PLANNING PROPOSAL

PP/1/2013 South Dural

December 2013



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BACKGROUND

The land known as South Dural is bounded by Old Northern Road, New Line Road and Hastings Road and spans part of the suburbs of Dural, Glenhaven and Castle Hill.

At a meeting with Council and the South Dural Residents and Ratepayers Group in June 2013, representatives from the DP&I confirmed that the State Government is not in a position to initiate the release of South Dural for urban development as a State lead process due to multiple landowners, high fragmentation, long lead times and potential cost to government.

The Department representatives indicated that a planning proposal to rezone South Dural could be considered subject to it being demonstrated that there would be no net cost to government. It was advised that the Gateway process should be used to determine the scope of supporting studies required.

In accordance with this advice, a Planning Proposal was submitted to Council by a consultant requesting the rezoning of South Dural for residential/urban development.

The Planning Proposal has been redrafted to fit Council's standard template.

PART 1 - OBJECTIVES OR INTENDED OUTCOMES

To facilitate the comprehensive urban development of the land for residential and mixed use development and employment purposes in an integrated manner in accordance with its environmental capacity and including the delivery of new infrastructure to support growth.

PART 2 - EXPLANATION OF THE PROVISIONS

Amendment of the Hornsby Local Environmental Plan 2013 as follows:

- 1. Changes to the Land Zoning Map to reflect a residential (and potentially business) zone to permit urban development;
- 2. Changes to the Lot Size Map to reflect a residential density; and
- 3. Changes to the Height of Buildings Map to reflect the density and housing types proposed.

PART 3 - JUSTIFICATION

Section A - Need for the planning proposal

1. Is the planning proposal a result of any strategic study or report?

No. However, the site was nominated and assessed in the NSW Government review of housing opportunities on landowner nominated sites (Potential Home Sites Program).

The NSW Government's PHS program evaluation summary states that South Dural is currently not deliverable due to multiple landowners, high fragmentation, long lead times and potential cost to government.

At a meeting with Council and the South Dural Residents and Ratepayers Group in June 2013, representatives from the DP&I confirmed that the State Government is not in a position to initiate the release of South Dural as a State lead process for the reasons listed above. The Department representatives indicated that a planning proposal to rezone South Dural could be considered subject to it being demonstrated that there would be no net cost to government. It was advised that the Gateway process should be used to determine the scope of supporting studies required.

A number of technical studies accompany the *Planning Proposal*. These studies are dated 2008/9 and include:

- Flora and Fauna Investigation (January 2009) Hayes Environmental;
- Bushfire Planning Investigation (January 2009) BES;
- Infrastructure Report (January 2009) Maunsell Australia;
- Traffic, Transport and Accessibility Assessment (January 2009) Maunsell Australia; and
- Retail and Commercial Potential (December 2008) Don Fox Planning.

The studies would be required to be updated if the *Planning Proposal* is progressed.

2. Is the planning proposal the best means of achieving the objectives or intended outcomes, or is there a better way?

Yes. The Planning Proposal is the best means of achieving the intended outcome of investigating the rezoning of the land for urban purposes. The *HLEP* specifies zoning and minimum lot size requirements which can only be amended by means of progression of a planning proposal.

3. Is there a net community benefit?

Yes. The *Planning Proposal* will deliver a net community benefit by:

- providing additional housing supply;
- providing housing choice in the form of free-standing dwellings as an alternative to multi-unit housing;
- providing infrastructure at no net cost to government

Section B - Relationship to strategic planning framework

4. Is the planning proposal consistent with the objectives and actions contained within the applicable regional or sub-regional strategy (including the Sydney Metropolitan Strategy and exhibited draft strategies)?

The *Metropolitan Plan for Sydney 2036* provides a framework for the sustainable growth of Sydney over the next 25 years. The *Strategy* promotes housing in and around urban centres, and the protection of rural and resource lands. The impacts of urban expansion would need

to be addressed in the progression of the South Dural Planning Proposal.

The *draft North Subregional Strategy* sets out a target of 11,000 new dwellings and 9,000 new jobs within Hornsby Shire by 2031. Council is well placed to meet its share of dwelling obligations. Potential for approximately 4,500 new dwellings can be achieved through infill development/subdivision. Opportunities for a further 3,000 new homes was provided through the finalisation of the Housing Strategy in 2011. The Epping Urban Activation Precinct being led by the DP&I promotes opportunities for 2,500 new dwellings within Hornsby Shire at Epping. Council is also reviewing the opportunities for additional development within the Hornsby West Side, which could provide approximately 1,000 new dwellings. Council's dwelling target is expected to increase when the *draft Subregional Strategy* is finalised, and in light of the draft *Metropolitan Strategy for Sydney 2031* (discussed below). The provision of housing at South Dural would further contribute to the achievement of Council's dwelling target.

The *draft Metropolitan Strategy for Sydney 2031* was released for public exhibition in March 2013. The *draft Strategy* alters subregional boundaries and groups Hornsby, Ku-ring-gai, Manly, Pittwater and Warringah Councils to form the North subregion. The new housing and employment targets set out in the draft Strategy for the North subregion are 37,000 new dwellings and 39,000 new jobs to be created between 2011 and 2031. As discussed above, Council is well placed to meet its share of dwelling obligations and the provision of housing at South Dural would further contribute to the achievement of Council's dwelling target.

The *draft Strategy* categorises the land within the Sydney Region into a Metropolitan Urban Area and a Metropolitan Rural Area. The northern two thirds of South Dural is identified as being within the Metropolitan Rural Area, while the remaining southern third is identified as within the Metropolitan Urban Area.

The Metropolitan Rural Area comprises one of nine "city shapers" identified in the *draft Strategy*, along with the North West Rail Link, that will directly influence Sydney's growth to 2031. The Metropolitan Rural Area provides opportunities for agricultural activities that contribute to Sydney's future ability to maintain a reliable and local source of fresh food and produce.

The *South Dural Planning Proposal* seeks rezoning of rural land for urban purposes. Consideration of this through the DP&I's Gateway process would be consistent with the identified priority to manage and monitor land for possible extension of the Metropolitan Urban Area.

The North West Rail Link corridor runs 23 kilometres between Epping and Rouse Hill in Sydney's North West Growth Centre. Planning around the Cherrybrook station precinct has not commenced. The final Corridor Strategy (October 2013) prepared by the DP&I estimates that a total of 3,200 additional dwellings and 50 additional jobs could be accommodated within the Cherrybrook Study Area.

The Department has advised that the Corridor Strategy will form the basis for future detailed planning within each precinct and will be supported by a Section 117 Direction to ensue that the Corridor Strategy is taken into consideration when preparing future detailed plans.

5. Is the planning proposal consistent with the local council's Community Strategic Plan or other local strategic plan?

Yes. The *Planning Proposal* is consistent with Council's Community Strategic Plan. *Your Community Plan 2013 – 2033* aims to achieve a harmonious natural and built environment by monitoring and reviewing existing planning controls to ensure quality outcomes for the long term benefit of the Shire.

6. Is the planning proposal consistent with applicable state environmental planning policies?

Yes. The *Planning Proposal* is consistent with relevant State Environmental Planning Policies (SEPPs) and deemed SEPPs. See Appendix B for details.

7. Is the planning proposal consistent with applicable Ministerial Directions (s.117 directions)?

The *Planning Proposal* will need to justify the rezoning of rural land to residential land to be consistent with Direction 1.2 Rural zones. The objective of this direction is to protect the agricultural production value of rural land. The direction states that a planning proposal must not rezone land from a rural zone to a residential or business zone unless the Director-General is satisfied that it is justified by a study prepared in support of the planning proposal which gives consideration to the objectives of this direction.

The Planning Proposal is consistent with the following directions which are also applicable:

Direction 1.1 Employment and resources Direction 2.1 Environmental protection zones Direction 2.3 Heritage conservation Direction 3.1 Residential zones Direction 3.4 Integrating land use and transport Direction 4.3 Flood Prone Land Direction 4.4 Planning for Bushfire Protection Direction 7.1 Metropolitan Planning See Appendix C for details.

Section C - Environmental, social and economic impact

8. Is there any likelihood that critical habitat or threatened species, populations or ecological communities, or their habitats, will be adversely affected as a result of the proposal?

Yes. The Flora and Fauna Investigation report submitted with the planning proposal identifies ecological features and habitats of conservation significance within the subject site, including threatened flora and fauna species and endangered ecological communities. In general, most of the ecological features and habitats converge within the Georges Creek Vegetation Corridor, but some endangered ecological communities occur outside the main corridor. The *Hornsby Shire Biodiversity Conservation Strategy 2006* has a policy of net improvement for native vegetation. Further detailed studies and planning would be required to investigate how the additional remnant native vegetation can be retained.

9. Are there any other likely environmental effects as a result of the planning proposal and how they are proposed to be managed?

The Georges Creek native vegetation corridor is of significant ecological value which functions as a wildlife corridor and provides habitat for several threatened species. The Planning Proposal recognises this significance and proposes to retain areas of the STIF, BGHF and Georges Creek corridor and acknowledges that there will be a need for further more detailed studies at a later stage of planning.

The other vegetation community mapped in the South Dural area is Blackbutt Gully Forest which is considered as of local significance in the *Hornsby Shire Biodiversity Conservation Strategy*. A significant corridor of this community provides essential connectivity with the BGHF and STIF communities and provides additional refuge and habitat for various threatened and local flora and fauna.

The Hornsby Development Control Plan provides prescriptive measures for the preservation of trees, vegetation and biodiversity values. In particular setbacks and buffer distances from remnant vegetation are required to be provided in any development. Any proposed development as a result of the South Dural Planning Proposal will be required to implement these setbacks and buffer zones.

10. How has the planning proposal adequately addressed any social and economic effects?

The provision of detailed information confirming the ability and commitment to finance and deliver the full estimated infrastructure required is a key element of the proposal. At this stage, no firm financial or business plan has been provided to estimate the infrastructure costs and how they would be funded to confirm the viability of the project. Council is seeking a conditional Gateway determination which sets out that a Business Plan is to be funded by the proponent and commissioned by Council to confirm the feasibility of the project being delivered with all necessary infrastructure at no cost to government.

Section D - State and Commonwealth interests

11. Is there adequate public infrastructure for the planning proposal?

No. Infrastructure would need to be augmented or provided, including the upgrading of roads, the extension of trunk water and sewer mains, drainage, electricity and communications. The proponent has acknowledged that the progression of the Planning Proposal is subject to there being no net cost to government. However, as discussed above, Council is seeking a conditional Gateway determination which sets out that a Business Plan is to be funded by the proponent and commissioned by Council to confirm the feasibility of the project being delivered with all necessary infrastructure at no cost to government.

12. What are the views of State and Commonwealth public authorities consulted in accordance within this gateway determination?

The Roads and Maritime Services have requested that the traffic report submitted with the Planning Proposal be updated and re-submitted for review.

Consultation will occur with relevant public authorities identified as part of the gateway determination.

PART 4 - COMMUNITY CONSULTATION

Council is committed to undertaking comprehensive community consultation as part of the progression of the Planning Proposal. It is usual Council practice to exhibit major Planning Proposals for a period of 2 months. At a minimum, consultation will include:

Public Authorities

Notification letters and a copy of the Planning Proposal will be sent to relevant public authorities.

Advertisement in local newspapers

An advertisement will be placed in local newspapers identify the purpose of the Planning Proposal and where the Planning Proposal can be viewed.

Advertisement on the Council website

The Planning Proposal will be exhibited on the Council website (<u>www.hornsby.nsw.gov.au/onexhibition</u>) under On Exhibition. Council's libraries have access to the website.

Your Say Hornsby website

An internet based discussion forum will be placed on the Your Say Hornsby website to allow independently moderated discussion.

Letters to affected and adjoining property owners

A letter will be sent to affected and adjoining property owners advising of the exhibition of the Proposal and inviting submissions.

Letters to persons who made a submission during preliminary notification

A letter will be sent to persons who made a submission during preliminary notification advising of the exhibition of the Proposal and inviting submissions.

Letters to persons who made a submission on the Housing Strategy

A letter will be sent to persons who made a submission on the *Housing Strategy* advising of the exhibition of the Proposal and inviting submissions.

Letters to community and industry groups

A letter will be sent to the following community and industry groups advising of the exhibition of the Proposal and inviting submissions:

- Dural and Round Corner Chamber of Commerce
- Dural and District Historical Society
- Community Voice;
- Hornsby Conservation Society;
- Friends of Berowra Valley;
- Galston Area Residents Association;
- Association for Berowra Creek;
- Dural District Progress Association;
- Friends of South Dural;
- Hornsby Kuring-gai Greens;
- Sydney Agricultural Rural and Public Lands Trust Incorporated;
- Pennant Hills District Civic Trust;
- Housing Industry Association;
- Royal Australian Institute of Architects;
- Urban Development Institute of Australia; and
- Real Estate Institute of Australia.

