs dominate locally. Variation in plant community floristics and structure is related to soil type. Three communities were recognised and these relate to topographic features and substrate. Plant community health is good with peripheral weed invasion being the main disturbance.
- The vegetation on the site was observed to be in consistently good condition with low level disturbance and, as an ecological linkage, can be maintained via the retention of vegetation outside building envelopes.

4.3 EFFLUENT DISPOSAL

Effluent produced from each household is proposed to be discharged to an Aerobic Treatment Unit for each lot, discussed in further detail in **section 6.2**.

ATU design will be to the Department of Health's Guidelines for Aerobic Treatment Units for single service dwellings.

4.4 ACID SULFATE SOILS

The subject site is located in the Low to No Risk of Actual (ASS) and Potential (PASS) Acid Sulfate Soils at depths of >3m. In consideration of the topographical and geological location of the site coupled with the Low to Nil Risk Classification of the site, ASS is not considered to be a constraint on the site.

No potentially contaminating land uses and/or activities were identified and there are no records of contamination at and/or complaints about the subject site. In the absence of visible signs of staining and/or residues at the surface of past and/or current contamination, no further assessments are deemed necessary.

4.5 DIEBACK CONSIDERATIONS

Based on site investigations by VDM Environmental there are currently no dieback implications over the subject site. However, in accordance with Section 5.8.1 (f) of the Scheme the following dieback mitigations measures will be put in place when the site is being developed:

- Ensuring, by visual inspection and/or cleaning, that vehicles, plant, equipment, foot-ware and bicycles etc are clean when entering an uninfested area (i.e. free of soil and plant material).
- Ensuring that any basic raw materials (rock, stone, gravel, soil and sand) being used on site are free of *P. cinnamomi*.
- When planting seedlings that were raised in nurseries it is essential that only uninfected planting stock in sterilised soil is utilised and that care is taken during seedling transport to ensure that the seedlings do not come in contact with infested soil or plants.
- Water draining from areas likely to be infested should be directed away from uninfested areas.

CALM 2004, *Best practice guidelines for the management of Phytophthora cinnamomi*, Public Consultation draft, Department of Conservation and Land Management, Western Australia.

4.6 ENVIRONMENTAL CONCLUSIONS / RECOMMENDATIONS

With respect to environmental considerations required to be addressed in the subdivision design, the following has been provided:

- Conservation of vegetation in a 20 ha Conservation Lot with Conservation covenants in place to ensure protection of the vegetation.
- A report is currently being prepared to address whether the development area contains Black Cockatoo foraging and breeding habitat. It will then be determined whether it will be necessary to provide a referral in accordance with the Federal EPBC Act once the assessment are known. It is not considered that the presence of Black Cockatoo habitat will be of significance as the environmental approval processes at the State and Federal levels allow for the offsetting of any impacts by the acquisition of other suitable land for conservation purposes.
- Where consistent with the recommendations of the Fire Management Plan, vegetation will be retained in a managed open parkland, which will warrant some thinning of vegetation to lower fuel loads.
- Planting in already cleared areas of some vegetation including local eucalyptus and banksia species within road reserves and cleared lots may be undertaken.
- A landscaping plan for the development is anticipated to be prepared as a condition of subdivision approval.
- Clearing within Building Envelopes, together with managed open parkland for areas outside of Building Envelopes, will assist with minimising clearing and housing will be able to facilitate screening using existing vegetation.
- Incorporation of water sensitive design principles.

5 PROPOSED DEVELOPMENT PLAN

5.1 LOT DESIGN

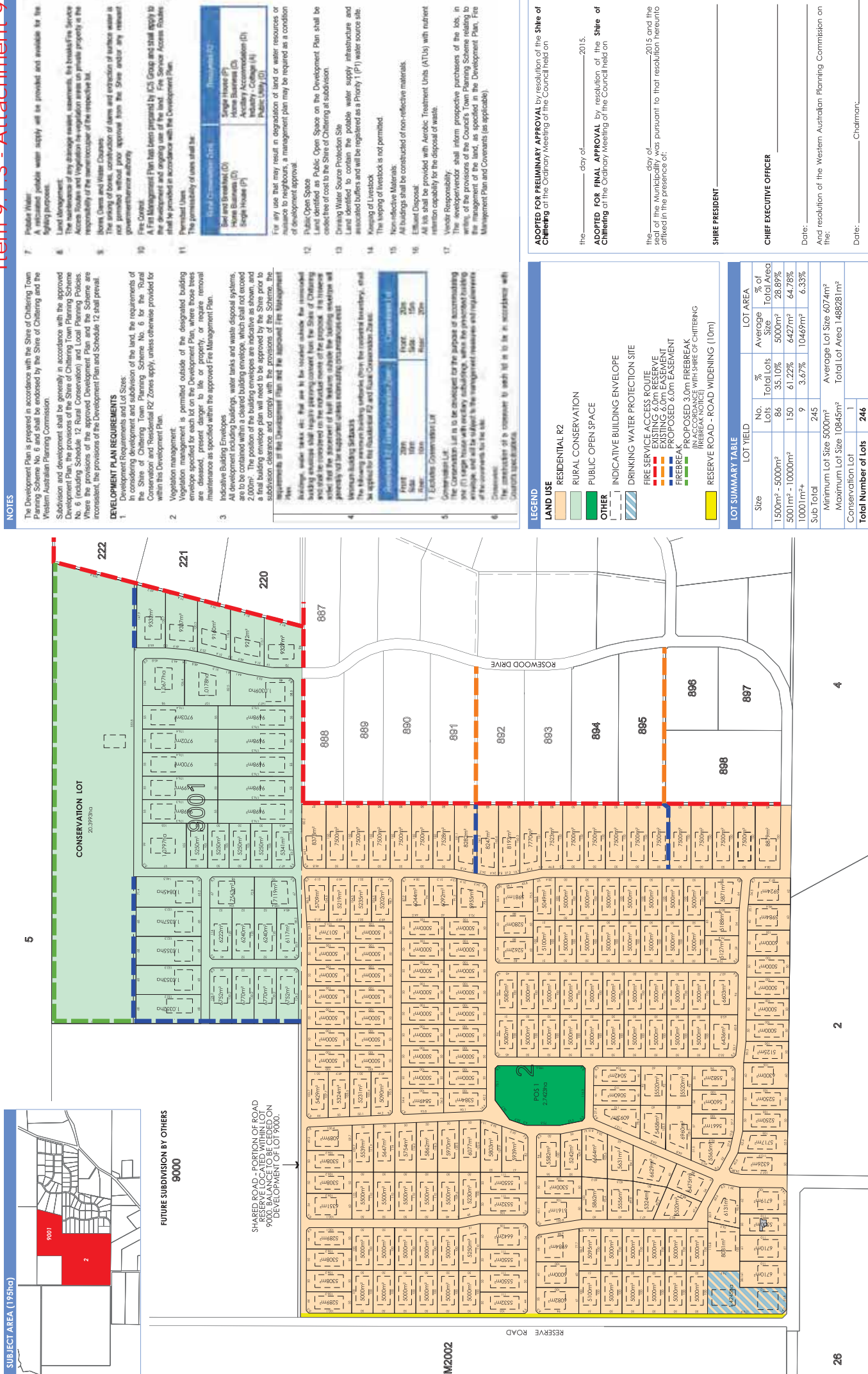
The proposed subdivision will create 246 lots, predominantly 5,000m² in land area within Lot 2 Reserve Road; as well as a lot for Drinking Water Protection Site; and larger lots between 5,250m² to 1.0677 ha, as well as one 20 hectare Conservation Lot, within Lot 9001 Rosewood Drive. The average lot size across the Development Plan area is 6,074m² (excluding the Conservation Lot). Each lot will be connected to a potable water source provided by a licensed water provider, which supports the minimum lot size of 5,000m² (refer **section 6.3** on water provision). The provision of 5,000m² lots has been proposed given the availability of water and the minimal site constraints for Lot 2 Reserve Road, which includes the subject site's gentle undulation and lack of local native vegetation on Lot 2 and no water courses on Lots 2 and 9001. An existing dwelling and some outbuildings on Lot 2 can be retained within the proposed lots within the subdivision layout. **Figure 8** Development Plan is included overleaf.

In addition to the policy provisions of the Local Planning Strategy, the proposed design concept has been formulated around the following criteria:

- To create a subdivisional form which is responsive to the physical and environmental sensitivities of the land;
- To create a subdivision design that provides for an ecological link across the northern aspect of the subject site;
- To create a subdivision which is conducive to an effective fire management strategy, consistent with the latest guidelines;
- To acknowledge the future development potential of adjoining land and provide for future continuity between developments.
- Due to the regular shape of the subject land, regular orientation and layout of lots orientated to Reserve Road.

5.2 MOVEMENT NETWORK

The subject site has its primary frontage from Reserve Road. Three access points to the subdivision are proposed from Reserve Road, creating a legible and robust street network. Two of the access points are wholly within Lot 2 and will be landscaped to create a sense of arrival. The southern access point will create a T-junction with Reserve Road, and is proposed to be a slightly wider road reserve to incorporate landscaping and an entry road appearance to the development. The second access point is midway along the western boundary of Lot 2 Reserve Road, which terminates internally at the proposed public open space. The third, northern, access point is proposed to be shared with future development of Lot 9000 Reserve Road, which is not part of this proposal. This access point creates an east-west access street that logically terminates with a proposed intersection to Rosewood Drive.



Connectivity to the rural residential development immediately to the east is proposed, by road connections to the south and north of Rosewood Drive. These road connections will be of a width and construction standard to coordinate with the levels and design of existing Rosewood Drive. This supports alternative means of movement for residents for accessing the district and regional road network, as well as alternative means of entry/escape in the event of bushfire or other emergencies.

The internal roads facilitate a high degree of connectivity and have a meandering road design where appropriate to limit vehicle speed. The road network within the subject site is logical and interconnected to create a regular layout which focuses on a sense of arrival within the design by converging the network towards an internal public open space. All roads extend either north-south or east-west, promoting good solar access opportunities in housing construction. The proposed within the design are 20 metres in width and are proposed to be sealed. The logical road grid is supportive of emergency service movement.

One proposed street is proposed as a future connection through to Lot 9000. For the interim, this street will be a cul-de-sac yet will provide access to the proposed Fire Service Access Route between Lot 9000 and Lot 9001.

It is proposed that the developer will construct the subdivisional roads within the subject site for handover to the local government.

5.3 INDICATIVE BUILDING ENVELOPES

In accordance with the Scheme and the Shire's policy requirements, building envelopes are provided on the Development Plan for all lots.

Building envelopes are indicative on the Development Plan for the purposes of illustrating the setback principles. The final positioning of Building Envelopes would need to comply with the provisions of the Scheme, the requirements of the Development Plan and the approved Fire Management Plan. Building Envelopes will be located accurately at the subdivision stage in consultation with Council Officers and a Licensed Surveyor, such that all parties are satisfied with the location of the Building Envelopes. The envelopes will be surveyed and pegged at this time. It is expected that an appropriate subdivision condition will be imposed in this regard.

All structures are required to comply with Council requirements and be contained within building envelopes where identified. Building envelopes are permitted to be a maximum of 2000m². Buildings, water tanks, etc that are to be located outside of nominated building envelopes will require planning consent from the Shire of Chittering and shall be considered on the individual merits of the proposal. It is, however, noted that the placement of built features outside of building envelopes will generally not be supported unless extenuating circumstances exist.

The building envelope within the Conservation Lot (20 hectare lot) is indicated to be setback 20 metres from subdivisional roads, 15 metres from side boundaries and 20 metres from rear boundaries, in accordance with clause 5.8.2 of the Scheme.

For the remainder of the Rural Conservation and Residential R2 Zoned lots, the building envelopes are based on the setbacks for the 'R2' density coding as contained in Table 1 of the Residential Design Codes, refer **Figure 9**, being 20 metres from the primary street, 10 metres from a secondary street and 10 metres from other/rear boundaries. The building envelopes are sited based on the principle of being located 20 metres from the primary street frontage, setback 10 metres from side boundaries, and extending towards the rear of properties to a maximum area of 2,000m². This ensures that development would be located towards primary streets and centrally within lots, to optimise setback distances between dwellings to the sides and rear.

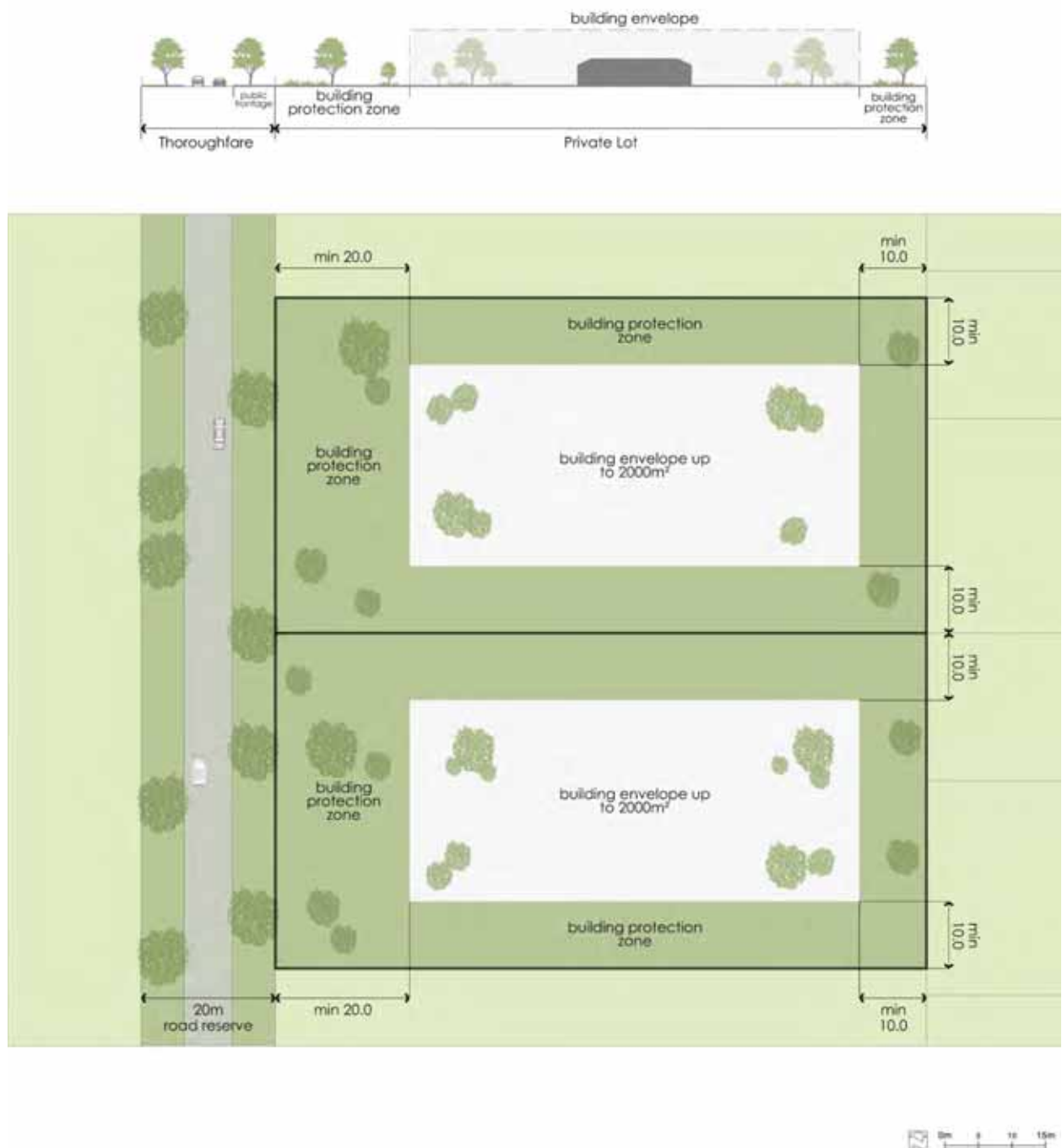


FIGURE 9 INDICATIVE BUILDING ENVELOPES AND CROSS-SECTION – TYPICAL LOTS

5.4 YIELD AND POPULATION

A total of 246 lots are proposed to be created. The 2011 Census indicates an average of 2.7 persons per household within the suburb of Chittering, which is consistent with the remainder of the Shire of Chittering local government area. Based on this guide, approximately 664 people will be accommodated within the development.