Displays at the Council Administration Building and local libraries

The Planning Proposal will be displayed at the Council Administration Centre, 296 Pacific Highway, Hornsby and the following libraries:

Hornsby Library Berowra Library Galston Library Pennant Hills Library Epping Library

Referrals to other Divisions/Branches

A copy of the Planning Proposal will be forwarded to relevant Divisions/Branches of Council for comment.

Review of Consultation Strategy

Where submissions warrant, the consultation strategy may be reviewed to extend the exhibition period and/or the methods of consultation. This may occur where a submission provides reasonable justification for a request for an extension to the exhibition period or where Council is of the opinion an amendment to the consultation strategy would facilitate greater feedback on the draft Plan.

Following the exhibition period, a report on submissions will be presented to Council for its consideration.

PROPOSED TIMELINE

Weeks/Months after	ltem
Gateway	
0	Gateway determination
8 weeks	Business Plan submitted to DP&I for review
10 weeks	DP&I advises Business Plan adequate
3 months	Proponent enters legal agreement to fund studies and resources
3 months	Briefs, tenders, engagement of consultants for studies (9 months)
9 months	Studies commenced
18 months	Studies/draft precinct planning completed
21 months	Revised Planning Proposal submitted to DP&I
22 months	DP&I authorisation for exhibition
23 months	Public Exhibition (2 months)
26 months	Consideration of submissions
28 months	Report to Council on submissions
28 months	Request planning instrument be made

OR

28 months	Report to Council on submissions
29 months	Re-exhibition with changes after submissions
32 months	Consideration of submissions
33 months	Report to Council on submissions
33 months	Request planning instrument be made

Appendix A

Location Map



Appendix B State Environmental Planning Policy Checklist

State Environmental Planning Policies		
SEPP Title	Compliance	Comment
1. Development Standards	N/A	
2. Minimum Standards for Residential	Repealed	
Flat Development		
3. Castlereagh Liquid Waste Disposal	Repealed	
Depot		
4. Development Without Consent and	N/A	
Miscellaneous Complying		
Development		
6. Number of Storeys in a Building	N/A	
7. Port Kembla Coal Loader	Repealed	
8. Surplus Public Land	Repealed	
9. Group Homes	Repealed	
10. Retention of Low-Cost Rental	Repealed	
Accommodation		
11.Traffic Generating Developments	Repealed	
12. Public Housing (Dwelling Houses)	Repealed	
13. Sydney Heliport	Repealed	
14. Coastal Wetlands	N/A	
16. Tertiary Institutions	Repealed	
17. Design of Building in Certain	Not Made	
Business Centres		
18. Public Housing	Not Made	
19. Bushland in Urban Areas	Yes	Biodiversity studies will consider the impact of the proposed urban development on bushland.
20. Minimum Standards for	Repealed	
Residential Flat Development		
21. Moveable Dwellings	N/A	
22. Shops and Commercial Premises	N/A	
24. State Roads	Not Made	
25. Residential Allotment Sizes	Repealed	
26. Littoral Rainforests	N/A	
27. Prison Sites	Repealed	
28. Town Houses and Villa Houses	Repealed	
29. Western Sydney Recreational	N/A	
Area		
30. Intensive Agriculture	N/A	
31. Sydney (Kingsford Smith) Airport	Repealed	
32. Urban Consolidation	N/A	
(Redevelopment of Urban Land)		
33. Hazardous and Offensive	N/A	
Development		
34. Major Employment Generating Industrial Development	Repealed	
35. Maintenance Dredging of Tidal	Repealed	
26 Manufactured Home Estates	NI/A	
27. Continued Mines and Extractive	IN/A Depended	
Industries	repealed	
38. Olympic Games and Related	Repealed	

SOUTH DURAL PLANNING PROPOSAL

Development Proposals		
39. Spit Island Bird Habitat	N/A	
40. Sewerage Works	Not Made	
41. Casino/Entertainment Complex	N/A	
42. Multiple Occupancy and Rural Land (Repeal)	Repealed	
43. New Southern Railway	Repealed	
44. Koala Habitat Protection	Yes	Encourages the conservation and management of natural vegetation areas that provide habitat for koalas. Council cannot approve development in an area affected by the policy without an investigation of core koala habitat. The biodiversity study would investigate this.
45. Permissibility of Mining	Repealed	
46. Protection and Management of Native Vegetation	Repealed	
47. Moore Park Showground	N/A	
48. Major Putrescible Landfill sites	Repealed	
49. Tourism Accommodation in Private Homes	Draft	
50 Canal Estates	N/A	
51. Eastern Distributor	Repealed	
52. Farm Dams and Other Works in Land and Water Management Plan Areas	N/A	
53. Metropolitan Residential Development	Repealed	
54. Northside Storage Tunnel	Repealed	
55. Remediation of Land	Yes	Requires consideration of contamination issues when rezoning land. Council must be satisfied that the land is suitable for the proposed use or can be remediated to make it suitable. A preliminary investigation report would be prepared in the progression of the Planning Proposal.
56. Sydney Harbour Foreshores and Tributaries	Repealed	
58. Protecting Sydney's Water Supply	Repealed	
59. Central Western Sydney	N/A	
Economic and Employment Area		
60. Exempt and Complying Development	N/A	
61. Exempt and Complying Development for White Bay and Glebe Island Ports	Repealed	
62. Sustainable Aquaculture	N/A	
63. Major Transport Projects	Repealed	
64. Advertising and Signage	N/A	
65. Design Quality of Residential Flat Development	N/A	
67. Macquarie Generation Industrial Development 68. Not Allocated	Repealed	
69 Major Electricity Supply Projects	Repealed	
70. Affordable Housing (Revised	N/A	
71 Coastal Protection	ΝΙ/Δ	
72. Linear Telecommunications	Repealed	
Development – Broadband	D	
7.3. KOSCIUSKO SKI Kesorts	Repealed	
Lands	Repealed	

SEPP 1989. Penrith Lakes Scheme	N/A	
SEPP 2004. Housing for Seniors or	N/A	
People with a Disability		
SEPP 2004 Building Sustainability	N/A	
Index: BASIX	11/7	
SEDD 2004 APTC Pail Infrastructure	Popoalod	
SEPP 2004. ARTC Rail Illiastructure	Repealed	
SEPP 2004. Sydney Metropolitan	Repealed	
CERR 2005 Development on Kurnell	N1/A	
SEPP 2005. Development on Kurnell	N/A	
	N 1/A	
SEPP 2005. Major Development	N/A	
SEPP 2006. Sydney Region Growth	N/A	
Centres		
SEPP 2007. Mining, Petroleum	N/A	
Production and Extractive Industries		
SEPP 2007. Temporary Structures	N/A	
SEPP 2007. Infrastructure	N/A	
SEPP 2007. Kosciuszko National Park	N/A	
 Alpine Resorts 		
SEPP 2008. Rural Lands	N/A	
SEPP 2008, Exempt and Complying	N/A	
Development Codes		
SEPP 2009, Western Sydney	N/A	
Parklands		
SEPP 2009 Affordable Rental	N/A	
Housing	11/7 (
SEPP 2009 Western Sydney	NI/A	
Employment Area		
SEDD 2010 Urban Banawal		
SEPF 2010. Olball Kellewal		
SEPP 2011. Sydney Drinking Water		
SEPP 2011. State and Regional		
Sydney Regional Plans		
(deemed SEPPs)		
SREP 1. Dual Occupancy	Repealed	
SREP 2. Dual Occupancy	Repealed	
SREP 3. Kurnell Peninsula	Repealed	
SREP 4. Homebush Bay	Repealed	
SREP 5. Chatswood Town Centre	N/A	
SREP 6. Gosford Coastal Areas	Repealed	
SREP 7. Multi-Unit Housing – Surplus	Repealed	
Government Sites		
SREP 8. Central Coast Plateau Areas	N/A	
SREP 9. Extractive Industry (No. 2)	N/A	
SREP 10. Blue Mountains Regional	Repealed	
Open Space	repeated	
SREP 11, Penrith Lakes Scheme	N/A	
SREP 12 Dual Occupancy	Repealed	
SREP 12. Dual Occupancy		
SREP 13. Mulgoa Valley	IN/A	
SREP 14. Eastern Beaches	Repealed	
SKEP 15. Terrey Hills	Repealed	
SREP 16. Walsh Bay	N/A	
SREP 17. Kurnell Peninsula	N/A	
SREP 18. Public Transport Corridor	N/A	
SREP 19. Rouse Hill Development	N/A	
Area		
SREP 20. Hawkesbury Nepean River	Yes	As part of the progression of a Planning Proposal,
(No. 2 – 1997)		Water Cycle Management and Water Sensitive
		Urban Design studies would be carried out.

SREP 21. Warringah Urban Release	Repealed	
Alea		
SREP 22. Parramatta River	Repealed	
SREP 23. Sydney and Middle	Repealed	
Harbours		
SREP 24. Homebush Bay Area	N/A	
SREP 25. Orchard Hills	N/A	
SREP 26. City West	N/A	
SREP 27. Wollondilly Regional Open	Repealed	
Space		
SREP 28. Parramatta	N/A	
SREP 29. Rhodes Peninsula	N/A	
SREP 30. St Marys	N/A	
SREP 31. Regional Parklands	Repealed	
SREP 33. Cooks Cove	N/A	
SREP 2005. Sydney Harbour	N/A	
Catchment		

Appendix C Local Planning Directions (s117) Checklist

SCHEDULE OF SECTION 117 DIRECTIONS SOUTH DURAL PLANNING PROPOSAL

Ministerial Directions (s117)		
S117 Direction Title & Summary	Compliance	Comment
1. Employment and Resources		
1.1 Business and Industrial Zones A planning proposal shall encourage employment growth in suitable locations, protect employment lands and support the viability of "identified strategic centres".	Yes	The proposal includes rezoning for employment land. The location and amount of business land will be considered in the context of a retail and employment study to be prepared in the progression of the Planning Proposal.
A planning proposal shall retain the areas and locations of existing business and industrial zones.		
A planning proposal shall not reduce the total potential floor space area for employment uses and related public services in business zones.		
A planning proposal shall not reduce the total potential floor space area for industrial uses in industrial zones.		
A planning proposal shall ensure that proposed new employment areas are in accordance with an approved strategy.		
1.2 Rural Zones	Justification	The studies carried out to support the progression of
A planning proposal shall not rezone rural land for urban purposes, including residential, business or industrial purposes.	required	the planning proposal must consider this Direction and satisfy the Director-General that non-compliance with this Direction is justified.
A planning proposal shall not contain provisions which will increase the permissible density of rural zoned land.		
A planning proposal shall not include provisions that control access from traffic generating developments to classified roads in rural zones.		
1.3 Mining, Petroleum Production and Extractive Industries	N/A	
Council shall consult the Director- General of the Department of Primary		

Industries (DPI) to identify any resources of coal, petroleum and extractive materials of State or regional significance and existing mines or extractive industries occurring in the area subject to the draft LEP. Council shall seek advice from the Director-General of the DPI on the development potential of the identified resources. Council shall consider any likely conflict between the development of existing mines or extractive industries, or identified resources and other land uses. Where a planning proposal prohibits or restricts development of identified resources or is likely to conflict with other land uses, Council shall consult with the Director-General of the DPI concerning the draft LEP and provide a copy of any comments received to the Director-General of the DPI concerning the draft LEP and provide a copy of any comments received to the Director-General of the DPI concerning the draft LEP and provide a copy of any comments received to the Director-General of the DPI concerning the draft LEP and provide a copy of any comments received to the Director-General of the DPI concerning the draft LEP and provide a copy of any comments received to the Director-General of the DPI concerning the draft LEP and provide a copy of any comments received to the Director-General of the DPI concerning the draft LEP and provide a copy of any comments received to the Director-General of the DPI concerning the draft LEP and provide a copy of any comments received to the Director-General of the DPI concerning the draft LEP and provide a copy of any comments received to the Director-General of the DPI concerning the draft LEP and provide a copy of any comments received to the Director-General of the DPI concerning the draft LEP and provide a copy of any comments received to the Director-General of the DPI concerning the draft LEP and provide a copy of any comments received to the Director-General of the DPI concerning the draft LEP and provide a copy of any comments received to the DIrector-General of the DPI concerning th	N/A	
Where a planning proposal could result in an impact on a POAA and oyster aquaculture leases outside such an area, Council shall consult the Director-General of the Department of Primary Industries (DPI) concerning the draft LEP and provide a copy of any comments received to the Director-General of the Department of Planning.		
1.5 Rural Lands	N/A	