5.5 FIRE MANAGEMENT

A number of different bushfire protection planning documents, standards and requirements are currently in place, or are proposed, in Western Australia. These documents, standards and requirements are not always consistent. **Section 2.1.2** (and **section 2.2.4** in relation to LPP 21 Fire Management Plans) provides an overview of the documents which are currently in place and which were incorporated in the bushfire risk management solutions for the proposed development of Lot 2 and Lot 9001. Further background information is provided below.

BUSHFIRE-PRONE AREA MAP

The Department of Fire and Emergency Services has recently carried out mapping to identify and designate bushfire-prone areas in Western Australia. It is understood that a bushfire-prone area map has been developed for the Shire of Chittering, but that this map is not yet available to the public (DFES 2014).

For the purpose of this Fire Management Plan, it is assumed that Lot 2 and Lot 9001 will be designated as a bushfire-prone area.

SHIRE OF CHITTERING FIREBREAK NOTICE 2014-15

The Shire of Chittering issues an annual Firebreak Notice. The Notice may change from year to year. The Firebreak Notice for 2014-15 lists a number of requirements, including:

- On lots which are less than 2 hectares, boundary firebreaks are not required. These lots should meet the requirements listed under General Fire Hazard Reduction.
- Lots with an area greater than 2 hectares must maintain 3m wide firebreaks clear of all flammable materials along the inside boundary of the property. A 4m vertical clearance along the firebreak is also required.
- 20m wide Building protection zones must be maintained around all buildings. Bushfire fuels in building protection zones must be maintained below 2t/ha.

5.5.1 BUSHFIRE RISK MANAGEMENT – SOLUTIONS

As mentioned above, a number of different bushfire protection planning documents, standards and requirements are currently in place, or are proposed, in Western Australia. These documents, standards and requirements are not always consistent. Furthermore, changes are expected to be made to the new draft SPP and *Guidelines* before they are adopted in May 2015.

The bushfire risk management solutions contained in the Fire Management Plan are based on the performance criteria listed in the draft *Guidelines*. However, in cases where the requirements contained in the different documents are inconsistent or have shortfalls, the solutions were developed to meet the requirements of the *Australian Standard for the Construction of buildings in bushfire-prone areas* AS3959.

VEGETATION MANAGEMENT

Lot 2 Reserve Road was previously used as nursery and as such the vegetation on-site is not representative of endemic vegetation complexes. Vegetation cover varies significantly and includes open paddocks (grassland), scrub and shrubland as well as *Banksia* woodland. These *Banksia* woodlands were all introduced to this site.

Vegetation cover on Lot 9001 Rosewood Drive is *Xanthorrhoea* – *Eucalyptus* woodland, *Adenanthos* woodland and *Banksia* – *Eucalyptus* woodland).

In order to reduce bushfire attack levels within the proposed development, most of the vegetation on Lot 2 and Lot 9001 will be managed as open parkland. Bushfire fuel loads across the site will generally be maintained below 2t/ha, in accordance with the requirements for building protection zones (refer to **Figure 8** for detail).

The vegetation on the Conservation Lot can generally be retained in its current form, except adjacent to buildings, where bushfire fuel loads have to be maintained low to reduce bushfire attack levels to achieve compliance with AS3959.

Where vegetation is introduced in cleared or disturbed parts of the development, it must also be maintained generally below 2t/ha, in accordance with requirements for building protection zones.

BUILDING PROTECTION – AS3959

- All habitable buildings will be constructed to comply with the *Australian Standard for the Construction of buildings in bushfire-prone areas* AS3959.
- Habitable buildings should not be constructed in areas where the level of bushfire attack is BAL-40 or BAL-FZ. Sufficient separation must be maintained between a habitable building and classified vegetation so that the bushfire attack level is reduced to BAL-29 or less.
- Increased setback distances for houses have been specified along the eastern boundary adjacent to the existing rural residential lots, as well as on lots which abut the Conservation Lot. This ensures that building protection zones do not extend into the adjacent rural residential lots and into the Conservation Lot.
- Site specific bushfire attack level assessments must be completed in accordance with AS3959 to determine the level of bushfire attack and minimum construction requirements when building plans are prepared and submitted to Council.
- As a minimum, all habitable buildings in this development must be constructed to BAL-12.5, even when houses are located in an area where a bushfire attack level assessment carried out under AS3959 has classified a site as BAL-Low, as ember attack can still impact on buildings.

Note: The Department of Fire and Emergency Services advised that the proposed bushfire prone area maps and the associated regulations will be released in May 2015. This will enable AS3959 to be applied.

VEHICULAR ACCESS

Refer to the Development Plan () for the location of roads and **section 5.2** for a description of the movement network.

- Within Lot 2 and Lot 9001, a network of through roads provides access for residents and emergency services.
- Roads leading into and out of the development, and within the development, are suitable for use by conventional 2wd vehicles.
- Fire Service Access Routes along the eastern boundary of Lot 2 and Lot 9001, and along the boundary between Lot 9000 and Lot 9001, provide additional access for fire services.
- Two Fire Service Access Routes will also be established to connect the Fire Service Access Route along the eastern boundary of Lot 2 with the road network in the development.
- A 3.0m firebreak is proposed on the western and northern boundary of the Conservation Lot.
- The following standards apply to Fire Service Access Routes:
 - a minimum of 6m wide;
 - hard surface;
 - turn around areas every 500m;
 - where necessary, corners will be truncated;
 - where required, gates will be installed to provide access for fire crews to the rear of lots;
 - gates and signs will be installed where Fire Service Access Routes connect to public roads;
 - Fire Service Access Routes will be located within a reserve vested in the Shire of Chittering or within an easement in accordance with Local Planning Policy No 21;
 - the cost of maintaining Fire Service Access Routes will be levied against individual lots within the development.

WATER SUPPLY AND FIRE HYDRANTS

- A reticulated water supply will be established for this development.
- Fire hydrants will be installed along roads within the development.

5.6 STOCKING RATES

The keeping of livestock (such as for pigs, horses, poultry or any grazing stock) shall not be permitted.

5.7 PUBLIC OPEN SPACE

2.7423ha of public open space is proposed centrally within the development to optimise its proximity to surrounding lots. Given the vegetation to be retained on sites, and the variety of larger lot sizes, it is considered that this public open space will supplement the amenity enjoyed by residents. The public open space is proposed to be reticulated and partly landscaped, in consultation with the Shire, for the enjoyment of the local community.

5.8 FENCING

All lots will be fenced to a rural standard, to be determined by the Developer in accordance with Council's LPP 22. The Developer proposes to fence all boundaries.

5.9 TIMING AND STAGING

Timing and staging will be determined by the Developer at the appropriate time.

5.10 MILITARY CONSIDERATIONS AREA

The Local Government shall not permit the construction and occupation of more than one dwelling or holiday or other short term accommodation on any one lot within the designated area. This only relates to the lots within Lot 2 Reserve Road.

Whilst our client acknowledges these provisions, further investigations have been undertaken and the subject land is outside specific ANEF contour relative to the RAAF base. Investigations with the City of Swan reveal that apart from those lots in close proximity to the RAAF base, the City of Swan has no specific development provisions outside of those areas.

It is therefore recommended that a review as to the necessity of the noise attenuation be undertaken as part of the Development Plan process.

5.11 RESPONSE TO SCHEME AND POLICY REQUIREMENTS

Clause 5.7 limits only one dwelling on any Rural Conservation lot, within the designated building envelope. Ancillary Accommodation may be permitted where it is proposed to be located within the building envelope.

Clause 5.8 requires planning approval for subdivision and development of rural conservation land.

Clause 5.8.1 requires the preparation of a Development Plan to accompany a subdivision application for rural conservation subdivisions. It is evident that the proposed subdivision and development plan has been prepared based on the Scheme and all state and local government policy requirements. In particular, in response to clause 5.8.1 which outlines the requirements to be addressed in the preparation of a Development Plan, the following comments are made:

- a) All lots are greater than 5,000m² in land area, with areas and dimensions for lots and indicative building envelopes identified on the Development Plan.

- b) An area of public open space is identified, which is in a central location to provide for recreation, amenity and landscaping for flora and fauna purposes.
- c) Fire Service Access Routes are provided, as shown on the Development Plan. The details of these are outlined in Fire Management Plan that is currently being prepared, refer **Appendix F**.
- d) Water erosion and catchment management performance of the site is to be enhanced by the proposed development, with revegetation where compatible with the Fire Management Plan, to be undertaken by the developer and individual purchasers.
- e) Existing vegetation will be managed as open parkland and landscaping across the whole development.
- f) Dieback was not identified in environmental studies for the subject site. Should, however, dieback be identified, corrective measures have been identified within the report.
- g) Land has been allocated within the Development Plan for the provision of a water supply (and water treatment plant), with infrastructure for effluent treatment, greywater re-use (where applicable) being incorporated into individual Building Envelopes.
- h) Aerobic treatment units are proposed within all lots.
- i) The development plan recognises future development plans both north, existing development to the east and provides road linkages to existing roads.
- j) The proponent is aware of its obligations under the Wildlife Conservation Act 1950 and the Environmental Protection and Biodiversity Act 1999, and will ensure compliance as required.
- k) As discussed in the Development Plan, there are no watercourses or areas of inundation located within the subject site. Drainage and infrastructure is discussed in the report.
- l) No areas have been identified to comply with an Environmental Management Plan as the particular details are otherwise addressed by the Development Plan and report. In lieu of an EMP, the approved Fire Management Plan will make recommendations regarding vegetation management. The Development Plan defines building envelopes and access. A Conservation covenant will be applied to the Conservation Lot. Management requirements are outlined on the Development Plan.

6 SERVICING

6.1 ROADWORKS

Access to the subject land is provided by Reserve Road which extends north-south from Great Northern Highway. Reserve Road extends along the entire western boundary of the site. One kilometre of the southern portion of Reserve Road is constructed to a bitumen finish with the balance comprising gravel. The future Perth-Darwin highway is located to the west of the subject land. The site is therefore well located with strong road linkages and accessibility, both north and south.

All internal roadworks will be designed and constructed in accordance with the requirements and standards of the Shire of Chittering as appropriate to the regulatory control requirement of the individual roads and hierarchy requirements. Roadworks will generally consist of rural standard road pavements.

The entrance road from Reserve Road to the south of Lot 2 into the development will be subject to high level treatments to provide an 'Identity entry statement'. The intersection treatment onto perimeter distributor roads will offer a high level of control for all traffic flow.

All road reserves within the development are proposed at 20m, except where connection with existing road reservations is required (25m wide road reserves). Minimum recommended carriageway widths will be selected with due reference to local authority and Community codes and will include parking provisions for local traffic.

The above reserve widths are also designed to accommodate the relevant services corridors required to provide reticulated essential services to the proposed development plus incorporate substantial planting zones along the road reserve boundaries.

The internal streets are designed to include both drainage (refer **section 6.4** of this report) and on street planting with native vegetation. This will mean that some streets will ultimately be designed with planting and drainage on both sides of the street and some will be designed to include drainage and planting on one side of the street only. This is considered to be a detailed design matter and the final design will be subject to the approval of the Shire of Chittering.

Existing perimeter roads will require upgrading to a full seal width of 7.4m (two coat seal). This will apply to the extension south along Reserve Road from the subject land to where the seal currently stops. This upgrade is well outside the development area and a recoup in the construction costs from future subdividers along this route will be possible under the *Planning and Development Act 2005*. Road widening to the extent of Reserve Road abutting Lot 2 is proposed in order to provide for a 30m wide road reserve.

6.2 EFFLUENT DISPOSAL

Reticulated sewerage infrastructure will not be provided to the development.

Effluent produced from each household is proposed to be discharged to an Aerobic Treatment unit for each lot. Aerobic Treatment Units, or ATU's, allow for treatment of raw effluent to a level acceptable for reuse in garden beds (non-contact). This process will reduce the potable water requirements for each lot, whilst providing beneficial reuse from a waste product. ATU design will be to the Department of Health's Guidelines for ATU's for single service dwellings and an approved Leach Drain or other DoH approved dispersal system.

Standard Water Corporation sewerage headworks charges will not apply to this development.

6.3 WATER SUPPLY

There is no Scheme water available in the area.

The potable water system proposed will be extracted groundwater from the Leederville Aquifer. The aquifer has been identified as a confined aquifer which has a lower requirement for a water quality protection plan. Although the limited water quality data currently available shows that the water is suitable for potable purposes with all analysed parameters meeting the *Australian Drinking Water Quality Guidelines for Health* it does have two low level exceedences (Fe and Mn) for the aesthetic water quality guideline values.

Further bore testing and water analysis will be undertaken in 2015 to gain a better understanding of the aquifer water quality and provide the necessary information for the water treatment plant system design.

This confined aquifer will be compatible with the proposed on-site effluent disposal system proposed for each household. The aquatard between the unconfined and confined aquifers will provide the required barrier for the protection of the source water and will be covered in the Source Protection Plan.

The potable water system will be treated to meet the *Australian Drinking Water Guidelines* (2011) for microbial, chemical and physical properties for both aesthetic and health guideline values. The water will be delivered to customers under pressure and on demand meeting the conditions as described in the Water Supply Code of Australia V3.1 (WSAA). It will be a four stage process of Aeration, Filtration and Disinfection

The system will consist of water treatment and multi barrier disinfection system required for the sustainable production of 'safe' drinking water.

Stage 1 - Water extraction, the bore will be developed in accordance with the *Minimum Construction Requirements for Water Bores in Australia* (February 2012) as required by the Department of Health. The installation of the bore will be undertaken to mitigate any risk of contamination of the Leederville Aquifer and hence the source water. All material used will be suitable for drinking water. The system will have a second bore to ensure as a contingency to any unforeseen incident that would impact source water supply.

Stage 2 - Primary treatment and disinfection, the water will undergo advanced oxidation and disinfection using Ozone. This will precipitate excess manganese and iron in the water to ensure it meets the *Australian Drinking Water Quality Guidelines* criteria for both health and aesthetic requirements. The use of Ozone provides a number of benefits including: high efficiency of oxidation, highly flexible to meet needs if water quality changes, provides one of the best levels of water disinfection available without problematic disinfection by products and does not require the importation of costly or dangerous chemicals.

Stage 3 - Filtration, sand filters will be used for the removal of Stage 2 precipitants and any other particulate material that may be characteristic of the source water. Filter back flush water will be discharged to a geotextile bag for storage and eventual removal from site. The balance of the discharge water will be used for the amenity irrigation of the water treatment plant site.

Stage 4 - Storage and Disinfection, there will be significant balance storage onsite to ensure adequate treated water to meet the supply requirements as set out in the *Water Supply Code of Australia V3.1* (WSAA). There will be further disinfection of the water as water is supplied to the reticulation network from storage. This disinfection will use liquid chlorine due to its long residual and its wide acceptance by the water and health regulators. The use of ozone as an oxidiser and pre disinfectant when integrated with chlorine disinfection will reduce the risk of the production of disinfection by products associated with chlorine disinfection alone, providing Reserve Road residents with possibly the best quality water in WA and Australia, and Aqua Ferre Pty Ltd will be the water supply service provider and will hold the necessary licences as required in Western Australia. Preparation of the application for an ERA Water Supply Services licence is underway and will be secured prior to the supply of water to customers. The application process will be undertaken concurrently with property sales and treatment plant design and construction.

It is anticipated that reticulated water will be a condition on the approval of both the Development Plan and subdivision application. This will allow subdivision of the lots down to 5,000m² in size. With respect to this and in relation to SPP 2.5:

- Council's Scheme and Local Planning Strategy permit subdivision within the Residential R2 zone with a minimum lot size of 5,000m² over the subject site.
- A reticulated water supply will be provided to an appropriate standard as determined by the Water Corporation, who will also be the licensed water provider. This also meets the requirements of clause 5.8.5 of the Scheme.
- Buffer requirements and site area to be given up for the treatment plant (30m buffer requirement).
- In accordance with the requirements of the Fire Management Plan and *Planning for Bushfire Protection*, fire hydrants will be strategically located within road reserves. The water provision to these hydrants will come from the reticulated water supply.