A Planning Proposal that affects land within an existing or proposed rural or environmental protection zone must be consistent with State Environmental Planning Policy (Rural Lands) 2008.		
2. Environment and Heritage	X	
A planning proposal shall include provisions that facilitate the protection and conservation of environmentally sensitive areas.	Yes	the Proposal contains provisions that facilitate the protection and conservation of environmentally sensitive areas.
A planning proposal that applies to environmental protection zoned land or land identified for environmental protection purposes shall not reduce the protection standards that apply to the land.		
2.2 Coastal Protection	N/A	
A planning proposal shall be consistent with the NSW Coastal Policy: A Sustainable Future for the New South Wales Coast 1997, the Coastal Design Guidelines 2003 and the NSW Coastline Management Manual 1990.		
 2.3 Heritage Conservation A planning proposal shall contain provisions to facilitate the conservation of items, places, buildings, works, relics, moveable objects or precincts of environmental heritage significance. A planning proposal shall contain provisions that facilitate the conservation of areas, places, landscapes and objects identified of being of Aboriginal heritage significance. 2.4 Recreation Vehicle Areas Planning proposals shall not zone or enable land to be developed for a recreational vehicle area where the land is in an Environmental Protection Zone, is a beach or dune, or in other areas unless the council has taken into consideration relevant audicinae line in the Direction Procession of the protection procession of the protection relevant audicinae line in the Direction relevant audicinae line in the Direction procession of the protection procession of the protection procession of the protection procession of the protection relevant audicinae line of the protection procession procession of the protection procession processi	Yes N/A	Parts of the road reserve in New Line Road and Old Northern Road are heritage listed, along with property No. 671-673 Old Northern Road within the study area. A heritage study will be undertaken in the progression of the Planning Proposal to ensure that there are provisions which facilitate the conservation of European and Aboriginal heritage.
3. Housing Infrastructure and Urban Development		
3.1 Residential Zones	Yes	The planning proposal has been submitted to broaden
A planning proposal shall include		the choice of housing types available in Hornsby Shire. housing type and location in Hornsby Shire.

housing provisions that broaden the choice of building types and housing locations, make more efficient use of existing infrastructure and services, reduce urban sprawl and be of good design. A planning proposal shall contain a requirement that residential development is not permitted until land is adequately services with water and sewerage. Planning proposals shall not contain provisions which reduce the permissible density on residential aread lande		The proponent is aware that infrastructure required to service the development is to be provided at no cost to government. Council is seeking a conditional Gateway determination which requires the proponent to fund a Business Plan commissioned by Council to ensure the feasibility of the project being delivered with all necessary infrastructure.
3.2 Caravan Parks and Manufactured Home Estates	N/A	
Planning proposals shall retain existing zones of land or utilise an appropriate zone under the standard Instrument to permit caravan parks in LEPs When preparing planning proposals,		
Council shall consider the categories of land and principles in SEPP No. 36 to determine suitable zones, locations and provisions for Manufactured Home Estates		
3.3 Home Occupations Planning proposals shall permit home occupations to be carried out in dwelling houses without the need for development consent.	N/A	Direction applies to all councils that do not have a principal Local Environmental Plan or a draft LEP, prepared pursuant to the standard instrument under section 33A of the EP&A Act 1979.
3.4 Integrating Land Use and Transport A planning proposal shall locate zones for urban purposes in areas in accordance with the identified guidelines and policies to reduce travel demand, including the number of trips generated by development and the distances travelled.	Yes	The planning proposal is seeks to provide additional housing and employment in an area serviced by public bus transport. The North West Rail Link may also improve access to public transport for the South Dural area.
3.5 Development Near Licensed Aerodromes	N/A	
For a planning proposal affecting land in the vicinity of a licensed aerodrome, the Council shall consult with the Department of Commonwealth responsible for aerodromes and the lessee of the aerodrome.		
A draft LEP shall take into consideration the Obstacle Limitation Surface (OLS) and for land affected by the OLS permit development compatible with the operation of an aerodrome and prepare appropriate development standards.		

A planning proposal shall not rezone land for certain purposes listed in the direction where the Australian Noise Exposure Forecast (ANEF) exceeds the levels specified in the direction. Draft LEPs which rezone lands for such purposes shall include a provision regarding interior noise levels.		
3.6 Shooting Ranges	N/A	
A Planning Proposal which affects, creates, alters or removes a zone or provision relating to land adjacent to or adjoining a shooting range must not seek to rezone land to permit more intensive land uses than those which are permitted under the existing zone, or that are incompatible with the noise emitted by the existing shooting range.		
4. Hazard and Risk		
4.1 Acid Sulfate Soils	N/A	
Council shall consider the <i>Acid Sulfate</i> <i>Soils Planning Guidelines</i> adopted by the Director-General of the Department of Planning when preparing a planning proposal that applies to any land identified on the Acid Sulfate Soils Risk Maps prepared by the Department of Natural Resources.		
Planning proposals that regulate works in acid sulfate soils shall be consistent with the Acid Sulfate Soils Model LEP or such other provisions provided by the Director-General of the Department of Planning.		
Council shall not prepare a planning proposal that intensifies land uses on land having a probability of containing acid sulfate soils unless an acid sulfate soils study has been considered		
4.2 Mine Subsidence and Unstable Land	N/A	Direction applies to all councils that contain a mine subsidence district proclaimed pursuant to section 15 of the Mine Subsidence Compensation Act 1961 or that
Where the land is subject to mine subsidence, council shall consult the Mine Subsidence Board to ascertain if the Board has any objection to the Plan and the appropriateness of the development for the potential level of subsidence. A planning proposal shall not permit development on unstable land.		contain unstable land. Clarification was sought from the Department of Planning in late 2005 as to the meaning of 'unstable land'. A formal response has not been received. However, a Department representative advised by email 29 November 2005 that unstable land is land that is subject to land slip because of slope and soil/ geological conditions.
4.3 Flood Prone Land A planning proposal shall include	Yes	Although the subject site is not mapped in the <i>HLEP</i> 2013 Flood Planning Map, a number of properties are affected by an overland flow path as identified in the

 provisions that give effect to the NSW Flood Prone Land Policy and are consistent with the Floodplain Development Manual 2005. A draft LEP shall not rezone land within the flood planning areas from Special Use, Special Purpose, Recreation, Rural or Environmental Protection Zones to a Residential, Business, Industrial, Special Use or Special Purpose Zone. A planning proposal shall not permit development in floodway areas, permit development that will significantly impact on other properties, permit a significant increase in development, result in a substantial increase in the need for government spending on flood mitigation, permit specified development without the need for consent. A planning proposal shall not impose flood related development controls above the flood planning level for residential development. In preparing a planning proposal, Council shall not determine a flood level inconsistent with the Floodplain Development Manual 2005. 		Hornsby Overland Flow Study 2010. Flooding investigations will be carried out in the progression of the Planning Proposal and if the land is identified as within a flood planning area, the planning proposal will be progressed in accordance with a floodplain risk management plan prepared in accordance with the principles and guidelines of the Floodplain Development Manual 2005.
 4.4 Planning for Bushfire Protection Council shall consult with the Commissioner of the NSW Rural Fire Service in the preparation of any planning proposal following receipt of a gateway determination and prior to undertaking community consultation and take into account any comments made. A planning proposal shall have regard to Planning for Bushfire Protection 2006, avoid permitting inappropriate development in hazardous areas and ensure that hazard reduction is not prohibited in the asset protection zone (APZ). A planning proposal, where development is proposal, where development is proposal, shall comply with specified provisions to minimise bushfire hazard risk, as appropriate. 	Yes	Approximately two thirds of the study area is identified as bushfire prone land. In accordance with this Direction, the Commissioner of the Rural Fire Service will be consulted following receipt of gateway determination and prior to community consultation.
5 Destionel Dianning		
5.1 Implementation of Regional Strategies A planning proposal shall be consistent with a regional strategy	N/A	

released by the Minister for Planning.		
5.2 Sydney Drinking Water Catchments	N/A	
A planning proposal shall be prepared in accordance with the general principle that water quality within the hydrological catchment must be protected and in accordance with specified principles.		
When preparing a planning proposal that applies to land within a hydrological catchment, Council, shall consider any strategic land and water capability assessment, or a settlement or rural residential strategy, consult the Sydney Catchment Authority (SCA) under Section 62 of the EP&A Act and zone SCA land in accordance with the specified zones from the Standard Instrument.		
5.3 Farmland of State and Regional Significance on the NSW Far North Coast	N/A	
A planning proposal shall not rezone land identified as "State Significant Farmland", "Regionally Significant Farmland" or "Significant non- contiguous farmland" for urban or rural residential purposes.		
5.4 Commercial and Retail Development along the Pacific Highway, North Coast	N/A	
A planning proposal that applies to land "within town" shall provide that new commercial or retail development shall be concentrated within distinct centres rather than spread along the Pacific Highway. A draft LEP that applies to land "out of town" shall provide that new commercial or retail development shall not be established near the Pacific Highway. Development with frontage to the Pacific Highway shall consider the impact the development has on the safety and efficiency of the Highway.		
A planning proposal shall permit a highway service centre beside the Pacific Highway where they are located close to the town bypassed, the local economy is considered and there is adequate separation from other service centres.		

A planning proposal shall limit the uses permitted in highway service centres to those specified in the Direction.		
5.5 Development in the vicinity of Ellalong, Paxton and Millfield (Cessnock LGA))	Revoked	
5.6 Sydney to Canberra Corridor	Revoked	
5.7 Central Coast	Revoked	
5.8 Sydney Second Airport: Badgerys Creek	N/A	
Planning proposals shall not contain provisions that enable development which could hinder the potential for development of a Second Sydney Airport.		
6 Local Plan Making		
6.1 Approval and Referral Requirements	N/A	
A planning proposal shall minimise provisions requiring concurrence, consultation or referral of development applications to a Minister or public authority.		
A planning proposal shall not identify development as designated development unless Council can satisfy the Director-General that such is warranted.		
6.2 Reserving Land for Public Purposes	Yes	
A planning proposal shall not create, alter or reduce existing reservations or zonings of land for public open space without the approval of the relevant public authority and the Director General.		
When a Minister or public authority requests a Council to reserve land for a public purpose, include provisions relating to the use of land reserved for a public purpose, rezone and/or remove a reservation, the council shall accede to the request.		
6.3 Site Specific Provisions	N/A	
A planning proposal that amends another LEP to allow a particular development to be carried out shall either: * allow that land use to be carried out in the zone; or * rezone the site to an existing zone		

 without imposing any additional development standards or requirements applying to that zone; or * allow that land use on the land without imposing any development standards in addition to those already contained in the principal LEP being amended. 		
7. Metropolitan Planning		
 7.1 Implementation of the Metropolitan Plan for Sydney 2036 A planning proposal shall be consistent with the NSW Government's Metropolitan Plan for Sydney 2036, published in December 2010 ("the Metropolitan Plan") 	Yes	The Metropolitan Plan promotes housing in and around urban centres, and the protection of rural and resource lands. The impacts of urban expansion would need to be addressed in the progression of the Planning Proposal. The <i>draft Metropolitan Strategy for Sydney 2031</i> was released for public exhibition in March 2013. Once finalised, the <i>draft Strategy</i> will replace the <i>Metropolitan Plan for Sydney 2036</i> . Consideration of rezoning South Dural for urban purposes through the Gateway process would be consistent with the identified priority in the <i>draft Strategy</i> to manage and monitor land for possible extension of the Metropolitan Urban Area.

Appendix D

Council report (PL 117/13) and Resolution

16 SOUTH DURAL PLANNING PROPOSAL

EXECUTIVE SUMMARY

- A Planning Proposal has been submitted on behalf of the South Dural Resident and Ratepayers Association to rezone South Dural for urban purposes. A mix of residential, educational, business and open space uses is proposed, with an indicative yield of 2,500 – 3,000 dwellings. Consideration of the rezoning would be consistent with Council's previous resolution to support investigations into the precinct, subject to the delivery of infrastructure and detailed studies to address constraints.
- Council received 123 submissions in response to preliminary notification, of the *Planning Proposal*, including 79 letters in support, or conditional support, and 44 in objection. Key concerns include traffic, biodiversity, agricultural potential and location of future development.
- It is recommended that Council seek a conditional Gateway determination which requires a Business Plan to confirm the feasibility of the project being delivered with all necessary infrastructure at no net cost to government, followed by the necessary technical studies.
- Should a Gateway determination be received, Council should be responsible for the preparation of study briefs, tenders and project management. The proponent should enter into a binding agreement to fund such studies and Council resources for project management.

RECOMMENDATION

THAT:

- 1. Council forward the *South Dural Planning Proposal* attached to Group Manager's Report No. PL117/13 to the Minister for Planning and Infrastructure seeking a conditional Gateway determination which:
 - requires the proponent to fund a Business Plan, to be commissioned by Council, to confirm the feasibility of the project being delivered with all necessary infrastructure at no net cost to government; and
 - b) subject to the Regional Director, Sydney West Region, being satisfied with the Business Plan, outlines the necessary studies to be prepared to justify the proposal.
- 2. Should a Gateway determination be issued, Council not proceed further with the *Planning Proposal* until such time as the proponent has entered into a binding agreement to fund the studies and Council resources for project management and a bank guarantee has been received by Council for same.
- 3. Submitters be advised of Council's resolution.

PURPOSE

The purpose of this Report is to consider a *Planning Proposal*, submitted by Michael Brown Planning Strategies on behalf of the South Dural Residents and Ratepayers Group, to rezone land known as South Dural for urban purposes.

BACKGROUND

The area known as South Dural has been the subject of numerous submissions and applications seeking rezoning since 1990. Most recently, Council considered Report No. PLN17/12 in February 2012 concerning the NSW Government review of housing opportunities on landowner nominated sites (Potential Home Sites Program). The report advised that South Dural was nominated by the South Dural Residents and Ratepayers Group for the Potential Homes Sites (PHS) Program. Council resolved (in part) that:

- 1. A submission based on the discussion contained in Executive Manager's Report No. PLN17/12 concerning the NSW Government review of housing opportunities be forwarded to the Department of Planning and Infrastructure concerning landowner nominated sites and stating that:
 - (a) Council confirms its support for the progression of investigations for the release of South Dural for urban purposes, subject to those investigations containing all the necessary studies to demonstrate that all required public infrastructure and community services would be in place to accommodate the additional population and surrounding neighbours.
 - (b) Any release of lands at South Dural and/or North Glenhaven should be accompanied by a funding and delivery plan for the associated infrastructure works.
 - (c) Any plan to release lands at South Dural and/or North Glenhaven should have comprehensive and exhaustive consultation with the ratepayers and residents to discuss all infrastructural, educational, medical and other civic services in view of the future increase in residents.
 - (d) Any community consultation process should include consultation with all persons who made a submission on the Hornsby Shire Housing Strategy to gauge a view of the residents of Hornsby Shire concerning the potential release of South Dural for urban purposes and the contribution of the precinct towards meeting Council's dwelling target under the State Government's Metropolitan Plan.
 - (e) Any release of lands at South Dural and/or North Glenhaven assess the impacts on the Endangered and Critically Endangered Ecological Communities of Turpentine Ironbark Forest and Blue Gum High Forest on the site under the Australian Environmental Protection and Biodiversity Conservation Act and the NSW Threatened Species Conservation Act 1995.
 - (f) Any release of lands at South Dural and/or North Glenhaven conserve and protect the Endangered and Critically Endangered Ecological Communities, the significant vegetation of the Georges Creek wildlife corridor, and allow for the enhancement and revegetation to enable a viable connection from the Georges Creek corridor to the Dooral Dooral Creek corridor through the creation of a viable bushland reserve network.

- TEM 16
- (g) Any release of lands at South Dural and/or North Glenhaven requiring the removal of native vegetation provide an offset for the loss of the native vegetation in accordance with Council's Green Offsets Code.
- (h) Any release of lands at South Dural and/or North Glenhaven provide for all stormwater management devices, detention basins and bushfire asset protection zones to be located outside the bushland reserve network.

In accordance with Council's resolution, a letter was sent to the DP&I advising the above. In March 2013, the Minister for Planning and Infrastructure announced that immediate action will be taken to support development of new homes for 7 sites nominated through the PHS Program. South Dural was not included on the list of sites. The NSW Government's PHS program evaluation summary notes that South Dural is currently not deliverable due to multiple landowners, high fragmentation, long lead times and potential cost to government.

At a meeting with Council and the South Dural Residents and Ratepayers Group in June 2013, representatives from the DP&I confirmed that the State Government is not in a position to initiate the release of South Dural as a State lead process for the reasons outlined above. The Department representatives indicated that a planning proposal to rezone South Dural could be considered subject to it being demonstrated that there would be no net cost to government. It was advised that the Gateway process should be used to determine the scope of supporting studies required. It is understood that similar advice was also provided by the DP&I to The Hills Council and proponents of the North Box Hill Precinct, which was similarly classified under the PHS program.

Council, by letter to the applicant dated 25 July 2013, requested that a Business Plan outlining how the development of South Dural could be achieved at no cost to government be submitted with any planning proposal. It was requested that the Business Plan include cost estimates for infrastructure and confirm the viability of the project being delivered with all necessary infrastructure.

A Planning Proposal has been submitted by a consultant to rezone South Dural for residential/urban development. A Planning Proposal for Box Hill North has also been submitted to The Hills Shire Council and was considered at its Ordinary meeting of Council on 8 October 2013, where the plan was endorsed for progression to the DP&I for Gateway determination. A Gateway determination was issued by the DP&I on 23 November 2013.

SITE

The land known as South Dural is bounded by Old Northern Road, New Line Road and Hastings Road and spans part of the suburbs of Dural, Glenhaven and Castle Hill. The site has an area of approximately 240 hectares and consists of 135 allotments. Existing land uses include large lot rural/residential development, a water reservoir, caravan park, seniors living development, landscape supplies, child care centre and a hotel/motel.

The topography varies and slopes from the ridgeline of Old Northern Road down to a densely vegetated valley along Georges Creek. The land is zoned part RU2 (Rural Landscape), part E3 (Environmental Management) and part SP2 (Infrastructure - Road) under the *Hornsby Local Environmental Plan (HLEP) 2013.* Approximately one third of the land is mapped as Bushfire Prone on the Bushfire Prone Land Map certified by the NSW Rural Fire Service. A map showing the location of the site is attached to this report.

The subject land is surrounded by a mix of uses, including Round Corner (commercial uses) and residential development immediately to the north, the Dural Service Centre (commercial/industrial uses) immediately to the east, residential to the south and rural to the west. Further north and north

east of the site, the land uses are rural. Old Northern Road forms the western boundary of the South Dural area and is also the Shire boundary. Land on the western side of Old Northern Road, opposite South Dural, is located within The Hills Council area.

PROPOSAL

The *South Dural Planning Proposal* has been submitted by a consultant on behalf of the South Dural Residents and Ratepayers Group. The applicant states that the intended objectives and outcomes of the planning proposal are to:

- facilitate the comprehensive urban development of the land in accordance with its environmental capacity and capitalising on existing infrastructure;
- conserve and enhance elements of the natural environment;
- establish a framework for more detailed planning;
- utilise and embellish existing physical and human infrastructure; and
- meet housing targets provided in the Sydney Metropolitan Strategy and promoting housing choice and diversity which respond to the needs of Hornsby's community.

A preliminary concept plan indicates a mix of residential and potential educational uses. The applicant identifies an indicative yield of 2,500 – 3,000 dwellings in the following mix:

- low rise (3-5 storey) residential flat buildings at 40-50 dwellings per hectare;
- townhouses and terrace housing on small lots at 25 dwellings per hectare;
- detached dwellings on average 450 600sqm lots at 10 15 dwellings per hectare; and
- large lot housing along creeks and where there are remnant areas of vegetation at 2 dwellings per hectare.

Should Council support progression of the *Planning Proposal*, further investigation would be required into the location and mix of residential, educational, open space and potential retail uses.

The *Planning Proposal* is accompanied by a number of technical studies which were prepared in 2008/9 as follows:

- Flora and Fauna Investigation (January 2009) Hayes Environmental;
- Bushfire Planning Investigation (January 2009) BES;
- Infrastructure Report (January 2009) Maunsell Australia;
- Traffic, Transport and Accessibility Assessment (January 2009) Maunsell Australia; and
- Retail and Commercial Potential (December 2008) Don Fox Planning.

The *Planning Proposal* and accompanying studies submitted by the consultant are available for viewing on Council's website at hornsby.nsw.gov.au/property/planning-legislation/planning-studies/south-dural-planning-proposal.

DISCUSSION

This report discusses the strategic context of the *South Dural Planning Proposal* and outlines issues which should be considered in any investigation into the rezoning of the land. It also discusses

preliminary comments received from property owners within and adjoining the precinct and other residents.

1. Strategic Context

There are a number of State and local planning strategies which set the context for growth and development into the future, as discussed below.

1.1 Metropolitan Plan for Sydney 2036

The State Government's *Metropolitan Plan for Sydney 2036* provides a framework for the sustainable growth of Sydney over the next 25 years. The *Plan* encourages the provision of housing near jobs, transport and services to ensure there is an adequate supply of housing to accommodate the forecast population growth. Hornsby and Ku-ring-gai Councils are grouped together to form the North subregion, with housing and employment targets of 29,000 new dwellings and 15,000 new jobs to be created between 2004 and 2036. The *Plan* promotes housing in and around urban centres, and the protection of rural and resource lands. The impacts of urban expansion would need to be addressed in the progression of the *South Dural Planning Proposal*.

1.2 Draft North Subregional Strategy

The *draft North Subregional Strategy* was prepared to provide more detailed guidance for the growth of the North subregion and breaks down the dwelling and employment targets separately for Hornsby and Ku-ring-gai Councils. However, the breakdown is based on previous targets issued by the DP&I. The *draft North Subregional Strategy* sets out a target of 11,000 new dwellings and 9,000 new jobs within Hornsby Shire by 2031.

Council is well placed to meet its share of dwelling obligations. Potential for approximately 4,500 new dwellings can be achieved through infill development/subdivision. Opportunities for a further 3,000 new homes was provided through the finalisation of the *Housing Strategy* in 2011. The Epping Urban Activation Precinct being led by the DP&I promotes opportunities for 2,500 new dwellings within Hornsby Shire at Epping. Council is also reviewing the opportunities for additional development within the Hornsby West Side, which could provide approximately 1,000 new dwellings. The table below illustrates how Council could meet its current dwelling target.

Source/Strategy	Approx number of dwellings
Infill	4,500
Housing Strategy	3,000
Epping UAP	2,500
Draft Hornsby West	1,000
Side Planning Proposal	
TOTAL	11,000

Council's dwelling target is expected to increase when the *draft Subregional Strategy* is finalised, and in light of the *draft Metropolitan Strategy for Sydney 2031* (discussed below). The provision of housing at South Dural would further contribute to the achievement of Council's dwelling target.

1.3 Draft Metropolitan Strategy for Sydney 2031

The State Government released the draft *Metropolitan Strategy for Sydney 2031* for public exhibition in March 2013. Once finalised, the *draft Strategy* will replace the *Metropolitan Plan for Sydney 2036*. The *draft Strategy* alters subregional boundaries and groups Hornsby, Ku-ring-gai, Manly, Pittwater and Warringah Councils to form the North subregion.

The new housing and employment targets set out in the *draft Strategy* for the North subregion are 37,000 new dwellings and 39,000 new jobs to be created between 2011 and 2031. As discussed above, Council is well placed to meet its share of dwelling obligations and the provision of housing at South Dural would further contribute to the achievement of Council's dwelling target.

The *draft Strategy* categorises the land within the Sydney Region into a Metropolitan Urban Area and a Metropolitan Rural Area. The northern two thirds of South Dural is identified as being within the Metropolitan Rural Area, while the remaining southern third is identified as within the Metropolitan Urban Area.

The Metropolitan Rural Area is one of nine "city shapers" identified in the *draft Strategy*, along with the North West Rail Link (NWRL), that will directly influence Sydney's growth to 2031. The relevance of these city shapers to the Planning Proposal is summarised below.

1.3.1 Metropolitan Rural Area

The Metropolitan Rural Area provides opportunities for agricultural activities that contribute to Sydney's future ability to maintain a reliable and local source of fresh food and produce. The *draft Strategy* identifies priorities for Sydney's Metropolitan Rural Area including:

- Manage and monitor land for possible future extension of the Metropolitan Urban Area;
- Support the function of the Metropolitan Urban Area to accommodate most of Sydney's urban growth;
- Encourage renewable energy investment resources;
- Increase the productivity of agricultural and resource lands and grow associated employment opportunities; and
- Identify and protect priority green corridors.

The South Dural Planning Proposal seeks rezoning of rural land for urban purposes. Consideration of this through the DP&I's Gateway process would be consistent with the identified priority to manage and monitor land for possible extension of the Metropolitan Urban Area. The appropriateness of extending the Metropolitan Urban Area into the northern two thirds of Dural would need to be addressed in the progression of the *Planning Proposal*.

1.3.2 North West Rail Link

The North West Rail Link corridor runs 23 kilometres between Epping and Rouse Hill in Sydney's North West Growth Centre. The main priorities of the *draft Strategy* relevant to Hornsby Shire are to:

- Prepare structure plans to guide the growth around NWRL stations; and
- Facilitate the delivery of the Epping Urban Activation Precinct (UAP).