6.4 STORM WATER DRAINAGE

Stormwater is to be managed effectively within road reserves.

Preliminary discussions with the Shire of Chittering indicates that the design philosophy for drainage in the area is to ensure that downstream discharges are limited to existing flows, which includes compensation and nutrient stripping prior to being allowed to overflow into the adjacent road drainage networks and the river foreshore area.

Stormwater collection disposal strategies will incorporate storage and flood attenuation prior to discharge to existing watercourses, should any occur.

Roundabouts will also be constructed, where appropriate, and can be used as a detention basin for the disposal and treatment of stormwater during rain events, where possible.

All road reserves will be drained with rural standard open drains and drainage swales designed in accordance with water sensitive design techniques discharging to soakage basins within the lots. Any soakage or compensation basin systems will require an easement in favour of the local authority and should be extensively landscaped to encourage nutrient stripping and natural filtration of the stormwater drainage.

In general, stormwater management for all development options would comprise the following general features:

- Localised infiltration of stormwater on each lot.
- Maximising on site storage and recharge of surface runoff into existing aquifers.
- Limiting runoff to pre-development conditions by promoting filtration of runoff through enhanced natural vegetation and storage systems.

In addition the stormwater system will incorporate the following features:

- Runoff to be collected in the naturalised channels traversing the artificial biodiversity corridor
- Small check dams, constructed of rock pitching, will be located along the naturalized channels allowing detention and infiltration of stormwater as well as reducing the velocity of flow along the swales and drains
- Any flow at the south east corner of the subject land not contained will flow offsite along existing outfall channels and watercourses.

ROAD VERGES & MEDIANS

The use of verge drainage areas is required to enable areas of planting to benefit from seasonal 'passive irrigation'. Species selection will directly reflect the anticipated water regime ranging from permanently dry areas through to seasonal inundation.

The location of swales in verges and medians will create areas that are seasonally inundated and generally wetter than other areas. The selection of plant species for these areas will be determined in consultation with the Shire of Chittering.

6.4.1 WATER QUALITY CONTROL

Water quality from surface flows within the development areas will be controlled by incorporating nutrient stripping facilities within the proposed and existing soakage areas and formal landscaped features.

6.4.2 GROUNDWATER RESOURCE MANAGEMENT

Groundwater Resource Management will include limiting drainage inverts to above the established Annual Average Maximum Groundwater Level.

As discussed above, groundwater levels across the site are at medium depths but may be managed by careful water sensitive design management.

6.5 POWER, TELECOMMUNICATIONS AND GAS

6.5.1 WESTERN POWER

Preliminary information from Western Power indicates there is a service network within the vicinity of the subject land. It is anticipated that this network will have sufficient capacity to service the development with underground power.

Western Power will require that all lots within the proposed development will be served by extension of the existing infrastructure. At this stage the subject land is serviced by a combination of an overhead and underground distribution system (depending on the date of original installation). It is likely that an underground network will be required for the proposed development.

The cost of this work will need to be met in full by the developer. Standard Western Power requirements will apply.

6.5.2 STREET LIGHTING

Standard Western Power street lighting design principles would be adopted for the development.

Western Power will provide one point of connection and a separate reticulation system will be required to be designed and installed as a part of the construction of the reticulated lighting network.

6.5.3 TELECOMMUNICATIONS

Preliminary information from Telstra indicates there is a service network in the vicinity of the proposed development. It is anticipated that this network will have sufficient capacity to service the development with Telecommunication services.

Telstra will install any new telecommunication network facilities to the proposed lots, subject to the developer providing, at its cost, trenching for cable laying.

Alternatively, where cable routes match Western Power underground power supply routes, Telstra will wherever possible use the Western Power trenches in lieu of the developer providing additional trenching.

No headwork charges for Telstra services are anticipated.

6.5.4 GAS SUPPLY

It is envisaged that reticulated gas services are not available in the area. It is anticipated that the cost of providing a reticulated gas network will be cost prohibitive and will not be provided in this instance.

6.6 BULK EARTHWORKS/SITE WORKS

The majority of Lot 2 Reserve Road is cleared and developed previously as a wildflower farm. Extensive reticulation lines exist across the site and will be removed where building envelopes are proposed.

Preparatory works for development should be limited to the following:

- Demolition of selected existing outbuildings, slabs structures and remnant improvements. It is envisaged that the existing dwelling will remain on site.
- Removal of reticulation and farm related services other than in areas where landscaping treatments will require the retention of vegetation as appropriate to council requirements and bushfire protection measures.
- Stripping and grubbing of areas to be earthworked with due regard to retention of vegetation as appropriate for bushfire protection.

Consideration of landscape treatments for road verges, common areas, and site entries, will be an important feature of the re-development strategy of the site, being mindful of required bushfire management measures.

It is anticipated that the bulk earthwork operations for the subject land will be completed using material available from site with some importation of additional fill as required to fulfil any specific geotechnical obligations of the site.

Once the earthworks have been completed, the site will be temporarily stabilised (prior to construction commencing) either by the respreading of stockpiled topsoil from the bulk earthwork operations, or by hydromulch stabilisation as appropriate and in accordance with the requirements of the local authority.

7 CONCLUSION

This Development Plan has been prepared in support of a Scheme Amendment Request for rezoning Lot 2 Reserve Road from 'Rural Residential' to 'Residential R2' zone, and rezoning Lot 9001 Rosewood Drive from 'Rural Residential' to 'Rural Conservation' zone in the Shire of Chittering's Town Planning Scheme No. 6.

In reassessing the development of the subject site, the landowners have now taken account of:

- The requirement to supply water to the Muchea Employment Node;
- Providing additional land as a conservation area on Lot 9001 Rosewood Drive;
- Providing for fire escape/access from the existing development to the east through to Reserve Road;
- Addressing Department of Planning's desire to see increased density of development on Lot 2 Reserve Road; and
- Addressing the viability of the project and associated infrastructure costs for the development.

The Development Plan has been prepared in accordance with the Scheme provisions and local policy requirements. The Development Plan incorporates Council's engineering standards for roads and drainage.

Given that the Development Plan recognises the opportunities and constraints of Lot 2 Reserve Road and Lot 9001 Rosewood Drive, it is requested that the Shire of Chittering and Western Australian Planning Commission proceed to:

- Initiate the Scheme Amendment Request; and
- concurrently advertise the Development Plan/Report prior to formal consideration.

APPENDIX A CERTIFICATES OF TITLE

WESTERN



AUSTRALIA

RECORD OF CERTIFICATE OF TITLE UNDER THE TRANSFER OF LAND ACT 1893

REGISTER NUMBER 2/D52612	
DUPLICATE EDITION N/A	DATE DUPLICATE ISSUED N/A

VOLUME
1481FOLIO
704

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES



LAND DESCRIPTION:

LOT 2 ON DIAGRAM 52612

REGISTERED PROPRIETOR: (FIRST SCHEDULE)

RIVERSIDE INVESTMENTS (WA) NO 2 PTY LTD OF GROUND FLOOR, 2/110 HAY STREET, SUBIACO
(T J940076) REGISTERED 5 OCTOBER 2006

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS: (SECOND SCHEDULE)

- EXCEPT AND RESERVING METALS, MINERALS, GEMS AND MINERAL OIL SPECIFIED IN TRANSFER 13795/1960.
- *J940077 MORTGAGE TO AUSTRALIA & NEW ZEALAND BANKING GROUP LTD REGISTERED 5.10.2006.
- *J940082 CAVEAT BY VICTOR BRYON SAMPSON, HELEN RUTH SAMPSON AS TO PORTION ONLY LODGED 5.10.2006.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

-----END OF CERTIFICATE OF TITLE-----

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: 1481-704 (2/D52612).
PREVIOUS TITLE: 1239-991.
PROPERTY STREET ADDRESS: 200 RESERVE RD, CHITTERING.
LOCAL GOVERNMENT AREA: SHIRE OF CHITTERING.

NOTE 1: DUPLICATE CERTIFICATE OF TITLE NOT ISSUED AS REQUESTED BY DEALING J940077

WESTERN



AUSTRALIA

REGISTER NUMBER 9001/DP60794	
DUPLICATE EDITION 1	DATE DUPLICATE ISSUED 30/3/2009

RECORD OF CERTIFICATE OF TITLE UNDER THE TRANSFER OF LAND ACT 1893

VOLUME
2713FOLIO
537

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES



LAND DESCRIPTION:

LOT 9001 ON DEPOSITED PLAN 60794

REGISTERED PROPRIETOR: (FIRST SCHEDULE)

RIVERSIDE INVESTMENTS (WA) NO. 2 PTY LTD OF POST OFFICE BOX 8179, SUBIACO EAST
(T K982104) REGISTERED 22 JUNE 2009

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS: (SECOND SCHEDULE)

- EXCEPT AND RESERVING METALS, MINERALS, GEMS AND MINERAL OIL SPECIFIED IN TRANSFER 16014/1958.
- *K982105 MORTGAGE TO AUSTRALIA & NEW ZEALAND BANKING GROUP LTD REGISTERED 22.6.2009.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

-----END OF CERTIFICATE OF TITLE-----

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: DP60794.
PREVIOUS TITLE: 1586-272.
PROPERTY STREET ADDRESS: 356 RESERVE RD, CHITTERING.
LOCAL GOVERNMENT AREA: SHIRE OF CHITTERING.

NOTE 1: DUPLICATE CERTIFICATE OF TITLE NOT ISSUED AS REQUESTED BY DEALING K982105

[illegible]

APPENDIX B CHITTERING BIOLOGICAL REVIEW

Our Ref: 1032AA

23 April 2015

The Directors
Riverside Investments (WA) No 2 Pty Ltd
c/- Pendulum Group
5 Ord Street,
West Perth, WA 6005

Via Email: sjs@3rdwavecapital.com

Dear Stephen

Lot 9001 Rosewood Drive and Lot 2 Reserve Road, Chittering - Response to comments on VDM Reports

1. Introduction

360 Environmental Pty Ltd (360 Environmental) is currently retained by Riverside Investments (WA) Pty Ltd (Riverside), to address environmental matters associated with the proposed development of Lot 7 Rosewood Drive (now named Lot 9001) and Lot 2 Reserve Road, Chittering. As part of this work 360 Environmental has been asked to consider comments made by the Chittering Landcare Centre on environmental documentation previously prepared in relation to the site's flora, vegetation and fauna. This letter report provides responses to these comments.

The Chittering Landcare Centre was provided with the following environmental reports as part of the stakeholder consultation process for the project:

- Belleng VDM (2005). Basic Ecological Assessment – Proposed Rural Residential Development, Lot 2 Reserve Road, Chittering.
- VDM Environmental (2008). Vegetation Survey – Lot 7 Reserve Road, Muchea.

We understand that VDM Environmental/Belleng VDM Pty Ltd (VDM) was commissioned by Riverside to produce the above reports ten and seven years ago respectively. It is recognised that there have been changes in regulatory requirements for some aspects of biological surveys since these documents were written. We have considered these changes and also provide comment on the implications (if any) they may have on the findings of the VDM reports.

2. Black Cockatoos

Comment

360 Environmental notes that Black Cockatoo species were not identified as potentially using the site in the VDM reports. These species are listed as having conservation significance at the State and Federal levels.

Response

A review of the vegetation communities on the site has led to the conclusion that Black Cockatoo species could potentially utilise the site. Accordingly Riverside has commissioned 360 Environmental to prepare a Black Cockatoo habitat assessment for both lots.

A report is currently being written to address whether the development area contains Black Cockatoo foraging and breeding habitat and how much would be cleared by the proposed development. Riverside will determine whether it is necessary to provide a referral in accordance with the Federal EPBC Act once the results of the assessment are known. At this stage it is not considered that the presence of Black Cockatoo habitat will be of significance as the environmental approval processes at the State and Federal levels allow for the offsetting of any impacts by the acquisition of other suitable land for conservation purposes.

3. Chittering Landcare Centre Comments

Comment

There were no species of state federal or local fauna identified on the site and it was also established that there were no significant habitat species identified during the basic fauna survey....unlikely to be used as habitat for the fauna expected to occur in the Brockman Catchment." Although this probably is meant to refer to endangered species it also incorrectly refers to the subject land being in the Brockman River Catchment. This mistake is caused by incorrect conclusions – with the species list being taken from the Brockman River Strategy. The subject land is in the Ellen Brook Catchment. The Ellen Brook Catchment Management Plan has significant differences to

the Brockman River Strategy as the land form and soil and vegetation types are very different.

Response

We agree that the development is in the Ellenbrook sub-catchment of the Swan Avon-Lower Swan Catchment. We consider, however, that this observation has no implications with regard to the adequacy of the findings of the VDM reports given the following;

- We note that there have been changes in catchment boundaries since the VDM reports were written meaning that while the definition of the catchments may have changed, the area being referenced has not.
- That the VDM report does not identify any species of State, Federal or local significance and it was also established that there were no significant habitat species identified during the basic fauna survey.
- There is no comment in the VDM reports that suggest that species recorded during the assessments are restricted to the Brockman River Catchment.
- 360 Environmental considers that most species of flora and fauna listed in the VDM reports are widespread and common and occur on a variety of soil types.

We conclude that while the comment regarding catchments is correct as of today, it has no implications regarding the accuracy of the VDM report.

Comment

The flora survey was conducted in either December 2005 or September /October 2007 depending on which part of the document is being read. A very significant issue is that the Chittering Landcare Centre holds a copy of the VDM Environmental Vegetation Survey – the date of which is Issue No 1, January 2008. The date on the document given to the Shire of Chittering is Issue No1, December 2014, giving the impression that the report has only recently been conducted.

Response

The field component of the Basic Ecological Assessment was undertaken in December 2005 and the Vegetation Survey was carried out in September and October 2007. The Chittering Landcare Centre comment regarding the date of December 2014 on the report gives the impression that it was written and conducted recently is fair. However, in the executive summary it does state that the survey was undertaken in September and October 2007 and references are made throughout the document to dates other than 2014. We can only conclude that the reference to December 2014 was a typographical error.

Comment

Out of date references are used. Flora Base (DPaW reference) will have significantly changed since 2005 (or 2007/2008 depending on which part of the document being read) – ten years ago. Threatened flora species may have changed/ more species discovered.

Response

360 Environmental has performed database searches as part of its work in considering this comment. It was found that none of the flora species listed in the 2005 and 2008 VDM reports is currently considered of conservation significance.

We trust this meets your requirements at this time. Should you have any questions or require further action please do not hesitate to contact Scott Bird on (08) 9388 8360. We look forward to hearing from you.

For and on behalf of

360 Environmental Pty Ltd



Scott Bird (Principal Scientist | Director)

APPENDIX C VEGETATION SURVEY

Proposed Residential Development

LOT 7 RESERVE ROAD, MUCHEA

Vegetation Survey

Issue No. 1
January 2008

VDM Environmental
DOCUMENT CONTROL RECORD

VDM Environmental 63 Burswood Rd, Burswood WA 6100 PO Box 186, Victoria Park WA 6979		Job No: 71222
Telephone: 08 6250 9900	File Reference:	W:\VDM Environmental\Projects\7 1222 - Lot 7 Reserve Road\Report\EDD Lot 7 Reserve RoadFINAL.doc
Facsimile: 08 6250 9999	Date of Issue:	22 January 2008
Email: vdmenvironmental@vdmgroup.com.au	Project Leader:	Carel van der Westhuizen

Report Details:

Title:	Proposed Residential Development Lot 7 Reserve Road, Muchea Vegetation Survey
Author(s):	S. Connell, R. Dawson, M. Harvey
Status:	Issue 1
Client Contact:	Mr. Andrew Van Der Meer
Synopsis:	This report presents the vegetation survey for the proposed residential development at Lot 7 Reserve Road, Muchea.

Document Distribution:

Issue No	Date	Checked By & Date		Issued By & Date		Distributed to:	No. of Copies
1	22/01/2008	RH	22/01/2008	RH	22/01/2008	Riverside Investments (wa) No.2 Taylor Burrell Barnett Ewing VDM VDM Environmental	1 1 1 1

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- The information contained within this report is provided in good faith in the belief that no information, opinions or recommendations made are misleading.
- All comments and opinions given in this report are based on a limited survey of the study site or on information supplied by the client, his agents and third parties.
- Assessments of site and the extent and nature of impacts of and to this study site are limited within the terms of reference stated within this report, and by the limited timeframe of study. Therefore the results presented herein cannot be considered absolute or conclusive without additional long-term follow-up studies.
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- Acceptance of this document denotes acceptance of these terms.

Executive Summary

An assessment of the flora and vegetation found at Lot 7 Reserve Rd, Muchea was undertaken in September and October 2007 on behalf of Riverside Investments (WA) No.2. The field study was supported by data from CALM Herbarium, FLORABASE, an extract of the CALM rare and threatened plants and communities databases and existing mapping and literature.

Extant native vegetation consists of *Corymbia calophylla* – *Eucalyptus marginata* – *Banksia* spp dominated woodlands with a variable open to closed understorey consisting of numerous woody shrubs and herbaceous species. Stands of tall *Adenanthos cygnorum* shrubs dominate locally. Variation in plant community floristics and structure is related to soil type. Three communities were recognized and these relate to topographic features and substrate. Plant community health is good with peripheral weed invasion being the main disturbance. No threatened ecological communities are present. There is no indication of dieback.

A total of 183 vascular plant species were recorded: 161 species being native. A specific search was undertaken for rare and priority species. No rare or priority plant species were found during the site survey undertaken by Steven Connell.

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1.0 Introduction

1.1 Background

VDM Environmental was requested by Riverside Investments (WA) No.2 to undertake a Vegetation survey at Lot 7 Reserve Rd, Muchea (the subject site). The report has been prepared in accordance with the EPA Guidelines for Terrestrial Flora Surveys and Vegetation Surveys for Environmental Impact Assessment in Western Australia.

1.2 Objectives

The primary aims and objectives were to ascertain and determine:

- All plant species present.
- Determine and map plant communities present.
- Report on ecological values and protection needed.

1.3 EPA's Perspective

The EPA's objective for flora is to maintain the abundance, diversity, geographical distribution and productivity of flora at the species and ecosystem levels, through the avoidance or management of adverse impacts and through improvement in knowledge. The EPA has established broad principals to maintain these objectives:

- Avoid clearing
- Maintain biodiversity at sustainable levels
- Prepare and implement regional strategies for native vegetation and biodiversity protection
- Conserver biodiversity in situ
- Reintroduce native vegetation
- Prevent loss of native biodiversity

2.0 Site Description

2.1 Location

Lot 7 Reserve Road, Muchea is approximately 50km north of the city of Perth within the Shire of Chittering Local Government Area. The site is to be subdivided into two separate portions of land, with the eastern portion to be subdivided for development. This report is an assessment of the eastern portion of the lot only. (Refer Figures 1 and 2).



Figure 1: Aerial Photograph of Lot 7 (Wetland Base).

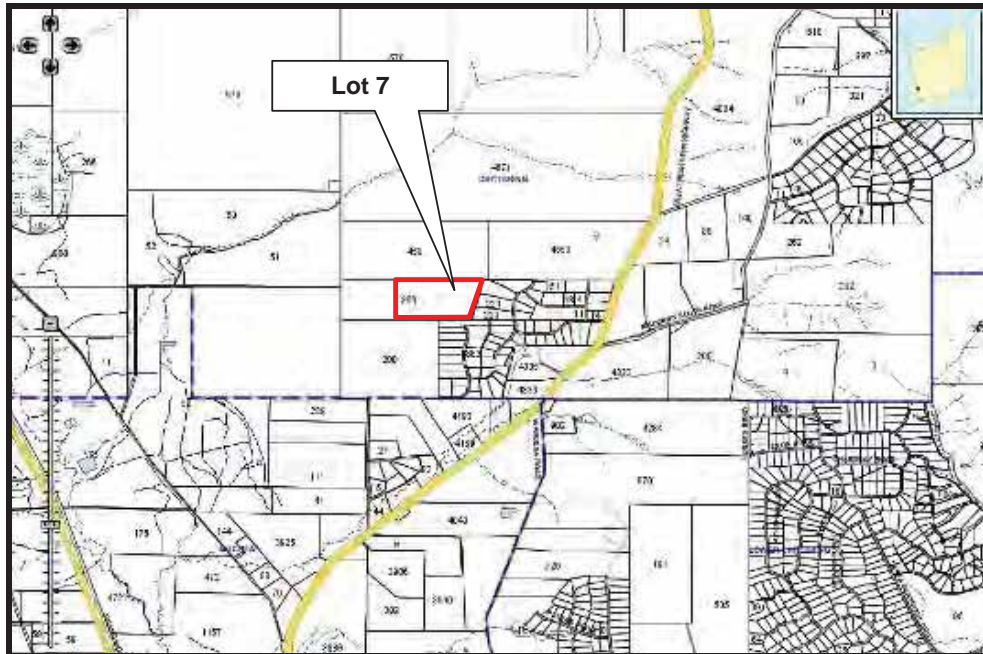


Figure 2: Cadastral Plan.

2.2 Land Use

Lot 7 occupies an area of approximately 50ha, and is classified as rural residential under the Shire of Chittering's Town Planning Scheme 8 (TPS 8). The site is densely vegetated and has no current land uses.

Surrounding land uses include a native wild flower farm to the south, rural land developments to the south and east, and semi-rural bushland to the north and west.

2.3 Landforms

Lot 7 occurs on low sand hills of the northern Swan Coastal Plain. The topography varies from approximately 140 to 165 m above sea level. A number of different soil types are mapped over the property (Table 1, Figure 3). The topographic and edaphic variation results in a mosaic of vegetation types (Refer fig 3).

2.4 Topography and Soils

Lot 7 occurs on low sand hills of the northern Swan Coastal Plain. The topography varies from approximately 140 m on the western boundary to 165 m on the eastern boundary above sea level. A number of different soil types are mapped over the property (refer Table 1).

Table 1: Land Management Units at Lot 7 Reserve Rd (Bessell-Browne unpub).

Unit	Name	Description	Soils
222Mb_1	Mogumber 1 Subsystem	Undulating broad crests and very gentle upper slopes <10% with common lateritic duricrust outcrop and shallow gravelly sands. Low woodland and shrubland of <i>E. tottiana</i> and <i>Acacia</i> spp.	Shallow gravelly sands.
222Mb_4	Mogumber 4 Subsystem	Gently to moderately inclined slopes <10% with shallow gravelly sands and few areas of lateritic outcrop. Low wood-land with some <i>C. calophylla</i> and <i>E. marginata</i> also with <i>E. tottiana</i> , <i>Dryandra</i> spp. and <i>Acacia</i> spp..	Shallow gravelly sands.
222Mb_3	Mogumber 3 Subsystem	Gently inclined undulating slopes and minor drainage head-waters. Deep grey siliceous or bleached sands. Low wood-land and shrubland of <i>C. calophylla</i> and <i>Acacia</i> spp.	Deep grey siliceous or bleached sands.
222Mb11	Mogumber 11 Subsystem	Drainage depressions in gently sloping (<10%) plain. Duplex brown and yellow duplex soils that are often gravelly. Low woodland of <i>C. calophylla</i> and <i>E. wandoo</i> with the occasional <i>E. marginata</i> , <i>Banksia</i> and <i>Allocasuarina</i> spp.	Duplex brown and yellow duplex soils that are often gravelly.

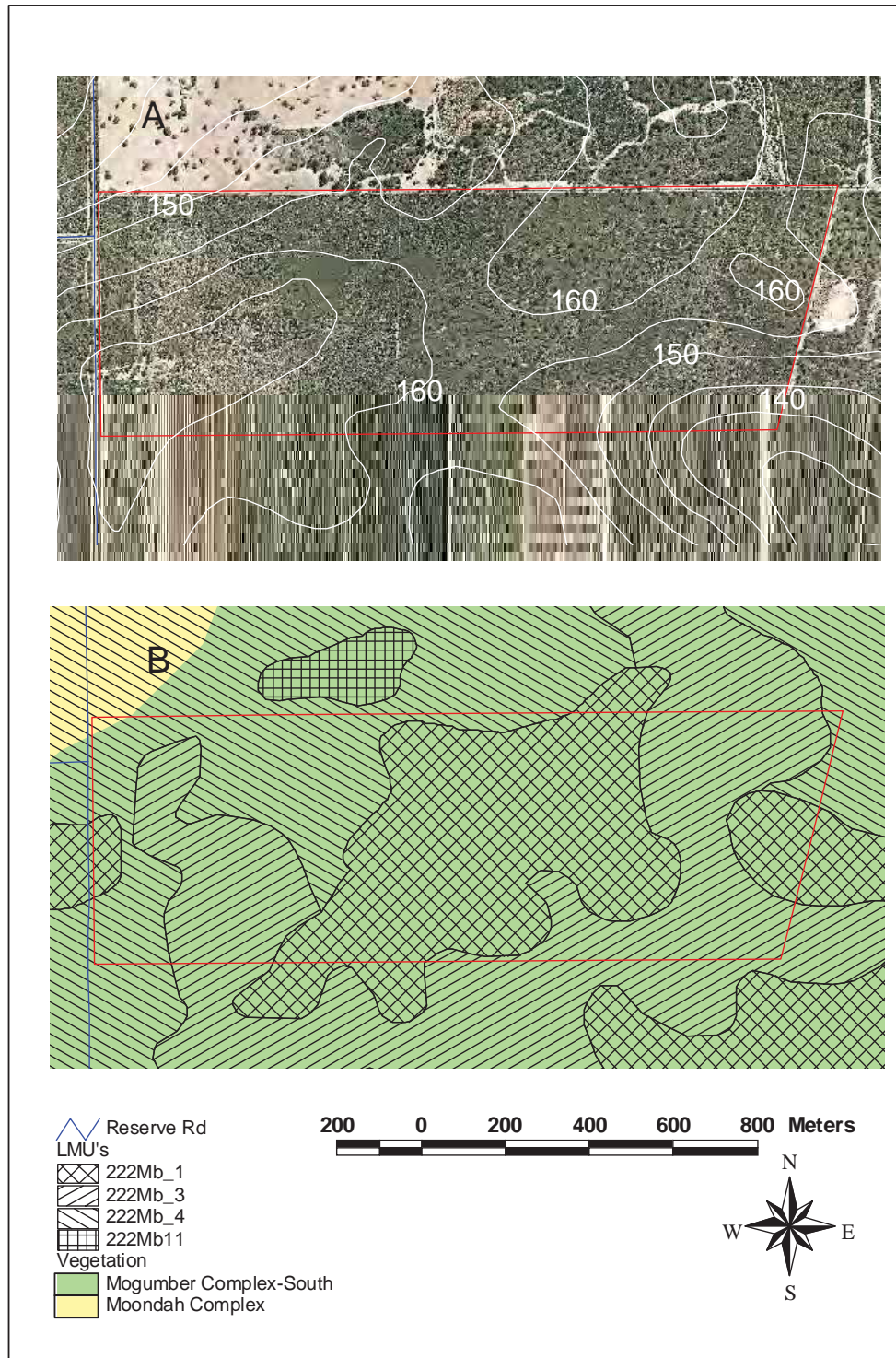


Figure 3 – Topography of Lot 7 Reserve rd

2.5 Rainfall

As part of this vegetation survey, VDM Environmental undertook a review of relevant climatic data and information obtained from the Bureau of Meteorology. Rainfall data from the climate statistics were obtained for Pearce, being 15km south and the closest measuring station to Lot 7. Most rain falls between May and September with heaviest falls during the winter months.

Relevant rainfall statistics derived for Pearce were as follows:

- Mean rainfall: 698.2 mm/year
- Dry Year (10th percentile): 498.7 mm/year
- Wet Year (90th percentile): 835.7 mm/year

3.0 Vegetation

3.1 Flora and Vegetation

Two System 6 Vegetation Complexes (Heddlé *et al.* 1980) occur on the property (Table 2). Both community types are extensive in the Muchea sandplain area and neither is considered to be under immediate threat (>40% of original areas remain, del Marco *et al.* 2004, Connell 2007b). These broad complexes include a considerable variation in both structural and floristic communities (e.g. wet and dry heaths, low woodlands, outcrops etc.).

3.2 Threatened Ecological Communities

A single Threatened Ecological Community is found within a 5 kilometre search radius of the property. This community, at Iopollo Rd. Gingin Ridge, occurs on similar soil and vegetation types. It includes many species in common with those found along Reserve Rd as well as DRF and priority species. It does not occur at Lot 7 Reserve Rd.

3.3 Threatened Flora

A number of declared rare flora and conservation priority species are located in the vicinity of the property (DEC database extraction October 2007) and are found on similar landforms and vegetation complexes found on Lot 7. However there was no threatened flora identified on the site during the flora survey.

3.4 Ecological Linkages

The native vegetation present on Lot 7 forms part of an important ecological linkage between the extensive uncleared bushlands of the Gingin Ridge and the network of vegetated blocks leading to the northern Darling Scarp forests (Figure 4, Connell 2007b). The vegetation on the site is in consistently good condition with low level disturbance and is therefore a good representative of corridor number 5 (Appendix C). This ecological linkage can be maintained via the retention of vegetation outside building envelopes.

3.5 Native Flora

161 native vascular plant species were collected (Table 4). The woody plant layer was dominated by species of *Myrtaceae*, *Dilleniaceae* and *Proteaceae* while the ephemeral flora consisted of a range of *Droseraceae*, *Orchidaceae* and *Stylidiaceae*. The populations of most species were in good condition with flowering, seed set and recruitment noted.

3.6 Exotic Species

22 exotic species were identified (Table 4). Most were confined to disturbed areas and the periphery and are not threatening.

3.7 Rare and Priority Flora

A number of rare and threatened plant species are recorded for the local area and for the vegetation complex present (Connell. 2007). No priority species were detected during this flora assessment.

Table 2. Heddle et al. (1980) vegetation complexes present and their conservation status within the Shire of Chittering (Connell 2007).