Whilst the finalisation of the Epping UAP is imminent, planning around the Cherrybrook station precinct has not commenced. The final Corridor Strategy (October 2013) prepared by the DP&I estimates that a total of 3,200 additional dwellings and 50 additional jobs could be accommodated within the Cherrybrook Study Area.

The Department has advised that the Corridor Strategy will form the basis for future detailed planning within each precinct and will be supported by a Section 117 Direction to ensure that the Corridor Strategy is taken into consideration when preparing future detailed plans.

The preparation of a Precinct Plan for the Cherrybrook Station Precinct is not listed on the Strategic Planning Branch's Programme for the current financial year. However, the Department has informally indicated it would support Council commencing the process.

1.4 Hornsby Local Environmental Plan 2013

The *HLEP 2013* applies to the subject land and zones the majority of the land RU2 (Rural Landscape). Part of the land is zoned E3 (Environmental Management). A small portion of the frontage of approximately 38 properties is zoned SP2 (Infrastructure).

The objectives of the RU2 (Rural Landscape) zone are:

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base;
- To maintain the rural landscape character of the land;
- To provide for a range of compatible land uses, including extensive agriculture;
- To encourage land uses that support primary industry, including low-scale and low-intensity tourist and visitor accommodation and the provision of farm produce direct to the public; and
- To ensure that development does not unreasonably increase the demand for public infrastructure, services or facilities.

Land uses permissible in the zone include (but are not limited to) aquaculture, animal boarding or training establishments, child care centres, community facilities, dwelling houses, eco-tourist facilities, environmental facilities, extractive industries, farm buildings, garden centres, intensive livestock agriculture, intensive plant agriculture, roadside stalls bed and breakfast accommodation and farm stay accommodation.

The objectives of the E3 (Environmental Management) zone are:

- To protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values;
- To provide for a limited range of development that does not have an adverse effect on those values; and
- To protect the natural environment of steep lands and floodplains within the catchment of the Hawkesbury River.

Land uses permissible in the zone include (but are not limited to) aquaculture, dwelling houses, environmental facilities, farm buildings, bed and breakfast accommodation and farm stay accommodation.

The objectives of the SP2 (Infrastructure - Road) zone are:

- To provide for infrastructure and related uses; and
- To prevent development that is not compatible with or that may detract from the provision of infrastructure.

The only land use permitted in the zone is roads, including any development that is ordinarily incidental or ancillary to development for the purpose of a road.

The *HLEP* specifies a maximum height limit of 10.5m for the subject land. A minimum lot size of 2 hectares applies to that part of the land zoned RU2 Rural Landscapes, with a minimum lot size of 40 hectares applying to the E3 Environmental Management zoned portion.

A number of maps accompany the *HLEP* and apply to the subject site. Parts of South Dural are identified on the Terrestrial Biodiversity Map to which Clause 6.4 of the HLEP applies. The Clause aims to protect native flora and fauna and their habitats.

The Heritage Map identifies parts of the road reserve in New Line Road (street trees and bushland) and Old Northern Road (roadside trees) as heritage listed, along with property Nos. 671 - 673 Old Northern Road (house).

The properties which have a part zoning of SP2 Infrastructure (Roads) are identified on the Land Reservation Acquisition Map. The frontages of approximately 38 properties are identified as SP2 Roads and the relevant acquisition authority is the Roads and Maritime Services.

Although not identified on the Flood Planning Map, a number of properties are affected by an overland flow path as identified in the *Hornsby Overland Flow Study 2010*. Any studies investigating the rezoning of South Dural would need to address the constraints mapped in the *HLEP*.

1.5 Hornsby Development Control Plan 2013

The Hornsby Development Control Plan (HDCP) 2013 contains development guidelines which apply to the land at South Dural. "Part 1 – General" identifies controls concerning the Built Environment (such as car parking and effluent disposal), Natural Environment (such as biodiversity and stormwater management) and hazards (such as bushfire and flooding).

"Part 2 – Rural" also applies to the subject land and identifies controls concerning the scale and design of rural dwellings/buildings and controls for rural land uses such as agriculture and tourism.

2. Evaluation

The *Planning Proposal* is accompanied by a number of technical studies prepared in 2008/2009 as follows:

2.1 Flora and Fauna Investigation (January 2009) – Hayes Environmental

The report identifies ecological features and habitats of conservation significance within the subject land including a riparian corridor, threatened flora and fauna species, and endangered ecological communities. In general, most of the ecological features and habitats converge within the Georges Creek Vegetation Corridor, but some endangered ecological communities occur outside the main corridor. The report acknowledges that further detailed studies and design would be required to retain and revegetate a wildlife corridor along Georges Creek, and to improve the quality and security of retained vegetation within the study area.

2.1.1 Comment

Council has completed vegetation studies across the Shire. There is variation between Council's vegetation mapping studies for the South Dural area and the Hayes Environmental mapping and assessment submitted with the *Planning Proposal*, as outlined below.
	Smith and Smith 2008 (Council mapping)	Hayes Environmental 2009 (Planning Proposal)
Blue Gum High Forest	9.01 ha plant community	4 ha in good condition
(BGHF)	11.3 ha remnant trees	12 ha in poor condition
BGHF total remaining	20.31 ha	16 ha
remnants		
Sydney Turpentine	2.1 ha plant community	3.5 ha in good condition
Ironbark Forest (STIF)	13.5 ha remnant trees	3.0 ha in poor condition
STIF total remaining	15.6 ha	6.5ha
remnants		

The vegetation mapping is consistent with the definition of both BGHF and STIF under the *Threatened Species Act 1993.* The condition of the vegetation does not exclude it from protection under the *Act.* As acknowledged in the Hayes Environmental report, there are areas of native vegetation and remnant Endangered Ecological Communities which are not being considered for conservation within the proposed parkland corridors identified in the *Planning Proposal.* The *Hornsby Shire Biodiversity Conservation Strategy 2006* has a policy of net improvement for native vegetation. Further detailed studies and planning would be required to investigate how the additional remnant native vegetation can be retained.

The proposal to include all stormwater management, detention ponds and swales within the open space area implies that these would be constructed within the identified corridor area. This would impact on native vegetation and may compromise the long term health and biodiversity value of the corridor. Detailed site specific water management measures and locations of any constructed wetlands or detention ponds should be investigated to ensure these initiatives would not remove or impact existing native vegetation.

2.2 Bushfire Planning Investigation (January 2009) – BES

This report concludes that South Dural is suitable and capable of being development for urban use whilst accommodating the minimum bushfire protection measures required. However, the report states that the retention of the Georges Creek bushland and riparian corridor, including its associated tributaries, creates a bushfire hazard that would require detailed assessment to design the appropriate bushfire measures.

2.2.1 Comment

The proposed Asset Protection Zones (APZs) and the requirements of *Planning for Bushfire Protection* as detailed in the *Planning Proposal* would need to be reviewed in consultation with the Rural Fire Service and within the context of native vegetation retention and offsetting. Council has adopted a *Green Offset Code* to address the unavoidable loss of valuable native vegetation across Hornsby Shire through the impacts of development. Any offsetting plan would need to comply with Council's policy and clearly demonstrate that a net improvement for native vegetation could be achieved through the development.

The provision of services, stormwater management, detention ponds and swales should be integrated within designated APZ's to further reduce impacts to bushland and biodiversity. Further detailed

regionally significant vegetation communities.

2.3 Infrastructure Report (January 2009) – Maunsell Australia

Preliminary investigations conclude that there is insufficient capacity in the existing water supply system to service the proposed development. The West Hornsby Sewerage Treatment Plant has sufficient capacity to service the proposed development, with an extension of the carrier main required to service the northern parts of South Dural.

Possible servicing options for power include new underground feeder mains from either the substation at Glenhaven or the substation at Galston. South Dural is serviced with limited telecommunications infrastructure and would required augmentation to service further development.

2.3.1 Comment

Further work and consultation with infrastructure agencies is required to ensure that infrastructure can be provided or upgraded to service any future development within South Dural, and that this can be achieved at no cost to government.

The Planning Proposal seeks rezoning for urban development which would change the natural landscape and transform vegetative ground cover to buildings and infrastructure with impervious services, roadways, roofing, driveways and paving. A Water Sensitive Urban Design (WSUD) integrated approach would be essential to mitigate impacts of the urban environment by developing a treatment train approach such as rain gardens, street tree bio-retention systems, vegetated swales, infiltration buffers strips, control detention ponds and wetlands for reducing pollutant export, retarding storm flows through on-site reuse and temporary storage of stormwater. Infrastructure necessary for urban development should be provided in such a way that natural stream flows in watercourses are maintained, riparian corridors are protected, groundwater resources are protected, pollution is minimised and water consumption and conservation plans should include water recycling and re-use programs.

2.4 Traffic, Transport and Accessibility Assessment (January 2009) – Maunsell Australia

This report identifies that road network upgrades would be required prior to the development of South Dural including:

- Duplication of Old Northern Road between Hastings Road and New Line Road;
- Duplication of New Line Road between Old Northern Road and Hastings Road;
- Signalisation of Old Northern Road and Glenhaven Road; and
- Addition of turn lanes on Old Northern Road.

The report also indicates that some intersection enhancements would be required.

Comment 2.4.1

The Traffic report is based on 2006 Journey to Work (JTW) data, 2005 Average Annual Daily Traffic (AADT) volumes, and 2008 traffic counts. New traffic modelling with a base model using current counts, JTW data and AADT volumes would be required to assess existing traffic volumes and potential traffic impacts associated with the proposal. Further detailed modelling would need to identify road network upgrades and intersection enhancements to support future development.

2.5 Retail and Commercial Potential (December 2008) – Don Fox Planning

The report states that, notwithstanding the availability of retail services in other nearby centres, there could be demand for local retail floorspace within South Dural. The report recommends that this be provided in one location as part of a community hub and adjacent to other uses such as open space or education. The addition of dwellings in South Dural would also support existing retail facilities in other centres. The additional dwellings could also generate demands for health, education and child care facilities.

2.5.1 Comment

The report on Retail and Commercial Potential was prepared in 2008. Further studies would be required to assess the availability of, and demand for, retail, health, education and childcare services and employment for future residents.

In summary, the studies submitted with the *Planning Proposal* are outdated and would be required to be reviewed and updated if the *South Dural Planning Proposal* was progressed. The studies identify constraints to urban development such as bushfire hazard, biodiversity, traffic and servicing which require further investigation and analysis. The preparation of a planning proposal is the first step in the process of requesting changes to a planning instrument. The initial Gateway determination would confirm the technical studies and community consultation required to justify the proposal. As the studies and consultation are undertaken, relevant parts of the planning proposal would be updated, amended and embellished.

3. Previous Council Adopted Position

A *Planning Proposal* to rezone land at South Dural for urban purposes would be consistent with Council's previous resolutions in 2011 and 2012 that, subject to being satisfied that all necessary public infrastructure and community services would be in place to accommodate the additional population, it would support investigations by the NSW Government to release the land for urban purposes. A rezoning for urban purposes would result in a change from the current rural zone to a residential zone, with different objectives to that of a rural zone. This would represent a change in the character of the area. The provision of housing at South Dural would assist Council meet revised dwelling targets in the *draft Metropolitan Strategy for Sydney to 2031* and the *draft North Subregional Strategy* when finalised.

At its meeting on 1 February 2012 Council indicated its support for the progression of investigations into the rezoning of South Dural for urban purposes, subject to a number of conditions. The table below sets out the conditions outlined in Council's previous resolution and how they could be addressed if the *South Dural Planning Proposal* is progressed.

Condition of Council Resolution 1/2/12	South Dural Planning Proposal		
A funding and delivery plan should be	It is recommended that a Business Plan be provided		
prepared for infrastructure works required.	to confirm the viability of the project being delivered		
	with all necessary infrastructure at no net cost to		
	government.		
Comprehensive consultation should be	Council practice includes extensive community		
carried out with ratepayers and residents.	consultation on major planning proposals.		
The community consultation process	The re-drafted planning proposal attached to this		
should include consultation with all persons	report outlines a consultation strategy which includes		

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Condition of Council Resolution 1/2/12	South Dural Planning Proposal		
who made a submission on the Housing Strategy.	consultation with persons who made a submission on the Housing Strategy.		
Assess the impacts on the Endangered and Critically Endangered Ecological Communities of Turpentine Ironbark Forest and Blue Gum High Forest.	Biodiversity studies would need to assess this.		
Conserve and protect the significant. vegetation of the Georges Creek wildlife corridor, allow for the enhancement and revegetation to enable a viable connection from the Georges Creek corridor to the Dooral Dooral Creek corridor through the creation of a viable bushland reserve network.	The brief for the preparation of any precinct plan would include this requirement.		
Offsets should be provided in accordance with Council's Green Offsets Code where the removal of native vegetation is required.	The brief for the preparation of any precinct plan would include this requirement.		
All stormwater management devices, detention basins and bushfire asset protection zones be located outside the bushland reserve network.	The brief for the water cycle management and bushfire studies would include this requirement.		

Due to the age of the studies submitted with the *Planning Proposal*, the constraints identified, and as indicated in the table above, a number of studies would need to be carried out to address/investigate, at minimum, the following issues:

- Bushfire;
- Biodiversity;
- Land Capability (including soils, contamination, agricultural potential etc);
- Water Cycle Management and Water Sensitive Urban Design;
- Flooding;
- Traffic;
- Infrastructure;
- Heritage (Aboriginal and European);
- Open space and recreation;
- Community facilities; and
- Retail and employment.

The *Environmental Planning and Assessment (EP&A) Act 1979* sets out that, if a planning proposal is requested by a proponent, council may require the owner to carry out studies or provide other information concerning the proposal, or to pay the costs of the council in carrying out the studies.

Due to the fragmented ownership of the existing 135 allotments within the South Dural precinct, it is recommended that Council undertake the planning process if a Gateway determination is sought and issued. This would require the applicant to fund the preparation of studies and an additional staff resource within the Strategic Planning Branch for a period up to two years.

It is recommended that Council be responsible for the preparation of study briefs, tenders and project management to ensure transparency and accountability through the following:

- Compliance with legal and policy requirements;
- Use of a competitive tender process for the engagement of consultants; and
- Identification and declaration of conflicts of interest.

The process of establishing the above framework would be outlined within a project plan and probity plan to be developed in consultation with Council and the proponent. The project plan would outline objectives, deliverables and governance arrangements for the project. The probity plan would outline how principals of fairness and impartiality, consistency and transparency, security and confidentiality and identification and resolution of conflicts of interest would be addressed.

CONSULTATION

Letters were sent to property owners within and adjoining the precinct seeking preliminary comments on the *Proposal*. The public notification was not intended to fulfil the requirements of the relevant sections of the *EP&A Act*. Rather, its purpose was to include preliminary community opinion to assist Council in deciding whether to support progression of investigations into rezoning South Dural for urban purposes.

The DP&I's *Guide to preparing Planning Proposals* states that it may be premature to undertake consultation with the broader community on a particular planning proposal before the Gateway determination. This is on the basis that there is no certainty that investigation of the planning proposal will be supported by either the Council or the DP&I. Furthermore, the Gateway will confirm the scope of additional information that may be required and the range of agencies to be consulted. As a result, the planning proposal may vary from the time it is initially conceived to the point where a definite proposal evolves for the site.

Notwithstanding, Hornsby Council has adopted a process of notifying owners directly affected by a planning proposal before the matter is reported to Council. Along with the letters to property owners within and adjoining the precinct, the *South Dural Planning Proposal* was exhibited on Council's website from 28 October 2013 to 25 November 2013.

In response to preliminary notification, 123 submissions were received, including submissions from the Roads and Maritime Services and The Hills Shire Council. Approximately 53% of submissions (65) indicated support for the progression of the *South Dural Planning Proposal* to the next stage of consideration. Of the 65 submissions in support, 52 were form letters outlining support for the proposal and acknowledging that the concept plan would be amended following the technical studies that would need to be undertaken. Approximately 11% of submissions (14) were supportive in principle but raised issues of concern and 36% (44) raised objections to the proposal, including submissions from the following community groups:

- Community Voice;
- Hornsby Conservation Society;
- Friends of Berowra Valley;
- Galston Area Residents Association;
- Association for Berowra Creek;
- Dural District Progress Association;
- Friends of South Dural;
- Hornsby Kuring-gai Greens;
- Sydney Agricultural Rural and Public Lands Trust Incorporated; and
- Pennant Hills District Civic Trust.

Key issues raised in submissions which object to the proposal, or are supportive with concerns, are discussed below.

Traffic

The submissions from the Roads and Maritime Services (RMS) and the Hills Shire Council note that the Traffic, Transport and Accessibility Assessment submitted with the proposal was undertaken in January 2009 and contains incorrect and out of date information and should be updated. The RMS requests that the report be submitted to the RMS for review, and that the updated report consider signalising all proposed intersections from New Line Road, including the roundabout located at the intersection of Old Northern Road and New Line Road to ensure efficient traffic flow within South Dural.

Other submissions state that the roads in the area are already congested and further development would exacerbate the problem and would increase traffic in neighbouring suburbs. Concerns are raised that significant investment in road infrastructure would be required to fix existing problems and support new development.

Protection of Biodiversity

A number of submissions raise concern regarding areas of endangered Blue Gum High Forest (BGHF) and Sydney Turpentine Ironbark Forest (STIF) which are located outside the open space corridor identified for protection in the *Planning Proposal*. Submissions also comment that the identified corridor is not likely to be sufficient to protect habitat for the threatened species recorded in the area. Submitters are concerned that all BGHF and STIF should be protected regardless of its condition and that the proposal for offsets is not adequate.

Agricultural Potential

Submissions comment that the *Hornsby Shire Housing Strategy* advocates the preservation of agricultural land and that rezoning South Dural would result in a loss of existing and potential agricultural activity. Concerns are raised that if agricultural land is not preserved it may impact on Sydney's long term food security and that many properties within the area are used for viable agriculture such as plant nurseries, vegetable production, sheep and cattle farming and alpaca grazing. Submissions also comment that the proposal would be inconsistent with the State Government's *Metropolitan Strategy* in regards to rural and agricultural land.

Infrastructure

A number of submissions raise concern with the lack of infrastructure to support new development. Concerns are raised regarding the need for fire fighting water, not just potable water. Submissions question the ability of the applicants to cover the costs of infrastructure and the timeliness of provision. One submission states that the cost to the developer of providing infrastructure would be prohibitive and would drive the cost of the land beyond the means of the market.

Rural Character

Concerns are raised that the area within and around South Dural is a desirable place to live because of the rural character and country charm, and that rezoning for urban purposes would destroy this character. One submission comments that Council's current rural zoning seeks to restrain population growth, promote the rural character and to ensure environmental sustainability, which is the opposite objective of the *Planning Proposal.*

Location of Development

A number of submissions raise concern with the planning process and how decisions have or will be made to locate the mix of residential, educational, open space and business uses. The land use concept plan (September 2013) submitted with the *Planning Proposal* identifies an indicative primary school and oval location. Submissions comment that this location does not give consideration to the level of capitalisation and landscape setting of that area compared to other parts of South Dural which may be more suitable for educational and open space areas due to their proximity to existing commercial development and infrastructure.

Notification Process

Some submissions raise concern with the consultation period and some raise concern that the broader community has not been informed.

Comment

The issues raised in submissions are addressed in this report. Further studies would be required to progress a planning proposal for the site. These studies would include traffic, biodiversity, land capability and infrastructure. The studies would be placed on public exhibition after authorisation from the DP&I and those who made submissions during the preliminary notification would have the chance to comment on the completed studies and any Precinct Plan resulting from the studies.

NEXT STEPS

The applicant acknowledges that infrastructure would be required to be augmented to support the development of South Dural. Principal infrastructure costs would include the upgrade of existing roads, the extension of trunk water and sewer mains, drainage, electricity and communications.

At this stage, no firm financial or business plan has been provided to estimate the infrastructure costs and how they would be funded to confirm the viability of the project. Council, by letter to the applicant dated 25 July 2013, requested that a Business Plan outlining how the development of South Dural could be achieved at no cost to government be submitted with any planning proposal. A letter was received from the South Dural Residents and Ratepayers Group on 22 October 2013 acknowledging that the progression of any rezoning would be subject to there being no cost to government. However, the Group states that it has concerns with making a commitment before support is received in writing from the DP&I that the matter can proceed (subject to technical studies being prepared), particularly as the matter has been discussed over many years.

The provision of detailed information confirming the ability and commitment to finance and deliver the full estimated infrastructure is a key element of the proposal. Similar requirements are placed on

proposals with the North West and South West Growth Centres Precincts where proponents apply to accelerate the release of a Precinct using the Precinct Acceleration Protocol which is managed by the DP&I. Under this Protocol, proponents are required to undertake a two staged approach for the funding of infrastructure:

- Stage 1 Outline the extent to which they will pay monetary contributions and / or carry out works-in-kind. No cost to government resulting from acceleration is a precondition of acceptance.
- Stage 2 Similar to the DP&I's Gateway process, proponents who are approved in Stage 1
 must identify the infrastructure required, the contribution required for connecting infrastructure
 and agree to meet the costs of the Department in preparing the Precinct Plan. This step is
 formalised by a Voluntary Planning Agreement.

Accordingly, it is recommended that Council commission a detailed Business Plan following any Gateway determination and prior to any studies being carried out. This is consistent with similar accelerated Precincts within the Growth Centres.

Should Council be of a mind to progress the *South Dural Planning Proposal* to the next stage of consideration, it is recommended that Council seek a Gateway determination from the DP&I which sets out the following conditions:

- 1. A Business Plan be commissioned to confirm the feasibility of the project being delivered with all necessary infrastructure at no net cost to government.
- 2. Once the Regional Director, Sydney West Region is satisfied that the Business Plan contains robust estimates for the provision of infrastructure and outlines details concerning the funding and delivery of the infrastructure at no cost to government:
 - a) Relevant studies be prepared (DP&I to confirm the studies required);
 - A revised Planning Proposal including a Precinct Plan, Development Control Plan, Section 94 Developer Contributions Plan based on the outcomes of the above studies, be submitted to the DP&I for consideration prior to exhibition.

To progress Step 2a above, the proponent would need to offer and enter into a binding legal agreement such as a Voluntary Planning Agreement or similar contract to secure payment for the studies and Council resources in project managing steps 2a and 2b above.

Upon completion of step 2b and authorisation from the DP&I for exhibition, the revised Planning Proposal and associated studies would undergo community consultation as outlined in the consultation strategy contained in Part 5 of the Planning Proposal.

Should Council be of a mind to progress the *Planning Proposal* (in its exhibited or an amended form) after the exhibition, Council would need to request the DP&I to make the *Planning Proposal* through an amending LEP.

BUDGET

Given the scale of the subject site and the scope of studies required, it is anticipated that costs for the engagement of consultants and staff resources for project management would be up to \$1 Million (subject to the costs being confirmed by tender evaluation). This cost is estimate is based on feedback from the DP&I regarding its experience in releasing Growth Centre Precincts of a similar size.

If the South Dural Planning Proposal was progressed to the next stage of consideration, the preparation of supporting studies would require a dedicated staff resource to manage the process for a period up to two years. Council advised the applicant that the preparation of studies and staff resources would cost up to \$1 Million by letters dated 25 July 2013 and 16 October 2013. A letter was received from the South Dural Residents and Ratepayers Group on 22 October 2013 indicating that options to fund upfront the preparation of studies necessary for the progression of the

A letter was received from the South Dural Residents and Ratepayers Group on 22 October 2013 indicating that options to fund upfront the preparation of studies necessary for the progression of the planning proposal include seeking commitments from individual landowners or funding from a developer who would take over the project. This funding would need to be secured prior to Council progressing to seek tenders for any studies identified as part of the Gateway determination.

Whilst the NSW Government requires that the proposal is conditional on being at no cost to government, the experience in the Growth Centres suggests that this requirement is a 'net' outcome that may result in both the NSW Government and Council incurring costs before they are recovered from contributions or offset by works-in-kind.

Should Council be of a mind to progress the *South Dural Planning Proposal*, it would be added to the Strategic Planning Program (SPP).

STATUTORY CONSIDERATIONS

In accordance with usual practice, the applicant's *Planning Proposal* has been re-drafted into Council's standard template. This has enabled additional information to be included for submission to the DP&I for Gateway determination, should Council resolve to progress the *Planning Proposal*. A number of issues have been identified in the applicant's *Planning Proposal* and have been addressed in the re-drafted *Planning Proposal* including:

- The objective of the *Planning Proposal* has been updated from capitalising on existing infrastructure to including the delivery of new infrastructure to support growth;
- Reference to the *Hornsby LEP 1994* has been updated to the *Hornsby Local Environmental Plan 2013;*
- Consideration of the Draft Metropolitan Strategy for Sydney to 2031; and
- Updating the responses to the Section 117 Directions.

Section 117 of the *EP& A Act* allows the Minister for Planning and Infrastructure to give directions to Council regarding principals, aims, objectives or policies to be achieved or given effect to in the preparation of draft local environmental plans. The *Planning Proposal* includes a table listing the Section 117 Directions and whether the proposal complies with them.