Vegetation complex	Description	Pre-clearing		1999		2006	
		No. of Blocks	Area (km ²)	No. of Blocks	Area (km ²)	No. of Blocks	Area (km ²)
Mogumber South	Open woodland of <i>C. calophylla</i> , with some admixture of <i>E. marginata</i> and a second storey of <i>E. tottiana</i> – <i>Banksia attenuata</i> – <i>B. menziesii</i> – <i>B. ilicifolia</i>	9	130	258	58	687	52 (40%)
Moondah	Low closed and open forest of <i>Banksia attenuata</i> – <i>Banksia menziesii</i> – <i>Banksia prionotes</i> – <i>Eucalyptus tottiana</i> on the slopes. Open woodland of various <i>Banksia</i> spp in the valley.	6	52	92	23	227	23 (44%)

Table 3. Vegetation Community Descriptions

Name	Description	Soil
<i>Xanthorrhoea-Eucalyptus</i> woodland	Open woodland of <i>Xanthorrhoea acanthostachya</i> – <i>Corymbia calophylla</i> with occasional <i>Banksia</i> spp and <i>Eucalyptus marginata</i> above a species rich understorey.	Sandy lateritic gravel
<i>Adenanthos</i> shrubland	Open low woodland of <i>Adenanthos cygnorum</i> with occasional <i>Banksia</i> spp., <i>Nuytsia floribunda</i> and <i>Eucalyptus marginata/Corymbia calophylla</i> over a low species rich understorey.	White-grey sands.
<i>Banksia-Eucalyptus</i> woodland	<i>Banksia attenuata</i> – <i>Banksia menziesii</i> – <i>Eucalyptus marginata</i> – <i>Eucalyptus tottiana</i> - <i>Corymbia calophylla</i> woodland over a species rich understorey	White-grey sands

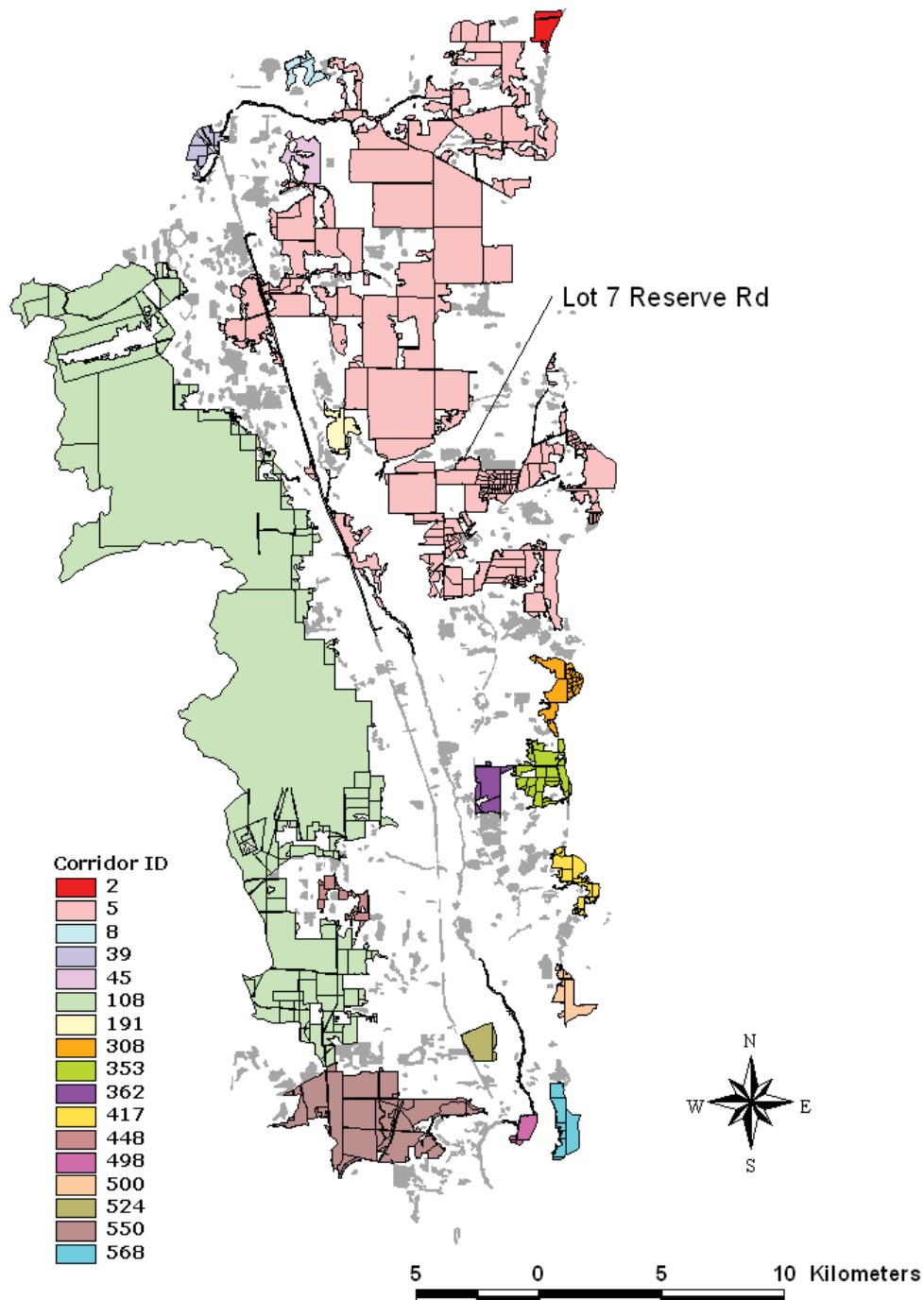


Figure 4 - Ecological linkages in the Ellen Brook Catchment

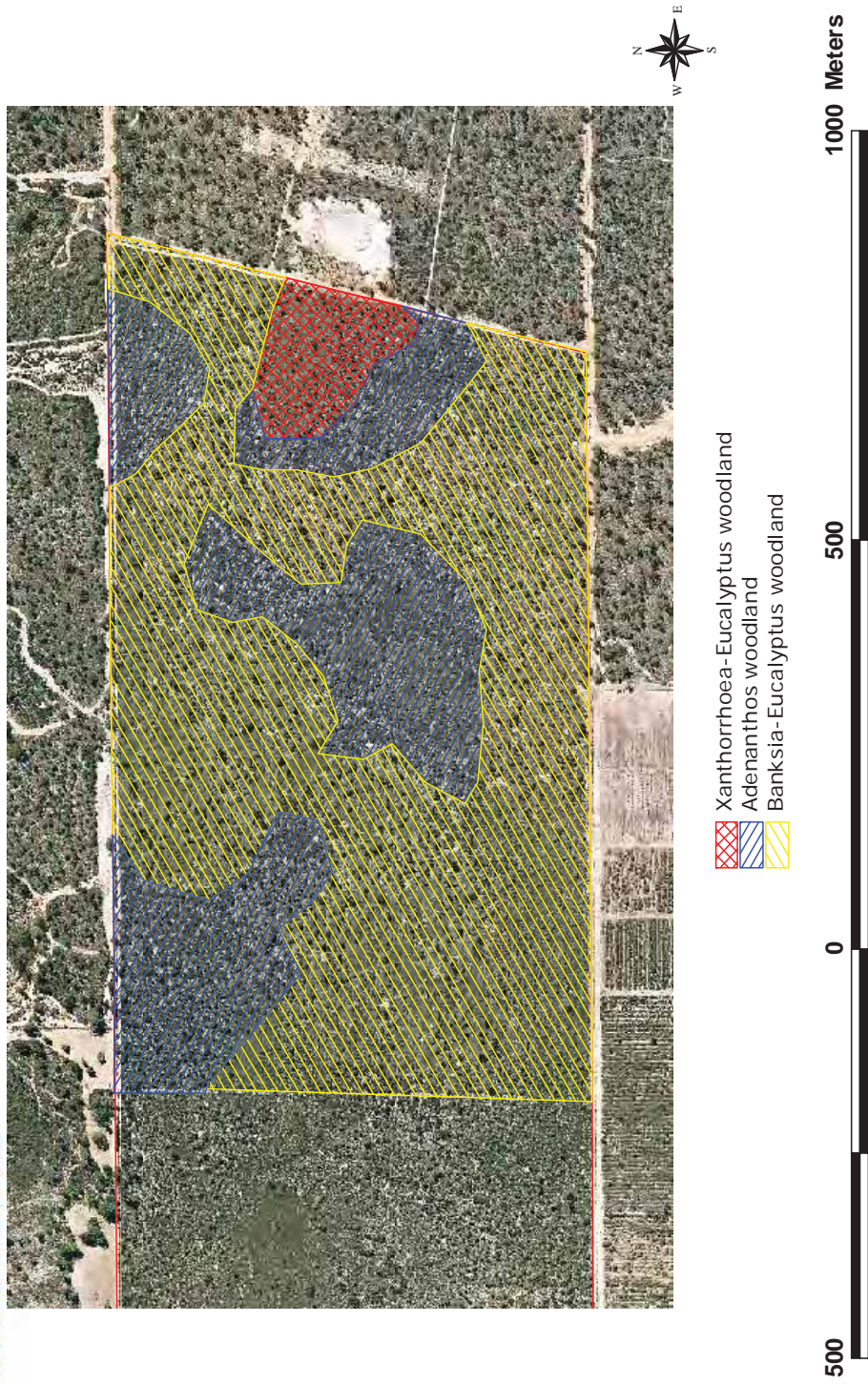


Figure 5 – Vegetation classification map

Table 4. Native plant species present, September/October 2007

Species	Author	Family
<i>Acacia pulchella</i>	R.Br.	Mimosaceae
<i>Adenanthos cygnorum</i>	Diels	Proteaceae
<i>Agrostocrinum scabrum</i>	(R.Br.)Baill	Antheriaceae
<i>Allocasuarina humilis</i>	(Otto & Dietr.) LAS.Johnson	Casuarinaceae
<i>Andersonia lehmanniana</i>	Sonder	Epacridaceae
<i>Anigozanthos humilis</i>	Lindley	Haemodoraceae
<i>Anigozanthos manglesii</i>	D.Don	Haemodoraceae
<i>Aphelia brizula</i>	F. Muell.	Centrolepidaceae
<i>Astartea fascicularis</i>	(Labill.)DC	Myrtaceae
<i>Astroloma pallidum</i>	R.Br.	Epacridaceae
<i>Baeckea crispifolia</i>	F.Muell	Myrtaceae
<i>Baeckea sp. Darling Range (R.J.Cranfield 1673)</i>		Myrtaceae
<i>Banksia attenuata</i>	R.Br.	Proteaceae
<i>Banksia grandis</i>	Willd.	Proteaceae
<i>Banksia menziesii</i>	R.Br.	Proteaceae
<i>Beaufortia elegans</i>	Schauer	Myrtaceae
<i>Boronia ramosa</i>	(Lind.)Benth.	Rutaceae
<i>Bossiaea eriocarpa</i>	Benth.	Fabaceae
<i>Burchardia umbellata</i>	R.Br.	Colchicaceae
<i>Caladenia flava</i>	R.Br.	Orchidaceae
<i>Calandrinia linifolia</i>	Fenzl	Portulacaceae
<i>Calectasia cyanea</i>	R.Br.	Dasypogonaceae
<i>Calothamnus sanguineus</i>	Labill.	Myrtaceae
<i>Calytrix flavescens</i>	Cunn.	Myrtaceae
<i>Cartonema philydroides</i>	F.Muell.	Commelinaceae
<i>Cassytha flava</i>	Nees	Lauraceae
<i>Chamaescilla corymbosa</i>	(R.Br.)Benth.	Antheriaceae
<i>Conospermum stoechadis</i>	Endl.	Proteaceae
<i>Conostephium pendulum</i>	Benth.	Epacridaceae
<i>Conostephium preissii</i>	Sonder	Epacridaceae
<i>Conostylis juncea</i>	Endl.	Haemodoraceae
<i>Conostylis setigera</i>	R.Br.	Haemodoraceae
<i>Conostylis setosa</i>	Lindley	Haemodoraceae
<i>Corymbia calophylla</i>	(Lindl.) KD Hill & L Johnson	Myrtaceae
<i>Craspedia variabilis</i>	Everett&Doust	Asteraceae
<i>Crassula colorata</i>	(Nees)Ostenf.	Crassulaceae
<i>Cyathochaeta avenacea</i>	Benth.	Cyperaceae
<i>Dampiera linearis</i>	de Vriese	Goodeniaceae
<i>Dasypogon bromelifolius</i>	R.Br.	Dasypogonaceae
<i>Daviesia decurrens</i>	Meissner	Fabaceae
<i>Daviesia longifolia</i>	Benth.	Fabaceae
<i>Daviesia physodes</i>	Cunn ex. Don	Fabaceae
<i>Daviesia triflora</i>	M.D. Crisp	Fabaceae
<i>Desmocladius fasciculatus</i>	(R.Br.)B.Briggs & L.Johnson	Restionaceae
<i>Desmocladius flexuosa</i>	(R.Br.)B.Briggs & L.Johnson	Restionaceae

<i>Dianella divaricata</i>	R.Br.	Phormiaceae
<i>Drosera erythrorhiza</i>	Lindley	Droseraceae
<i>Drosera macrantha</i>	Endl.	Droseraceae
<i>Drosera menziesii</i>	R. Br. ex DC	Droseraceae
<i>Drosera paleacea</i>	DC	Droseraceae
<i>Dryandra bipinnatifida</i>	R.Br.	Proteaceae
<i>Dryandra lindleyana</i>	Meisn.	Proteaceae
<i>Eremaea pauciflora</i>	(Endl.) Druce	Myrtaceae
<i>Eucalyptus marginata</i>	Donn ex Smith	Myrtaceae
<i>Eucalyptus todtiana</i>	F.Muell.	Myrtaceae
<i>Fimbristylis velata</i>	R.Br.	Cyperaceae
<i>Gastrolobium spathulatum</i>	Benth.	Fabaceae
<i>Gompholobium confertum</i>	(DC)Crisp	Fabaceae
<i>Gompholobium knightianum</i>	Lindley	Fabaceae
<i>Gompholobium marginatum</i>	R.Br.	Fabaceae
<i>Gompholobium tomentosum</i>	Labill.	Fabaceae
<i>Grevillea pilulifera</i>	(Lindey)Druce	Proteaceae
<i>Grevillea synapheae</i>	R.Br.	Proteaceae
<i>Haemodorum paniculatum</i>	Lindley	Haemodoraceae
<i>Haemodorum spicatum</i>	R.Br.	Haemodoraceae
<i>Hakea erinacea</i>	Meisn.	Proteaceae
<i>Hakea ruscifolia</i>	Labill.	Proteaceae
<i>Hakea trifurcata</i>	(Smith)R.Br.	Proteaceae
<i>Hemiandra pungens</i>	R.Br.	Lamiaceae
<i>Hibbertia huegii</i>	(Endl.) F. Muell.	Dilleniaceae
<i>Hibbertia hypericoides</i>	(DC)Benth.	Dilleniaceae
<i>Hibbertia subvaginata</i>	(steudel) F. Muell.	Dilleniaceae
<i>Hovea trisperma</i>	Benth.	Fabaceae
<i>Hybanthus calycinus</i>	(DC ex Ging.) F. Muell.	Violaceae
<i>Hypocalymma xanthopetalum</i>	F.Muell	Myrtaceae
<i>Hypoxis occidentalis</i>	Benth.	Hypoxidaceae
<i>Isopogon dubius</i>	(R.Br.)Druce	Proteaceae
<i>Isopogon sphaerocephalus</i>	Lindley	Proteaceae
<i>Isotoma hypocrateriformis</i>	(R.Br.)Druce	Lobeliaceae
<i>Jacksonia sternbergiana</i>	Huegel	Fabaceae
<i>Johnsonia lupulina</i>	R.Br.	Antheriaceae
<i>Kunzea ericifolia</i>	(Smith) Heynh.	Myrtaceae
<i>Labichea punctata</i>	Benth.	Caesalpinaceae
<i>Lagenophora huegii</i>	Benth.	Asteraceae
<i>Lasiopetalum lineare</i>	S. Paust	Sterculiaceae
<i>Laxmannia squarrosa</i>	Lindley	Antheriaceae
<i>Lechenaultia biloba</i>	Lindley	Goodeniaceae
<i>Lechenaultia floribunda</i>	Bentham	Goodeniaceae
<i>Lepidosperma longitudinale</i>	Labill.	Cyperaceae
<i>Lepidosperma squamatum</i>	Labill.	Cyperaceae
<i>Leptomeria cunninghamii</i>	Miq.	Santalaceae
<i>Leucopogon glaucifolius</i>	W.Fitz.	Epacridaceae