The Director-General would need to be satisfied that any inconsistencies with the Section 117 Directions are justified by a study prepared in support of the planning proposal which gives consideration to the objectives of the direction. Any studies prepared to investigate the rezoning of South Dural would need to consider the 117 Directions where there may be an inconsistency, in particular Direction 1.2 Rural Zones. Confirmation would need to be sought that the Director-General is satisfied that any inconsistency is justified.

CONCLUSION

The provision of housing at South Dural would assist Council meet revised dwelling targets outlined in the *draft Metropolitan Strategy for Sydney to 2031*. The progression of the *South Dural Planning Proposal* to investigate the rezoning of the area for urban development would be consistent with previous resolutions of Council to indicate its support for the progression of investigations of the

precinct by the DP&I, subject to the delivery of all necessary infrastructure and community facilities and further studies including (but not limited to) traffic, biodiversity, bushfire, and land capability.

Due to the fragmented ownership of the existing 135 allotments within the South Dural precinct, it is recommended that Council undertake the planning process if a Gateway determination is sought and issued. This would require the applicant to fund the preparation of studies and an additional staff resource within the Strategic Planning Branch for a period up to two years.

RESPONSIBLE OFFICER

The officer responsible for the preparation of this Report is the Manager, Strategic Planning – Fletcher Rayner - who can be contacted on 9847 6744.

FLETCHER RAYNER Manager - Strategic Planning Planning Division JAMES FARRINGTON Group Manager Planning Division

Attachments:

- **1.** South Dural Location Map
- 2. South Dural Planning Proposal Version 1 December 2013

File Reference:PP/1/2013Document Number:D02670027

Manager's Report No. PL113/13 to permit vehicle access to Arcadia Road be adopted.

- 2. All persons who made a submission be advised of Council's decision.
- FOR: COUNCILLORS ANISSE, BERMAN, BROWNE, COX, GALLAGHER, HUTCHENCE, RUSSELL, SINGH AND TILBURY

AGAINST: NIL

15 PL114/13 Planning Proposal - Rezoning of Property No. 99 New Line Road, Cherrybrook

(F2013/00511)

RESOLVED ON THE MOTION OF COUNCILLOR HUTCHENCE, seconded by COUNCILLOR BROWNE,

THAT:

- 1. Council forward the Planning Proposal attached to Group Manager's Report No. PL114/13 to the Department of Planning and Infrastructure seeking endorsement for exhibition.
- 2. In accordance with the plan making powers delegated to Council, Council Exercise Authorisation to prepare and make the Planning Proposal following the receipt of Gateway Authorisation.
- 3. The General Manager be given delegated authority to endorse the exhibition material.
- 4. Following the exhibition, a report on submissions be presented to Council.
- FOR: COUNCILLORS ANISSE, BERMAN, BROWNE, COX, GALLAGHER, HUTCHENCE, RUSSELL, SINGH AND TILBURY
- AGAINST: NIL

16 PL117/13 South Dural Planning Proposal

(PP/1/2013)

Note: Councillor Anisse declared a pecuniary interest in this item under Clause 51A of Council's Code of Meeting Practice (see Declarations of Interest in these Minutes). The nature of interest was stated by Councillor Anisse on the Declaration of Interest form as "Family home inside precinct". Councillor Anisse was not present at, or in sight of, the Meeting when the matter was being debated or voted on.

Mr Liv Cicchini, on behalf of South Dural Residents and Ratepayers Group, addressed Council regarding this item.

Mr Zigmunt Malter, of Dural, addressed Council regarding this item.

Mr Craig Sutton, of Cherrybrook, addressed Council regarding this item.

This is page 11 of the Minutes of the General Meeting of Hornsby Shire Council held on 18 December 2013.

Mr Dennis Merchant, from Sydney Agricultural Rural and Public Lands Trust Incorporated, addressed Council regarding this item.

Mr John Napoli, on behalf of Friends of South Dural, addressed Council regarding this item. Mr John Inshaw, on behalf of Galston Area Residents Association, addressed Council regarding this item.

RESOLVED ON THE MOTION OF COUNCILLOR TILBURY, seconded by COUNCILLOR SINGH,

THAT:

- Council forward the South Dural Planning Proposal attached to Group Manager's Report No. PL117/13 to the Minister for Planning and Infrastructure seeking a conditional Gateway determination which:
 - a) requires the proponent to fund a Business Plan, to be commissioned by Council, to confirm the feasibility of the project being delivered with all necessary infrastructure at no net cost to government; and
 - b) subject to the Regional Director, Sydney West Region, being satisfied with the Business Plan, outlines the necessary studies to be prepared to justify the proposal.
- 2. Should a Gateway determination be issued, Council not proceed further with the Planning Proposal until such time as the proponent has entered into a binding agreement to fund the studies and Council resources for project management and a bank guarantee has been received by Council for same.
- 3. Submitters be advised of Council's resolution.
- FOR: COUNCILLORS BERMAN, BROWNE, COX, GALLAGHER, HUTCHENCE, RUSSELL, SINGH AND TILBURY
- AGAINST: NIL

17 PL116/13 Native Title Determination Application to the Federal Court - Awabakal and Guringai People

(F2004/06302)

RESOLVED ON THE MOTION OF COUNCILLOR GALLAGHER, seconded by COUNCILLOR ANISSE,

THAT Council:

1. Write to the Crown Lands Division of NSW Trade and Investment advising that Council would be willing to assist the Crown in defence of the Claim as the granting of any Claim should not restrict the availability of land under Council's care, control and management for essential public purposes including recreation and bushland management and should not compromise Council's autonomy in decision making for lands under its control.

This is page 12 of the Minutes of the General Meeting of Hornsby Shire Council held on 18 December 2013.

Appendix E Flora and Fauna Investigation

PROPOSED REZONING OF LAND

OLD NORTHERN ROAD, HASTINGS ROAD, AND NEW LINE ROAD, SOUTH DURAL

FLORA AND FAUNA INVESTIGATION

January 2009





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PROPOSED REZONING OF LAND

OLD NORTHERN ROAD, HASTINGS ROAD, AND NEW LINE ROAD, SOUTH DURAL

FLORA AND FAUNA INVESTIGATION

This assessment has been prepared by:

Hayes

Rebecca Hayes BSc (environmental biology) MEngMngt MEIANZ MECA (NSW)

26th January 2009

Date

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- **FIGURE 2A** Ecological communities within the study area: northern.
- FIGURE 2B Ecological communities within the study area: southern.
- APPENDIX 1 Threatened fauna species known from the locality.
- **APPENDIX 2** Inventory of flora species recorded.
- **APPENDIX 3** Fauna species from the locality.

PROPOSED REZONING OF LAND

OLD NORTHERN ROAD, HASTINGS ROAD AND NEW LINE ROAD, SOUTH DURAL

FLORA AND FAUNA INVESTIGATION

January 2009

1 INTRODUCTION

1.1 Context

This report investigates potential flora and fauna issues pertaining to a proposed rezoning of approximately 240 hectares of land at South Dural.

The study area for this report is located immediately south of Round Corner at Dural, and includes 130 land titles in an area bounded by Old Northern Road, Hastings Road and New Line Road (Figure 1).

A relatively steep-sided gully associated with Georges Creek dominates the central part of the study area. This gully area contains relatively intact native vegetation and habitats, which connect across New Line Road to the east to similarly vegetated creekline gullies.

Lands surrounding the gully are gently undulating, and have been extensively cleared for agricultural landuses, including stock grazing, market gardens and pine plantations.

Substantial areas of native vegetation occur within the Dooral Dooral Creek corridor to the northwest of the study area. These areas are currently separated from the Georges Creek corridor within the study area by cleared and developed lands.

1.2 Objectives

The objectives of this investigation and report are:

- to identify and describe the existing vegetation and habitats of the study area;
- to identify and map the extent of any 'endangered ecological communities' occurring within the study area (as listed under the NSW Threatened Species Conservation Act 1995, and/or under the Commonwealth Environment Protection & Biodiversity Conservation Act 1999);
- to consider the likelihood of 'threatened species' occurring within the study area (as listed under the NSW Threatened Species Conservation Act 1995, and/or under the Commonwealth Environment Protection & Biodiversity Conservation Act 1999);
- to list and describe potential flora and fauna issues that may constrain further development of the study area, and to consider the implications of these in relation to Growth Centres Commission sustainability criteria;

- to identify and describe opportunities for improving existing ecological values within the study area and in the locality, and to illustrate these as appropriate;
- to provide input and comments on the Indicative Concept Master Plan (ICMP) prepared by Inspire (13 January 2009).

2 FIELD SURVEYS AND RESEARCH

2.1 Desktop Research and Review

Relevant data (including records of threatened species) were obtained from a search of records listed within 10km of the study area on the NSW NPWS Atlas of NSW Wildlife (data obtained August 2008).

Threatened fauna species recorded within 10km of the study area since 1980 are listed in Appendix 1 of this report, along with known details of their habits, habitat and foraging requirements, and distributions.

The following documents were reviewed as part of the investigation:

- Vegetation Communities Map, prepared by P Smith & J Smith for Hornsby Shire Council, August 2007, and a more detailed supplementary map of the study area provided by Council officer Jamie Slaven in June 2008;
- Sydney Metropolitan Strategy, Fact Sheet 5: Sustainability Criteria;
- South Dural Area Stream Classification, NSW Department of Water and Energy (2007);
- Land Capability Planning Context Report, submission to Hornsby Shire Council prepared by Michael Brown & Associates for the South Dural Land Owners Group, March 2007;
- South Dural Future Urban Release Area, prepared by McKenzie Land Planning Services, April 2002;
- Hornsby Shire Council, Executive Manager's Report No. PLN191/07, Rezoning request of land in the South Dural area.

2.2 Flora Field Survey

A general botanical survey was conducted across the study area on the 16th of August 2008.

The survey included ground-truthing of previous vegetation mapping of the study area (Hornsby Council 2007), and some opportunistic targeted searches in areas of potential habitat for plant species of conservation significance known from the general region (NPWS Atlas), or otherwise anticipated to occur.

An inventory was compiled of all plant species recorded during the survey (Appendix 2). Plant identifications conform to nomenclature in Harden (1990-1993) and to recent reclassifications and name changes listed in *Cunninghamia* and *Telopea*.

Ecological communities were identified and described with reference to the vegetation descriptions of P & J Smith (August 2007), Native Vegetation Maps (NVM) of the Cumberland Plain Western Sydney (NPWS 2002), and to the descriptions included in the Final Determinations of communities listed on

the NSW Threatened Species Conservation Act 1995 (TSC Act) and the Commonwealth Environment Protection & Biodiversity Conservation Act 1999 (EPBC Act).

The conservation significance of individual species, populations and vegetation communities recorded during the survey was established with reference to the EPBC Act in the national context, and to the TSC Act in the state context.

2.3 Fauna Field Survey

A general inspection and assessment of fauna habitats across the study area was conducted on the 16th and 25th of August 2008.

Fauna habitats were assessed with particular consideration to the specific requirements of fauna species of conservation significance known from the general region (NPWS Atlas), or otherwise anticipated to occur. Relevant details are reported in Appendix 1.

A list of fauna species known to have occurred in the vicinity, and therefore likely to occur within the study area, is provided in Appendix 3.

The conservation significance of native fauna expected to occur within the study was established with reference to the EPBC Act in the national context, and to the TSC Act in the state context.

3 EXISTING VEGETATION AND HABITATS

3.1 General Description

The study area is dominated (ecologically) by a broad vegetation corridor located within and adjacent to the steep-sided gully associated with Georges Creek.

Georges Creek is a Category 1 stream (DWE classification), which drains to the southeast through the study area, exiting near the intersection of Hastings Road with New Line Road.

The vegetation within this main gully area is relatively intact and undisturbed, although with dense shrubby weed infestations in some places, and with usual edge-effects include hazard reduction works and incursion of exotic grasses and groundcovers.

The creekline itself is affected by invasive exotic groundcovers indicating higher than natural nutrient levels in the water.

Surrounding lands within the study area contain isolated small patches of remnant/regrowth native vegetation, and scattered native trees. These areas vary in condition and regeneration potential. Typically, these areas have a canopy of native trees, and either a shrub layer dominated by invasive woody weeds, or no shrub layer, and a groundcover containing a mixture of native and exotic grasses maintained as lawn or as grazed pasture.

The study area contains a range of habitat features for native fauna, include a range of tree-hollow sizes, rocky boulders, crevices, small sandstone escarpments, ephemeral and permanent drainage lines, perched soaks, and a range of woodland and forest structures.

3.2 Flora and Fauna Species

Compilation of detailed inventories of flora and fauna species were beyond the scope of this investigation.

However, an inventory was compiled of all plant species recorded during the survey (Appendix 2), and a list of fauna species known to have occurred in the vicinity, and therefore likely to occur within the study area, is provided in Appendix 3.