<i>Leucopogon pulchellus</i>	Sonder	Epacridaceae
<i>Levenhookia pusilla</i>	R.Br.	Stylidiaceae
<i>Levenhookia stipitata</i>	(Sonder)F.Muell.	Stylidiaceae
<i>Lomandra micrantha</i>	(Endl.) Ewart	Dasypogonaceae
<i>Lomandra preisii</i>	(Endl.) Ewart	Dasypogonaceae
<i>Lyginia barbata</i>	R.Br.	Restionaceae
<i>Lysinema ciliatum</i>	R.Br.	Epacridaceae
<i>Macrozamia fraseri</i>	Miq.	Zamiaceae
<i>Melaleuca incana</i>	R.Br.	Myrtaceae
<i>Melaleuca seriata</i>	Lindley	Myrtaceae
<i>Melaleuca uncinata</i>	R.Br.	Myrtaceae
<i>Mesomelaena pseudostygia</i>	(Kurek.)K.L.Wilson	Cyperaceae
<i>Microleana stipoides</i>	(Labill.)R.Br.	Poaceae
<i>Millotia myosotidifolia</i>	(Benth.)Streetz	Asteraceae
<i>Monotaxis grandiflora</i>	Endl.	Euphorbiaceae
<i>Nemcia reticulata</i>	(Mesiner)Domin.	Fabaceae
<i>Neurachne alopecuroides</i>	R.Br.	Poaceae
<i>Nuytsia floribunda</i>	(Labill.) R.Br. ex Fenzl	Loranthaceae
<i>Orthrosanthus laxus</i>	(Endl.) Benth.	Iridaceae
<i>Patersonia juncea</i>	Lindley	Iridaceae
<i>Patersonia occidentalis</i>	R.Br.	Iridaceae
<i>Persoonia saccata</i>	R.Br.	Proteaceae
<i>Petrophile linearis</i>	R.Br.	Proteaceae
<i>Petrophile macrostachya</i>	R.Br.	Proteaceae
<i>Petrophile seminuda</i>	Lindley	Proteaceae
<i>Philothea spicatus</i>	(ARich)P.Wilson	Rutaceae
<i>Phyllangium paradoxa</i>	(R.Br.)Dunlop	Loganiaceae
<i>Phyllanthus calycinus</i>	Labill.	Euphorbiaceae
<i>Pimelea imbricata</i>	R.Br.	Thymeleaceae
<i>Pimelea suaveolens</i>	Meissner	Thymeleaceae
<i>Podolepis gracilis</i>	(Lehm.)R.A.Graham	Asteraceae
<i>Podolepis lessonii</i>	(Cass.)Benth.	Asteraceae
<i>Podotheca angustifolia</i>	(Labill.)Less	Asteraceae
<i>Podotheca gnaphalioides</i>	R.A.Graham	Asteraceae
<i>Poranthera microphylla</i>	Brongn	Euphorbiaceae
<i>Pterochaeta paniculata</i>	Streetz	Asteraceae
<i>Ptilotus polystachyus</i>	(Gaudich.) Muell.	Amaranthaceae
<i>Quinetia urvillei</i>	Cass.	Asteraceae
<i>Rhodanthe citrina</i>	(Benth.)Wilson	Asteraceae
<i>Scaevola canescens</i>	Benth.	Goodeniaceae
<i>Scaevola fascicularis</i>	Benth.	Goodeniaceae
<i>Scaevola platyphylla</i>	Lindley	Goodeniaceae
<i>Schoenus grandiflora</i>	(Nees) F. Muell.	Cyperaceae
<i>Siloxeros humifusus</i>	Labill.	Asteraceae
<i>Sowerbaea laxiflora</i>	Lindley	Antheriaceae
<i>Sphaerolobium linophyllum</i>	(Huegel) Benth.	Fabaceae
<i>Stipa compressa</i>	R.Br.	Poaceae

<i>Stirlingia latifolia</i>	(R.Br.) Steudel	Proteaceae
<i>Stylidium adpressum</i>	Benth.	Stylidiaceae
<i>Stylidium amoenum</i>	R.Br.	Stylidiaceae
<i>Stylidium bulbiferum</i>	Benth.	Stylidiaceae
<i>Stylidium calcaratum</i>	R.Br.	Stylidiaceae
<i>Stylidium diuroides</i>	Lindley	Stylidiaceae
<i>Stylidium hispidum</i>	Lindley	Stylidiaceae
<i>Stylidium junceum</i>	R.Br.	Stylidiaceae
<i>Stylidium repens</i>	R.Br.	Stylidiaceae
<i>Stylidium schoenoides</i>	DC	Stylidiaceae
<i>Synaphaea gracillima</i>	Lindley	Proteaceae
<i>Synaphaea petiolaris</i>	R.Br.	Proteaceae
<i>Synaphaea spinulosa</i>	(Burm.f.) Merr.	Proteaceae
<i>Tetrarrhena laevis</i>	R.Br.	Poaceae
<i>Thysanotus manglesianus</i>	Kunth	Antheriaceae
<i>Trachymene pilosa</i>	Smith	Apiaceae
<i>Tripterococcus brunonis</i>	Endl.	Stackhousiaceae
<i>Velleia trinervis</i>	Labill.	Goodeniaceae
<i>Verticordia nitens</i>	(Lindley) Endlicher	Myrtaceae
<i>Verticordia densiflora var densiflora</i>	Lindley	Myrtaceae
<i>Xanthorrhoea preisii</i>	Endl.	Xanthorrhoeaceae
<i>Xanthosia pusilla</i>	Bunge	Goodeniaceae

Table 5. Exotic plant species present, September/October 2007

Species	Author	Family
<i>Aira cupiana</i>	Guss.	Poaceae
<i>Anagalis arvense</i>	L.	Primulaceae
<i>Arctotheca calendula</i>	(L.) Levyns	Asteraceae
<i>Briza maxima</i>	L.	Poaceae
<i>Briza minor</i>	L.	Poaceae
<i>Ehrarta calycina</i>	Smith	Poaceae
<i>Eragrostis curvula</i>	(Schrad.) Nees	Poaceae
<i>Erodium botrys</i>	(Cav.) Bertol.	Geraniaceae
<i>Gladiolus caryophyllaceus</i>	(N.L. Burman) Poiret	Iridaceae
<i>Hypochoeris glabra</i>	L.	Asteraceae
<i>Lolium perenne</i>	L.	Poaceae
<i>Lupinus consentinii</i>	Guss.	Fabaceae
<i>Narcissus tazetta</i>	L.	Amaryllidaceae
<i>Orobanche minor</i>	Smith	Orobanchaceae
<i>Oxalis corniculata</i>	L.	Oxalidaceae
<i>Pelargonium capitatum</i>	(L.) L.'Her.	Geraniaceae
<i>Petrorhagia velutina</i>	(Guss.) Bail. & Heywood	Caryophyllaceae
<i>Romulea rosea</i>	(L.) Ecklon	Iridaceae
<i>Silene gallica</i>	L.	Caryophyllaceae
<i>Sonchus oleraceus</i>	L.	Asteraceae
<i>Ursinia anthemoides</i>	(L.) Poiret	Asteraceae
<i>Wahlenbergia capensis</i>	(L.) A.D.C.	Campanulaceae



4.0 CONCLUSIONS AND RECOMMENDATIONS

No declared rare flora and threatened ecological communities were found during the flora surveys conducted by Dr Steven Connell during September and October 2007. Vegetation on the site is consistently in good condition, with little evidence of weed invasion, logging and dumping of household wastes.

It is recommended that vegetation outside building envelopes is retained to maintain the ecological link mentioned in Section 3.4.

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Appendix A: Site Photographs:



South east corner of site facing north



North east corner of site facing west



North west corner of site facing south



South west corner of site facing north

Appendix B: Definition of Rare and Priority Flora Species

(Department of Conservation and Land Management, 2004)

Conservation Code	Category	Description
R	Declared Rare Flora – Extant Taxa	“Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection and have been gazetted as such.”
P1	Priority One – Poorly Known Taxa	“Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat. Such taxa are under consideration for declaration as ‘rare flora’, but are in urgent need of further survey.”
P2	Priority Two – Poorly Known Taxa	“Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as ‘rare flora’, but urgently need further survey.”
P3	Priority Three – Poorly Known Taxa	“Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as ‘rare flora’ but need further survey.”
P4	Priority Four – Rare Taxa	“Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.”

Appendix C: Criteria Used for the Field Assessment of remnant vegetation condition

Rating	Criteria
4. Very Good	Evidence of localised low level damage to otherwise healthy bush. Recruitment should be apparent. Weed and grazing damage is confined (<20% of area). Some modification to vegetation structure due to changes in fire regimes may be apparent. Little evidence of logging or fire wood collection.
3. Good	Evidence of localised high level damage to otherwise low-level damaged bush. Recruitment is localised and the populations of some species may be senescent. Weed and grazing damage is apparent in <50% of the area. Modification to vegetation structure due to changes in fire regimes may be apparent. Gall and mistletoe damage may be apparent. Evidence of logging or fire wood collection.
2. Poor	Widespread high level damage. Recruitment is disrupted and most woody species appear senescent. Weed and grazing damage may be apparent throughout the area. Modification to vegetation structure due to changes in fire regimes may be apparent. Locally some strata may be absent. Gall and mistletoe damage may be apparent. Evidence of logging or fire wood collection.
1. Very Poor	Widespread high level damage. Recruitment is disrupted and most woody species appear senescent. Weed and grazing damage may be apparent throughout the area. Modification to vegetation structure due to changes in fire regimes may be apparent. Widespread loss of vertical strata. Gall and mistletoe damage may be apparent. Evidence of logging or firewood collection.
Damage type	Description
High Level	Grazing (domestic and feral), logging, clearing and excavation, die-back, salinisation or other water table modification, road works, flower picking, major structures (eg. managed or fenced areas), mowing, car bodies.
Low Level	Dumping (household, garden etc.), minor structures (eg. sheds), fire wood collection, weed infestation, modified fire regime.

 Good Condition Vegetation

Low Level Disturbance

[illegible]

APPENDIX D BASIC ECOLOGICAL ASSESSMENT

Riverbank Investments Pty Ltd
Proposed Rural Residential Development
Lot 2 Reserve Road, Chittering
Basic Ecological Assessment

Issue No. 1
22 December 2005

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Riverbank Investments Pty Ltd

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Reference: I:\jobcorro\2005\100-200\2005-156\environmental\report\bea_05-156 2 reserve rd.doc
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Belleng VDM Pty Ltd 63 Burswood Rd, WA 6100		Job No:	2005-156
Telephone:	08 6250 9900	File reference:	I:/jc/2005-156/BEA_156
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Report Details:

Title:	Proposed Rural Residential Development Lot 2 Reserve Road, Chittering Basic Ecological Assessment
Author(s):	Gemma Connolly
Status:	Issue No. 1 - <i>Final</i>
Client:	Riverbank Investments Pty Ltd
Client Contact:	Andrew van der Meer
Synopsis:	This report presents the Basic Ecological Assessment for a proposed rural residential development. It has been developed in accordance with the Shire of Chittering Town Planning Scheme No. 6.

Revision History:

Issue No	Date	Checked By & Date		Issued By & Date		Distributed to:	No. of Copies
1	22/12/2005	JES	22/12/2005	GC	22/12/2005	Riverbank Investments Pty Ltd	6
						Taylor Burrell Barnett	1
						Van Der Meer Consulting	1
						Belleng VDM Pty Ltd	1

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Disclaimer and Limitations

- The information contained within this report is provided in good faith in the belief that no information, opinions or recommendations made are misleading.
- All comments and opinions given in this report are based on a limited survey of the study site or on information supplied by the client, his agents and third parties.
- Assessments of site biology, ecology and the extent and nature of impacts of and to this study site is limited within the terms of reference stated within this report, and by the limited timeframe of study. Therefore the results presented herein cannot be considered absolute or conclusive without additional long-term follow-up studies.
- Belleng VDM Pty Ltd, its agents and employees, expressly disclaim any and all liability for representations, expressed or implied, contained in, or omissions from, this report or any of the written or oral communications transmitted to the client or any third party.
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1.0 INTRODUCTION

Belleng VDM Pty Ltd were commissioned by Riverbank Investments Pty Ltd to prepare a Basic Ecological Assessment for a Proposed Residential Development of Lot 2 Reserve Road, Chittering (the subject site).

1.1 Objectives

The objectives of the Basic Ecological Assessment are:

- Mapping of existing vegetation types, topographical features, existing infrastructure etcetera.
- Basic assessment of ecological features including location of expected and known significant flora, fauna and habitat, location of poorly conserved ecosystems, significant weed infestations, all water bodies and drainage lines, location and tenure of conservation reserves and location of areas subject to Voluntary Conservation Agreements.
- Basic assessment of ecological functions, including core habitat areas, ecological corridors and buffer areas.
- Basic assessment of impacts of the development on the conservation of Ecologically Significant Areas, Fauna, Buffers and Ecological Corridors.
- Provide recommendations to mitigate the impact of development on ecological features and functions.
- Propose any additional management plans required to conserve ecologically significant areas identified in the study area.

1.2 Methodology

Owing to the large area of the site, survey methodology for flora and fauna comprised a random walk over through vegetated areas. Cleared areas were not surveyed.

Vegetation communities are described in accordance with the standard descriptions listed by the Water and Rivers Commission (Natural Resource Management Plan and status as gazetted under the Wildlife Conservation Notice 2005 (*Wildlife Conservation Act 1950*)).

Fauna was identified through on-site identification and observation of scats, scratchings, burrows and vocalizations. Habitat quality was also assessed throughout the surveyed areas. The survey was performed in December 2005; conditions comprised relatively warm temperatures with no rain experienced on the day of the survey or days prior to the survey.

1.3 Site Location

The subject site is located on Lot 2 Reserve Road, Chittering. Reserve Road is situated west of Great Northern Highway, at the southern end of the Shire of Chittering (see Figure 1.1). The site is bounded to the south and west by Reserve Road and to the north by rural residential lots.

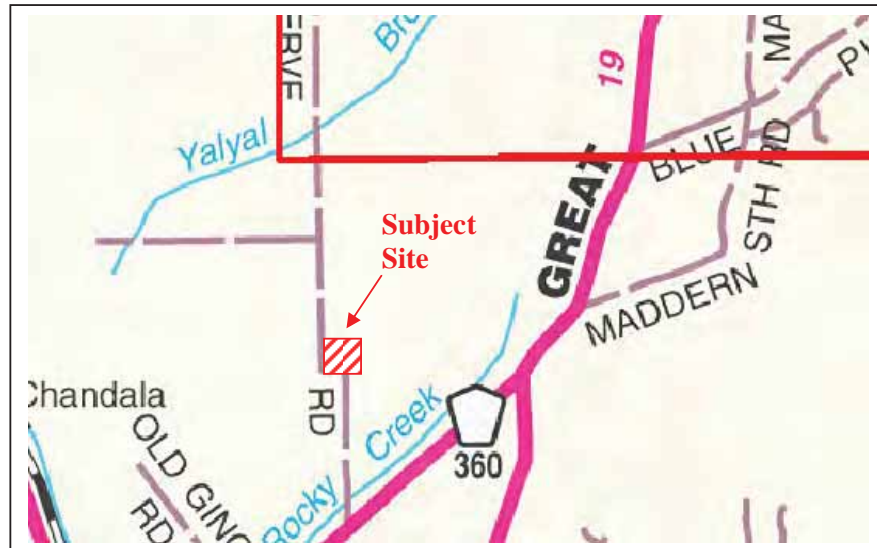


Figure 1.1: Site Locality (UBD Extract)

1.4 Proposed Development Summary

Riverbank Investments Pty Ltd propose to develop the site into 110 lots approximately 1ha in size with one area of Public Open Space (3901m²) in the north-western corner. The housing will be low density, rural residential focusing on a rural lifestyle theme. Access to the development will be via a subdivisional loop road connecting to Reserve Road.

2.0 STAGE 1A: BASIC ASSESSMENT OF ECOLOGICAL FEATURES

2.1 Site Description

Existing vegetation communities, topographical features and infrastructure are mapped on Figure 2.1.

2.1.1 General Features

The site is situated on the Dandaragan Plateau east of the Darling Scarp, in the Brockman River Catchment, 20km south west of the Bindoon townsite. Rocky Creek is located approximately 750m south of the site flowing in a south-west direction. The site slopes gently to the east from a maximum of 165m AHD in the northwest corner to 150m AHD in the southeast corner. A gravel pit exists in the northwest corner of the site. The removed gravel from the pit has been spread over vehicle tracks.

2.1.2 Land Use

The site is currently utilised as a wildflower nursery operating for over 20 years. The site is heavily cleared and highly disturbed by weeds. The plantations include a mosaic of Geraldton wax, Kangaroo paw, Olive trees, Wandoo and Banksias. A residential home is located at the entrance of the site on the southern boundary. Large packing sheds are located to the east of the entrance and home. Firebreaks run along the perimeter of the site boundary. Surrounding landuses include rural residential lots, rural retreat (native vegetation) and limited horticulture.

2.1.3 Planning Scheme

Under the Shire of Chittering Planning Strategy the vegetation in the northern section of the site has been mapped as *Vegetation Protection Area* (Local Planning Strategy Map 2001-2015). This category aims to enhance rural amenity. The proposed management objectives for areas mapped as *Vegetation Protection* is to limit clearing, felling or removal of vegetation to:

- a) *vegetation that is dead, diseased or poses a danger to humans or stock,*
- b) *clearing required by law for firebreaks,*
- c) *clearing for the purpose of access to a dwelling or outbuildings;*
- d) *clearing within a defined building envelope and limited to that area;*
- e) *clearing necessary for the construction of a dwelling, outbuildings and area 20m wide surrounding the dwelling for the purpose of bush fire protection.*



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2.2 Vegetation

Figure 2.1 shows vegetation communities and other ecological features and functions identified at the subject site. A full plant species list for the site is given in Appendix 1. Sections 2.2.1-2.2.3 below summarise the characteristics and structure of vegetation communities identified at the site; predominately a mosaic of planted vegetation that is highly disturbed by weedy grasses. Refer to figures 2.2-2.6.

2.2.1 Scrub-heath and Plantation Banksia Woodlands

Dense plantation Banksia woodlands up to 3m in height are growing in a mosaic across the site in between Kangaroo paw and Geraldton wax. The Banksia woodlands are situated in pockets with dense scrub-heath and a number of sparse larger Blackbutt that have Diameter at Breast Height (DBH) of 30-40cm. One Blackbutt in the southern entrance has a DBH of approximately 50cm. The mosaic of vegetation is highly disturbed by weed species.

Canopy: Scattered *Eucalyptus tottiana*, *E. macrocarpa*, common *Nuytsia floribunda*, and one *E. gomocephala*.

Understorey: Dominated by closed plantation Banksia woodland including *Banksia prionotes*, *B. sphaerocarpa*, *B. speciosa*, *B. grandis*. Frequent *Xanthorrhoea priessi*. Shrubs interspersed include *Acacia saligna*, *Adenanthos cygnorum*, *Conospermum stoechadis*, *Jacksonia* sp. Dominant small shrubs include *Hemiandra linearis*, *Hibertia hypercoides*, *Thysanotus tuberosus*, *Verticordia picta*. Grass *Ptilotus polystachyus*. Plantations include *Anigozanthos manglesii*, *Anigozanthus flavidus*, *Chamelaucium ulcinatum*, and small section of *Olea europaea* in northwest corner. Exotic weeds of low species diversity include *Carpobrotus edulis*, *Chamaecytisus palmensis*, *Hypochaeris radicata*, *Hypochaeris radicata*, *Pelargonium capitatum*.

Groundcover: Ground layer covered in leaf litter, Herb *Scaveola* sp.

2.2.2 Scrub-heath and Coastal Blackbutt

A section on the western boundary of the site is dominated by dense scrub heath and scattered Coastal Blackbutt up to 3m height and DBH of 20cm.

Canopy: Scattered *Eucalyptus patens* and *Nuytsia floribunda*.

Understorey: Open understorey dominated by larger shrubs *Adenanthos cygnorum*, *Allocasuarina* sp, *Dryandra* sp and *Xanthorrhoea priessi*. Dense shrubs to 40cm with moderate species diversity including; *Conospermum stoechadis*, *Daviesia pachyphylla*, *Eremaea beaufortioides*, *Eremaea brevifolia*, *Isolepis* sp, *Isopogen dubias*, *Melaleuca gibbosa*, *Petrophiel linearis*, *Synaphea* sp, *Verticordia chrysanthra*, *Verticordia picta*.

Groundcover: The ground layer is open with a dense covering of leaf litter.

2.2.3 Stand of Marri – Wandoo Plantation

Rows of 6-10 planted Wandoos running in a north south direction intersect the sections of Geraldton wax, Banksia heath and Kangaroo paw. Height 4-5m and DBH of 20cm. A small stand of large Red gum are situated in the southern section of the site near the packing shed.

Canopy: Row of *Eucalyptus wandoo*. Stand of Red Gum *E. calophylla*.

Understorey: Plantation includes *Anigozanthus flavidus*, *Anigozanthos manglesii* and *Chamelaucium ulcinatum*.

Groundcover: The ground layer is open with limited leaf litter or groundcover.



Figure 2.2: Plantation Banksia Woodland



Figure 2.3: Eastern section of site, Common Woolly Bush, Grass Tree and Round-leaved Eremaea



Figure 2.4: Central section of site, Geraldton Wax in foreground, Blackbutt and Kangaroo Paw in background



Figure 2.5: Scrub Heath and Coastal Blackbutt



Figure 2.6: Large Blackbutt at southern entrance

2.3 Known and Expected Fauna

2.3.1 Basic Site Survey

A list of expected and known fauna identified during a basic fauna survey of the site is given in Table 2.1 below. Fauna were identified through on-site identification and observation of scats, scratchings, burrows and habitat types. The survey was conducted on the 8th December 2005, being partly cloudy, mild temperatures of 23 degrees and west- south- westerly winds.

Table 2.1: Fauna species identified at the subject site

Family	Genus and Species	Common name	Status*	Method**
Aves (Birds)				
Artamidae	<i>Gymnorhina tibicen</i>	Australian Magpie	-	O
Corvidae	<i>Corvus cornoides</i>	Australian Raven	-	O
Grallinidae	<i>Grallina cyanoleuca</i>	Magpie Lark	-	O
Meliphagidae	<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater	-	O
Meliphagidae	<i>Phylidonyris nigra</i>	White Cheeked Honeyeater	-	O
Meliphagidae	<i>Lichmera indistincta</i>	Brown Honeyeater	-	O
Psittacidae	<i>Barnardius zonarius</i>	Port Lincoln Parrot ('28')	-	O
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail	-	O
Mammals				
Macropodidae	<i>Macropus fuliginosus</i>	Western Grey Kangaroo	-	S

****Primary Method of identification**

C = Hand Caught, H = Heard, O = Observed, T = Trapped, S = Other Signs of Presence (scats, traces etc).

2.3.2 Fauna of the Brockman Catchment

A search of Western Australian Museum records and observations in the catchment area, listed 186 bird, 24 mammal, 15 amphibian, 49 reptile, 6 fish and 3 crustacean species as having been recorded in the Brockman River Catchment, covering 1520km², as listed in Appendix 2 of this report (Water and Rivers Commission, 2003).

2.4 Significant Species

2.4.1 Significant Flora

No species of state, federal or local significance were identified during the site survey.

2.4.2 Significant Fauna

The following significant species are known or expected in the Brockman River Catchment area, as identified in Section 2.3 above, are summarised in Table 2.2 below.

Table 2.2: Expected and Known Significant Fauna Species in the Brockman River Catchment

Scientific name	Common name	Family	Observed/ Expected	Significance	Likelihood of occurrence at the site
<i>Bettongia penicillata</i>	Woylie	Potoridae	Expected	*Schedule 4 WCA	Unlikely. Woylie are found predominantly in the shrubby understorey of dry eucalypt forest and woodlands. The site does not support any areas, which would be suitable for this species.
<i>Dasyurus geoffroyi</i>	Chuditch	Dasyuridae	Expected	*Schedule 1 WCA V & V IUCN	Unlikely. This species requires dense scrub/bush jarrah or mallee ecosystems (no areas of dense vegetation exist on the property). There are also few mature trees that are capable of supporting hollows for den sites.
<i>Isoodon obesulus fusciventor</i>	Quenda	Peramelidae	Expected	*Schedule 4 WCA	Unlikely. Although this species is common in areas of banksia woodland on the Swan Coastal Plain, the banksia woodlands on site are isolated.
<i>Macropus eugenii</i>	Tammar Wallaby	Macropodidae	Expected	*Schedule 4 WCA	Unlikely, as this species is usually found in scrub or semi desert habitats.
<i>Pseudemydura umbrina</i>	Western Swamp Tortoise	Chelidae	Expected	*Schedule 1 WCA C & Endangered IUCN	Unlikely, as the site does not contain any winter wet depressions. This species has only been re-introduced in a few select locations at Mogumber.
<i>Trichosurus vulpecula</i>	Brush-tailed Possum	Petauridae	Expected	*Schedule 4 WCA	Unlikely. Although brush tailed possums occur in a variety of habitats, the scattered areas of wandoo occurring on the site are not capable of supporting a population of this species (due to a lack of hollows for den sites)

Significance-

WCA= As listed in the Wildlife Conservation (Specially Protected Fauna) Notice 2005 (Wildlife Conservation Act 1950).

Schedule 1= fauna that is rare or likely to become extinct- in need of special protection.

Schedule 2= fauna presumed to be extinct.

Schedule 3= birds that are subject to an agreement between the governments of Japan and Australia for the protection of migratory birds and birds in danger of extinction.

Schedule 4= fauna that is in need of special protection, otherwise than for the reasons outlined for schedules 1, 2 and 3. (Conservation dependant)

* = As listed under the Natural Resource Management Plan for the Brockman River Catchment.

EPBC =As listed in the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act).

CE*= Critically endangered, E*= Endangered, V*= Vulnerable, CD*= Conservation dependent, I = introduced species

IUCN = As listed under the International Union for Conservation of Nature and Natural Resources.

EX=Extinct, EW= Extinct in the Wild, CR=Critically Endangered, EN=Endangered, VU=Vulnerable, NT=Near Threatened, LC=Least Concern.

2.5 Significant Fauna Habitats

No significant habitat areas were identified during the basic fauna survey. One Blackbutt (*Eucalyptus tottiana*) at the southern entrance of the site had a DBH of approximately 50cm. Trees with DBH of over 50cm are considered over 100 years old and begin to hollow out forming habitats for native fauna. Due to the isolation of the tree it is unlikely to be used as habitat for the significant or other fauna identified in Sections 2.3.1 and 2.4.2.

2.6 Significant Weed Infestations

A basic ecological assessment of the site identified no weed species listed as Declared Plants of Western Australia under the *Agricultural and Related Resources Protection Act 1976*.

A number of non-declared weed species were identified during the survey as summarised in the table below (refer to Appendix 1). Non declared weed species include those that are environmental weeds not locally endemic, such as species used in agriculture and landscaping.

Table 2.3: Non declared weeds on site

Botanical Name	Family	Common Name
<i>Carpobrotus edulis</i>	Aizoaceae	Pigface
<i>Chamaecytisus palmensis</i>	Papilionaceae	Tagasaste
<i>Hypochaeris radicata</i>	Asteraceae	Flatweed
<i>Pelargonium capitatum</i>	Geraniaceae	Rose Pelargonium
<i>Watsonia meriana</i>	Iridaceae	Watsonia

Pigface, Watsonia and a number of exotic grasses occurred in large infestations across the site. Pigface is predominately growing in the north of the site and Watsonia in the south. The remainder of the species listed do not occur in large numbers and are present as isolated individuals scattered throughout the site.

2.7 Wetlands, Water bodies and Drainage Lines

No wetlands, water bodies or drainage lines were identified on site as indicated on Chittering Local Planning Strategy Map 2001-2015.

2.8 Conservation Reserves and Voluntary Conservation Agreements

No Conservation reserves (for example National Parks, Protected Areas or Environmental parkland) as identified on the Town Planning Scheme Map are located on or adjacent to the subject site (Town Planning Scheme Map 3). No parts of the site are subject to a Voluntary Conservation Agreement.

3.0 SUMMARY OF RELEVANT LEGISLATION

3.1 Federal Legislation – Environmental Protection and Biodiversity Conservation Act

No species listed as Endangered/Vulnerable under the Commonwealth Environmental Protection and Biodiversity Conservation Act were identified during the site survey.

3.2 Western Australian Environmental Protection Act

No species listed as Endangered/Vulnerable/Rare under the Western Australian *Environmental Protection Act* were identified during the site survey.

Under the *Environmental Protection Amendment Act 2003* new legislation relating to land clearing will require permits to remove native vegetation over 1ha or where it is not for an exempt purpose. No portions of vegetation on the subject land is mapped as *Environmentally Sensitive Area* as depicted on the Native Vegetation Map Viewer, on Department of Environment's (DoE) website dated 5th December 2005. However the removal of mature native trees on site will require a clearing permit from the DoE, unless found exempt during the application process.

3.3 Wildlife Conservation Act

No species listed as Threatened under the Wildlife Conservation (Specially Protected Fauna) Notice 2005 (*Wildlife Conservation Act 1950*) were identified during the site survey.

3.4 Shire of Chittering Council

3.4.1 Land Management

Developments in the Shire of Chittering require land management by the landowner which can be summarised as;

- (a) *replanting and remedial works for environmental protection and regeneration of vegetation, using endemic local species;*
- (b) *preventing degradation of the land or vegetation;*
- (c) *minimising vegetation disturbance during earthworks;*
- (d) *minimising soil tillage, and controlling dust and emissions;*
- (e) *employing stormwater management*
- (f) *fire control; and*
- (g) *minimising the spread of Jarrah dieback.*

To address these requirements an Environmental Management Plan is recommended. The EMP will support the Outline Development Plan submitted to Council for approval.

4.0 STAGE B: BASIC ASSESSMENT OF ECOLOGICAL FUNCTIONS

Figure 2.1 provides a summary of the ecological functions of the subject site.

4.1 Core Habitat

Basic ecological assessment of the subject site indicates that existing vegetation at the site is isolated therefore unlikely to provide core habitat for the significant fauna species listed in Table 2.2.

4.2 Ecological Corridors

Due to its isolation the remaining vegetation on the subject site is unlikely, in its current state, to have any functional role as a corridor or linkage for significant flora or fauna.

4.3 Buffer Areas

The vegetation on the subject site does not function as a buffer for any larger native vegetation communities.

4.4 Other Ecological Functions

The intermittent rows of plantation Wandoo are habitat to a large variety of insects that are frequented by insectivorous birds. The Blackbutt at the southern entrance of the site is frequented by Port Lincoln Parrot who feed on the flowers and the plantation Banksia woodlands is frequented by honeyeaters; Brown Honeyeater, New Holland Honeyeater, White Cheeked Honeyeater who feed on the nectar. Once fully mature, the Wandoo and Blackbutt have the potential to bear hollows, which may be used by a variety of bird species.

5.0 STAGES 2 & 3: BASIC ASSESSMENT OF ECOLOGICALLY SIGNIFICANT AREAS AND IMPACTS

Table 5.1 summarises the ecologically significant areas identified at the subject site and lists potential impacts on these areas resulting from the proposed development in addition to requirements for maintaining ecological viability of these areas.

Table 5.1: Summary of Ecologically Significant Areas, Requirements and Impacts of Proposed Development

Location	Description	Significance	Requirements for maintaining viability	Impacts of Development
Scattered throughout the site	Mature Blackbutt, Wandoo and Red Gum	Marginal insectivorous eating - nectar feeding birds. Also provides visual amenity.	Retain existing large trees where possible and incorporate into landscaping or lots.	The proposed development is still in the preliminary stages but covers the areas where Blackbutt tree(s), Wandooos and Red Gums are located. Their removal will result in the loss of a number of bird foraging trees on the site.

6.0 STAGE 4: RECOMMENDATIONS

The proposed development involves the subdivision of the site into 1 ha lots with a loop access road. Establishment of residence and roads are unlikely to further impact on the highly disturbed vegetation. However individual Blackbutt, Wandoo and Red Gum will provide future habitat and foraging for birds and arboreal mammals connecting to surrounding vegetation.

The adjacent rural retreat to the west and vegetation surrounding the north and east of the site are best served by artificial biodiversity corridors along roadsides allowing the movement of fauna through the development. To enhance the ecological viability of the corridors mature trees will be retained where possible. Retaining vegetation and creating artificial roadside corridors will also provide visual amenity to the rural lifestyle development.

Within the proposed lots, in the northeast corner of the site, an area of Public Open Space (POS), 3901m² has been provided as fauna habitat, drainage basin, buffer and linkage to surrounding native vegetation. The POS is included in the supplementary planting of the roadside corridors. All logs will be retained where possible to provide new fauna habitats.

Supplementary planting of the POS and roadside corridors should adhere to a Landscape Plan and as a minimum the following conditions;

- Experienced and qualified personnel with knowledge of local and exotic species identification should carry out all revegetation work.
- Plants used for revegetation must be exclusively those listed in the Landscape Plan that will be developed for the site. However not all plants may be horticulturally available at the time of planting. Despite this, every effort should be made to use a diverse mix of species and life form types.
- Supplementary planting should take into account site suitability for natural regeneration and must not be conducted in such a way as to cause damage to naturally regenerating plants.
- Supplementary planting should take into account the existing species composition, for example, in areas with good canopy cover but degraded lower strata, ground cover and understorey species are to form the predominant part of the revegetation planting. In some instances woody weeds may be retained to shade out other weeds and allow a native ground cover to establish. These species should be removed once native species are established.
- Planting should be carried out during suitable weather conditions to minimise the risk of loss of newly establishing plants through drought.
- The retained vegetation is to be weeded and revegetated
- Green plastic tree guards to be installed around seedlings where necessary

Prior to construction works, to minimise the risk of environmental damage, all personnel involved in construction activities including transient deliverers and other associated contractors and builders shall be briefed on all aspects of the environment related to their activity and their compliance to the stated protection measures is to be demanded including dust control and prevention of jarrah dieback.

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APPENDICES

APPENDIX 1: PLANT SPECIES LIST

APPENDIX 2: FAUNA LIST EXTRACTED FROM NATURAL RESOURCES MANAGEMENT PLAN

Appendix 1
Plant Species List

Flora List – Reserve Rd, Chittering

Native Plants by Genus

Botanical Name	Family	Common Name
<i>Acacia saligna</i>	Mimosaceae	Orange Wattle
<i>Adenanthos cygnorum</i>	Proteaceae	Common Woollybush
<i>Allocasuarina</i> sp.	Casuarinaceae	
<i>Anigozanthus flavidus</i>	Haemodoraceae	Tall Kangaroo Paw
<i>Anigozanthos manglesii</i>	Haemodoraceae	Mangles Kangaroo Paw
<i>Anigozanthus pulcherrimus</i>	Haemodoraceae	Yellow Kangaroo Paw
<i>Banksia grandis</i>	Proteaceae	Bull Banksia
<i>Banksia prionotes</i>	Proteaceae	Acorn Banksia
<i>Banksia speciosa</i>	Proteaceae	Showy Banksia
<i>Banksia sphaerocarpa</i>	Proteaceae	Round- fruit Banksia
<i>Beaufortia squarrosa</i>	Myrtaceae	Sand Bottlebrush
<i>Chamelaucium ulcinatum</i>	Myrtaceae	Geraldton Wax
<i>Conospermum stoechadis</i>	Proteaceae	Common Smokebush
<i>Conostylis</i> sp.	Haemodoraceae	
<i>Dasypogon bromeliifolius</i>	Dasypogonaceae	Pineapple Bush
<i>Daviesia pachyphylla</i>	Papilionaceae	Ouch Bush
<i>Dryandra</i> sp.	Proteaceae	
<i>Eremaea beaufortioides</i>	Myrtaceae	Round Leaved Eremaea
<i>Eremaea brevifolia</i>	Myrtaceae	
<i>Eucalyptus calophylla</i>	Myrtaceae	Red Gum
<i>Eucalyptus gomphocephala</i>	Myrtaceae	Tuart
<i>Eucalyptus macrocarpa</i>	Myrtaceae	Mottledcah
<i>Hemiandra linearis</i>	Lamiaceae	Speckled Snakebush
<i>Hibbertia hypericoides</i>	Dilleniaceae	Yellow Buttercups
<i>Isolepis</i> sp.	Cyperaceae	
<i>Jacksonia floribunda</i>	Papilionaceae	Holly Pea
<i>Melaleuca gibbosa</i>	Myrtaceae	Slender Honey-myrtle
<i>Nuytsia floribunda</i>	Loranthaceae	Christmas Tree
<i>Olea europaea</i>	Oleaceae	Olive Tree
<i>Patersonia occidentalis</i>	Iridaceae	Purple Flag
<i>Petrophile linearis</i>	Proteaceae	Pixie Mops
<i>Ptilotus polystachyus</i>	Amaranthaceae	Prince of Wales Feather
<i>Scaevola</i> sp.	Goodeniaceae	
<i>Synaphea</i> sp.	Proteaceae	
<i>Thysanotus dichotomus</i>	Anthericaceae	Branching Fringe Lily
<i>Verticordia chrysantha</i>	Myrtaceae	
<i>Verticordia picta</i>	Myrtaceae	Painted Featherflower
<i>Xanthorrhoea preissii</i>	Xanthorrhoeaceae	Grass Tree

Exotic Species by Genus

Botanical Name	Family	Common Name
<i>Watsonia meriana</i>	Iridaceae	Watsonia
<i>Hypochaeris radicata</i>	Asteraceae	Flatweed
<i>Pelargonium capitatum</i>	Geraniaceae	Rose Pelargonium
<i>Carpobrotus edulis</i>	Aizoaceae	Pigface
<i>Chamaecytisus palmensis</i>	Papillionaceae	Tagasaste

Appendix 2

**Fauna list extracted from Natural
Resources Management Plan**

Priority Species	Conservation code
<i>Persoonia sulcata</i>	3
<i>Petrophile plumosa</i>	3
<i>Synaphea grandis</i>	3
<i>Acacia clydonophora</i>	4
<i>Boronia tenuis</i>	4
<i>Calytrix sylvana</i>	4
<i>Dryandra polycephala</i>	4
<i>Grevillea drummondii</i>	4
<i>Hydrocotyle lennoides</i>	4
<i>Schoenus natus</i>	4
<i>Verticordia lindleyi</i> subsp. <i>lindleyi</i>	4
<i>Verticordia paludosa</i>	4
<i>Lysinema elegans</i>	C

Typical flora in the Brockman River catchment

Jarrah forest		
Botanical name	Common name (if known)	Notes
<i>Allocasuarina fraseriana</i>	sheoak	small tree
<i>Banksia grandis</i>	bull banksia	small tree
<i>Eucalyptus accedens</i>	powerbark wandoo	tree, some sites only
<i>Corymbia calophylla</i>	marri	tree, usually <50% of tree cover
<i>Eucalyptus marginata</i>	jarrah	dominant tree
<i>Eucalyptus patens</i>	blackbutt	tree, some sites
<i>Eucalyptus wandoo</i>	wandoo	trees, some sites
<i>Grevillea wilsonii</i>	native fuchsia	shrub
<i>Persoonia longifolia</i>	snottygobble	small tree
Marri-wandoo		
<i>Corymbia calophylla</i>	marri	tree
<i>Eucalyptus wandoo</i>	wandoo	tree
<i>Eucalyptus laeliae</i>	Darling Range ghost gum	tree
<i>Xanthorrhoea preissii</i>	grasstree	small tree
<i>Macrozamia riedlei</i>	samia	small tree
<i>Nuytsia floribunda</i>	Christmas tree	small tree
<i>Dryandra sessilis</i>	parrot bush	tall shrub
<i>Daviesia horrida</i>	prickly bitter pea	tall shrub
<i>Hakea cristata</i>	snail hakea	tall shrub
<i>Hakea trifurcata</i>	two-leaf hakea	tall shrub
<i>Acacia pulchella</i>	prickly Moses	small shrub
<i>Dryandra nivea</i>	couch honeypot	small shrub
<i>Hibbertia hpericoides</i>	yellow buttercups	small shrub
<i>Hibbertia montana</i>		

Jarrah- wandoo – powerbark		
Botanical name	Common name (if known)	Notes
<i>Acacia acuminata</i>	jam	small tree in drier eastern areas
<i>Acacia varia</i> var. <i>affinis</i>		large shrub
<i>Adenanthos cygnorum</i>	common woollybush	large shrub
<i>Allocasuarina fraseriana</i>	sheoak	small tree
<i>Allocasuarina humilis</i>	dwarf sheoak	large shrub
<i>Anigozanthos humilis</i>	catspaw	herb
<i>Anigozanthos mangelisii</i>	Mangle's kangaroo paw	herb
<i>Astroloma pallidum</i>	kickbush	small shrub
<i>Baeckea crispiflora</i>		small shrub
<i>Banksia grandis</i>	bull banksia	small tree
<i>Bossiaea armata</i>		small shrub
<i>Bossiaea eriocarpa</i>	common brown pea	small shrub
<i>Burchardia umbellata</i>	milkmaids	herb
<i>Calothamnus quadrifidus</i>	one sided bottlebrush	tall shrub, drier eastern parts
<i>Calothamnus sanguineus</i>	pindak	large shrub
<i>Calytrix brachyphylla</i>		small shrub
<i>Calytrix sappirina</i>		small shrub
<i>Chorizema dicksonii</i>	yellow-eyed flame pea	small shrub
<i>Comesperma volubile</i>	love creeper	creeper
<i>Conospermum densiflorum</i>	common smokebush	small shrub
<i>Conospermum glumaceum</i>	hooded smokebush	small shrub
<i>Conostylis setosa</i>	white cottonhead	herb
<i>Darwinia</i> sp.		
<i>Daviesia divaricata</i>	marno	large shrub
<i>Daviesia pectinata</i>	prickly bitter pea	large shrub
<i>Dianella revoluta</i>	blueberry lily	herb
<i>Dillwynia cinerascens</i>	grey parrot-pea	small shrub
<i>Dryandra polycephala</i>	many-headed dryandra	large shrub
<i>Dryandra nivea</i>	couch honeypot	small shrub, wetter western part
<i>Dryandra sessilis</i>	parrot bush	tall shrub, wetter western parts
<i>Eucalyptus accedens</i>	powderbark wandoo	tree in drier eastern parts
<i>Eucalyptus marginata</i>	jarrah	occasional, western parts
<i>Eucalyptus patens</i>	Swan River blackbutt	tree, in some valleys
<i>Eucalyptus wandoo</i>	wandoo	tree, wetter western parts
<i>Gastrologium spinosum</i>	prickly poison	medium shrub, drier eastern parts
<i>Gastrolobium villosum</i>	crinkle-leaved poison	small shrub
<i>Gompholobium knightianum</i>		small shrub
<i>Grevillea synapheae</i>	catkin grevillea	small shrub
<i>Grevillea pilulifera</i>	woolly-flowered grevillea	large shrub
<i>Haemodorum</i> sp.		herb
<i>Hakea ruscifolia</i>	candle hakea	large shrub
<i>Hakea lissocarpha</i>	honey bush	large shrub
<i>Hakea cristata</i>	thick leaved hakea	tall shrub, wetter eastern parts
<i>Hakea undulata</i>	wavy-leaved hakea	tall shrub, wetter eastern parts
<i>Hakea trifurcata</i>	two leaved hakea	tall shrub, wetter eastern parts

Botanical name	Common name (if known)	Notes
<i>Hibbertia hypericoides</i>	yellow buttercups	small shrub, wetter eastern parts
<i>Hibbertia montana</i>	mountain primrose	small shrub, wetter eastern parts
<i>Hibbertia lasiopus</i>	large hibbertia	small shrub
<i>Keumedia prostrata</i>	scarlet runner	creeper
<i>Lechenaultia biloba</i>	blue lechenaultia	small shrub
<i>Leucopogon pulchellus</i>	beard-heath	small shrub
<i>Leptospermum erubescens</i>	roadside tea tree	tall shrub, drier eastern parts
<i>Macrozamia riedlei</i>	zamia	wetter eastern parts
<i>Melaleuca scabra</i>	rough honey myrtle	large scrub
<i>Nuytsia floribunda</i>	Christmas tree	small tree, western eastern parts
<i>Orthrosanthus laxiflorus</i>		herb
<i>Oxylobium parviflorum</i>	box poison	shrub, drier eastern parts
<i>Patersonia occidentalis</i>	purple flag	herb
<i>Petrophile serruriae</i>		large shrub
<i>Petrophile striata</i>		large shrub
<i>Ptilotus mangelsii</i>	pom poms	herb
<i>Phyllanthus calycinus</i>	false bornia	small shrub
<i>Spaerolobium vimineum</i>	leafless glove pea	small shrub
<i>Stackhousia</i> sp.		herb
<i>Tetratheca</i> sp.		herb
<i>Xanthorrhoea prissii</i>	grass tree	shrub
Riverine woodland		
<i>Eucalyptus loxophleba</i>	York gum	in drier areas on and close to drainage
<i>Eucalyptus rudis</i>	Flooded gum	along streams in wetter areas
<i>Melaleuca raphiophylla</i>	swamp paperbark	narrow strips along streams
<i>Melaleuca uncinata</i>		
<i>Melaleuca vinea</i>		
Granite outcrops in drier areas		
<i>Allocasuarina huegeliana</i>	rock sheoak	small tree, peripheral groves
<i>Borja spaerocephala</i>	pincushions	tussocks
<i>Grevillea bipinnatifida</i>	Fuchsia grevillea	shrub
<i>Hakea elliptica</i>	two leaf hakea	shrub
<i>Hakea undulata</i>	wavy-leaf hakea	shrub
York gum, wandoo and salmon gum woodlands and heath		
<i>Acacia acuminata</i>	jam	small tree
<i>Acacia unicorbotrya</i>	manna wattle	shrub
<i>Acacia pulchella</i>	prickly Moses	understorey species
<i>Allocasuarina campestris</i>	tamma	shrub
<i>Allocasuarina humilis</i>	dwarf sheoak	shrub
<i>Allocasuarina huegeliana</i>	rock sheoak	medium tree
<i>Casuarina obesa</i>	swamp sheoak	small tree, along streams
<i>Eucalyptus accedens</i>	powerbark wandoo	tree, associated with breakaways

Botanical name	Common name (if known)	Notes
<i>Eucalyptus loxophleba</i>	York gum	tree
<i>Eucalyptus rudis</i>	flooded gum	tree, along stream
<i>Eucalyptus salmonophloia</i>	salmon gum	tree
<i>Eucalyptus wandoo</i>	wandoo	tree
<i>Adenanthos cygnorum</i>	common woollybush	heath species
<i>Banksia attenuata</i>	slender banksia	heath species
<i>Calathamus quadrifidus</i>	one-sided bottlebrush	understorey species
<i>Conospermum</i> sp.	smoke bush	heath species
<i>Dryandra nivea</i>	couch honey pot	heath species
<i>Eucalyptus drummondii</i>	Drummond's mallee	heath species/mallee
<i>Eucalyptus macrocarpa</i>	mottlecak	heath species/mallee
<i>Leptospermum erubescens</i>	roadside tea-tree	heath species
<i>Isopogon dubius</i>	pin cushion cornflower	heath species
<i>Jackson</i> sp.		heath species
<i>Stirling latifolia</i>	blueboy	heath species
<i>Nuytsia floribunda</i>	Christmas tree	heath species
<i>Pericalymna ellipticum</i>		understorey species
<i>Gastrolobium spinosum</i>	prickly poison	shrub
<i>Hakea priessi</i>	needle tree	small tree
<i>Pericalymna ellipticum</i>	swamp tea tree	shrub
<i>Xanthorrhoea preissi</i>	grass tree	understorey species
Scrub-heath and banksia low woodland		
<i>Actinostrobus arcarius</i>	sandplain cypress	shrub
<i>Adenanthos cygnorum</i>	common woollybush	tall shrub
<i>Adenanthos drummondii</i>		shrub
<i>Allocasuarina campestris</i>		shrub
<i>Allocasuarina humilis</i>	dwarf sheoak	shrub
<i>Astraloma</i> sp.		shrub
<i>Banksia attenuata</i>	slender banksia	small tree
<i>Banksia menziesii</i>	firewood banksia	small tree
<i>Banksia prionotes</i>	acorn banksia	medium tree
<i>Comesperma volubile</i>	love creeper	low shrub
<i>Chorizema dicksonii</i>	Flame pea	low shrub
<i>Diannella revoluta</i>	blueberry lily	herb
<i>Dryandra</i> sp.		shrub
<i>Eremaea</i> sp.		
<i>Gastrolobium spinosum</i>	prickly poison	medium shrub
<i>Grevillea eriostachya</i>	flame grevillea	shrub
<i>Grevillea integrifolia</i>	entire-leaved grevillea	shrub
<i>Hakea trifurcata</i>	tow-leaf hakea	shrub
<i>Isopogon dubius</i>	pin cushion cone flower	small shrub
<i>Leptospermum ellipticum</i>	swamp tea tree	shrub
<i>Melaleuca radula</i>	graceful honeymyrtle	shrub
<i>Melaleuca scabra</i>	rough honeymyrtle	large shrub
<i>Nuytsia floribunda</i>	Christmas tree	small tree, parasitic

Botanical name	Common name (if known)	Notes
<i>Petrophile</i> sp.		shrub
<i>Verticordia chrysantha</i>		low shrub
<i>Verticordia picta</i>	painted featherflower	low shrub
<i>Xanthorrhoea preissii</i>	grasstree	shrub
Salt flats		
<i>Halosarcia</i> sp	samphire	small tree, adjacent salt flats
<i>Casuarina obesa</i>	swamp sheoak	medium to large shrub
<i>Melaleuca thyoides</i>		medium shrub
<i>Melaleuca uncinata</i>	broombrush	

This list was modified from list published in the Weaving, S. (1999). Native vegetation handbook for the Shire of Toodyay.

APPENDIX E FIRE MANAGEMENT PLAN