3.3 Ecological Communities (TSC Act & EPBC Act)

Three native ecological communities have been previously mapped within the study area (Smith & Smith, 2007):

- Blackbutt Gully Forest;
- Sydney Turpentine Ironbark Forest; and
- Blue Gum High Forest.

Recent surveys conducted for this report confirmed the presence of these three communities within the study area, although with some variation to their previously mapped location and extent. Refer to Figure 2 (A:northern and B:southern).

3.3.1 Blackbutt Gully Forest (as described by Smith & Smith, 2007)

Blackbutt Gully Forest within the study area occurs predominantly within and adjacent to the main gully associated with Georges Creek Figure 2A and 2B). The study area contains approximately 20 hectares of Blackbutt Gully Forest.

The canopy is dominated by Blackbutt *Eucalyptus pilularis*, with common occurrences of Sydney Red Gum *Angophora costata* and Turpentine *Syncarpia glomulifera* ssp *glomulifera*. Occurring occasionally are Sydney Blue Gum *Eucalyptus saligna* and Red Bloodwood *Corymbia gummifera*.

There is a midstorey with Black She-oak *Allocasuarina littoralis*, Christmas Bush *Ceratopetalum gummiferum*, Sweet Pittosporum *Pittosporum undulatum*, and regenerating canopy species.

The shrub layer is a mosaic of established native cover, with patches of dense weed infestations in places. Common native shrubs include White Wattle *Acacia linifolia*, Tea-trees *Leptospermum* spp, regenerating Sweet Pittosporum *Pittosporum undulatum* and Elderberry Panax *Polyscias sambucifolia*. Common exotic shrubs include Lantana *Lantana camara*, Mickey Mouse Plant *Ochna serrulata* and Small-leaved Privet *Ligustrum sinense*.

The groundcover is dominated by native species such as Maiden-hair Fern Adiantum aethiopicum, Soft Bracken Calochlaena dubia, Wombat Berry Eustrephus latifolius, Spiny-headed Mat-rush Lomandra longifolia, Basket Grass Oplismenus spp and Common Bracken Pteridium esculentum. Exotic groundcovers are limited mainly to the disturbed edges of the community. Wandering Jew Tradescantia albiflora forms dense carpets along Georges Creek itself, and on adjacent alluvial deposits.

Resilience and regeneration potential are moderate to high within the relatively undisturbed areas of this community (including areas with thickets of Lantana infestation), but are low to moderate within the edge areas disturbed by bushfire hazard reduction works.

In general, areas of this community labelled patch 3 on Figure 2A and 2B are in moderate to good condition, and areas labelled patch 7 are in poor condition.

3.3.2 Sydney Turpentine Ironbark Forest (described by the NSW Scientific Committee)

Sydney Turpentine Ironbark Forest (STIF) occurs across the northern part of the study area, as a large and relatively intact stand at the northern extremity of the vegetated Georges Creek corridor, and as several small and highly modified stands scattered through surrounding agricultural land (Figure 2A). Approximately 3.5 hectares of STIF in moderate to good condition occurs within the study area, and approximately 3 hectares of STIF in poor to very poor condition occurs within the study area.

The canopy is dominated by Blackbutt *Eucalyptus pilularis*, with Sydney Red Gum *Angophora costata*, and Turpentine *Syncarpia glomulifera* ssp *glomulifera*. Occurring occasionally are Grey Ironbark *Eucalyptus paniculata*, and Grey Gum *Eucalyptus punctata*.

Common midstorey species include Black Wattle Acacia decurrens, Sydney Green Wattle Acacia parramattensis and Sweet Pittosporum Pittosporum undulatum.

Common shrubs include Rough Guinea Flower *Hibbertia aspera*, Prickly Beard-heath *Leucopogon juniperinus*, Rice Flower *Ozothamnus diosmifolius*, Narrow-leaved Geebung *Persoonia linearis*, Shrubby Platysace *Platysace lanceolata*, Elderberry Panax *Polyscias sambucifolia* and Sandfly Zieria *Zieria smithii*.

Common native groundcovers include Mulga Fern *Cheilanthes sieberi*, Blady Grass *Imperata cylindrica*, Mat-rush *Lomandra obliqua*, Weeping Meadow Grass *Microlaena stipoides*, Common Silkpod *Parsonsia straminea*, *Phyllanthus hirtellus*, Whiteroot *Pratia purpurascens* and Woolly Xanthosia *Xanthosia pilosa*.

The structure of this community within the study area varies considerably, depending on past and current landuses:

- patch 1 is highly degraded and best described as a 'mixed native and exotic shrubland'. It is
 currently dominated by *Acacia* spp and the invasive Privet *Ligustrum* spp, with scattered
 native trees. Native resilience is very low. This patch of vegetation would be unlikely to
 regenerate to a representative example of STIF;
- patch 2 is in moderate to good condition, although with some minor occurrences of Lantana. Vegetation to the north and west of the dam is in better condition than vegetation to the southwest of the dam, which has a cleared understorey and has been disturbed through firewood cutting;
- patches 4 and 5 are highly degraded and best described as 'disturbed woodland'. The understorey of patch 5 is heavily infested with woody weeds such as Lantana. The groundcover is dominated by annual and perennial weeds, with exotic pasture grasses invading from adjacent cleared areas. Although native resilience is low, there is some potential for this area to be regenerated with sustained input of effort and resources.

3.3.3 Blue Gum High Forest (described by the NSW Scientific Committee)

Blue Gum High Forest (BGHF) occurs through the southwestern part of the study area. There is one relatively intact patch located on a major tributary to Georges Creek in the south of the study area, and numerous other tiny stands and narrow rows of trees. The study area contains approximately 4 hectares of BGHF in moderate to good condition, and approximately 12 hectares of BGHF in poor condition.

Common canopy trees include Blue Gum *Eucalyptus saligna*, Turpentine *Syncarpia glomulifera*, White Mahogany *Eucalyptus acmenioides*, Grey Ironbark *Eucalyptus paniculata*, Grey Gum *Eucalyptus punctata*, Blackbutt *Eucalyptus pilularis*. The relative dominance of these tree species varies within the various patches mapped on Figure 2A and 2B.

The midstorey and shrub layer of much of this community has been cleared, and is currently either very sparse or absent. Native shrubs present in some areas include Sweet Pittosporum *Pittosporum undulatum* and Blackthorn *Bursaria spinosa*.

The groundcover is generally dominated by mown or grazed exotic pasture grasses, with patches of native species including Weeping Meadow Grass *Microlaena stipoides* and Native Geranium *Geranium homeanum*.

The condition of BGHF within the study area varies considerably:

- patch 6 consists of narrow corridors of remnant and regrowth native trees, above a maintained lawn of exotic pasture grasses. This area is best described as 'disturbed woodland'. It has a low resilience, and would require significant and sustained input of effort and resource to regenerate to representative example of BGHF;
- patch 8 is probably the most representative of BGHF of the vegetation surveyed. This patch contains a sparse midstorey of Pittosporum, and a sparse shrub layer of Blackthorn, with some woody weeds at low densities. Resilience of this area is low to moderate. Regeneration to a representative example of BGHF would be possible with conventional bush regeneration techniques;
- patch 9 was not surveyed for this report, but appears to contain relatively intact BGHF, with native understorey, and some invasion of exotic woody weeds;
- patch 10 consists of several extant stands and disturbed corridors of vegetation best described as 'disturbed woodland'. The patch contains remnant and regrowth native trees, above a maintained lawn of exotic pasture grasses. It has a low resilience, and would require significant and sustained input of effort and resource to regenerate to representative example of BGHF. Some parts of this patch, such as along the major tributary to Georges Creek, could be more similar to Blackbutt Gully Forest than BGHF. This would only be determined through the use of statistical quadrat surveys which were beyond the scope of this investigation.

3.4 Conservation Significance

3.4.1 Species

One plant species listed as "*threatened*" under the TSC Act, *Epacris purpurascens* var *purpurascens*, was recorded within the study area, as illustrated on Figure 2A.

Thirty-nine (39) fauna species listed as threatened under the TSC Act and/or EPBC Act have been recorded previously in the locality (NPWS Atlas). These species are listed in Appendix 1, along with details of their habits and habitat requirements, and a discussion as to their likelihood to occur within the study area. In summary of Appendix 1, thirty (30) of these threatened fauna species could potentially or theoretically occur within the study area.

Twenty-seven (27) bird species listed as migratory under the EPBC Act are known to have occurred in the locality (Appendix 3). Most of these species could occur within the study area on occasions.

3.4.2 Populations

No flora species being part of any "endangered population" listed under the TSC Act was recorded within the study area.

An endangered population of a threatened fauna species, the Gang Gang Cockatoo, is listed as occurring within the Hornsby Shire. This species is likely to occur within the study area (see details in Appendix 1).

3.4.3 Ecological Communities

Sydney Turpentine Ironbark Forest (STIF) and Blue Gum High Forest (BGHF) are both listed under the TSC Act and the EPBC Act. Blackbutt Gully Forest is not listed under either Act.

STIF is listed as an 'endangered ecological community' under the TSC Act, and as a 'critically endangered ecological community' under the EPBC Act, whilst BGHF is listed as a 'critically endangered ecological community' under both Acts. The distributions of these communities are illustrated on Figures 2A and 2B.

4 FLORA AND FAUNA ISSUES

4.1 NSW Threatened Species Conservation Act 1995

4.1.1 General

The *Threatened Species Conservation Act 1995* (TSC Act) outlines the protection of threatened species, populations, ecological communities and critical habitat in New South Wales. Schedules 1, 2 and 3 of the Act list the species, populations, ecological communities and critical habitat that are protected.

The TSC Act, and subsequent *NSW Threatened Species Legislation Amendment Act 2004*, modified the *NSW Environmental Planning & Assessment Act 1979* (EP&A Act) by including in Section 5A seven factors which are to be considered when determining "whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats".

These seven factors "*must be taken into account*" by a consent or determining authority when considering a development proposal or Development Application.

The seven factors are:

- (a) "in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction"
- (b) "in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction"
- (c) "in the case of a critically endangered or endangered ecological community, whether the action proposed:
 - (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
 - (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction"
- (d) "in relation to the habitat of a threatened species, population or ecological community:
 - (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and
 - (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and
 - (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the longterm survival of the species, population or ecological community in the locality"

- (e) "whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)"
- (f) "whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan"
- (g) "whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process"

4.1.2 Relevant Matters

Epacris purpurascens var purpurascens

One plant species listed as "*threatened*" under the TSC Act, *Epacris purpurascens* var *purpurascens*, was recorded in the northern part of the Georges Creek vegetation corridor within the study area, as illustrated on Figure 2A.

It should be assumed that the individuals recorded are part of a 'viable' population of this threatened species. The extent of known habitat for this species should be retained and protected.

Note that the population of *Epacris purpurascens* var *purpurascens* occurs within an area of vegetation that is also otherwise identified as being of high conservation significance for its riparian and wildlife corridor values – see Chapters 4.3 and 4.4 below.

The Indicative Concept Master Plan (ICMP) would retain the majority of, if not all of, the *Epacris purpurascens* var *purpurascens* population within the study area. Further targeted surveys and GPS mapping would be required to accurately determine the extent of this population in relation to the ICMP.

The ICMP would probably not significantly affect this threatened species.

Threatened fauna

Thirty-nine (39) fauna species listed as threatened under the TSC Act have been recorded previously in the locality (NPWS Atlas). The majority of these species could theoretically occur within the study area either regularly or on occasions, based on consideration of habitats present.

Habitats and resources of potential value for threatened fauna species generally occur within the broad vegetation corridor along Georges Creek, and possibly also along its major tributary in the southern part of the study area.

Surrounding lands which contain scattered trees and small stands of highly disturbed vegetation are less likely to be of value for threatened fauna.

Further detailed survey work would be required to determine which threatened fauna species do utilise the study area, and to determine the relative importance of habitat and resources for threatened fauna species within the study area.

It should be assumed at this stage that the broad vegetation corridor along Georges Creek is of significance for one or more threatened fauna species.

It is probable that retention of the Georges Creek corridor as proposed within the ICMP would adequately protect threatened fauna species in the study area.

Sydney Turpentine Ironbark Forest

Sydney Turpentine Ironbark Forest (STIF) is listed as an 'endangered ecological community' under the TSC Act. The distribution of this community is illustrated on Figure 2A.

Areas of STIF which are in moderate to good condition should be retained and protected within the study area.

Small isolated remnants of STIF which are in poor condition, with low resilience and low regeneration potential, are of some significance but could be considered for removal in exchange for appropriate compensatory works which improve the condition, extent or security of other areas of STIF either within the study area or in the locality.

The ICMP would retain the largest and most intact remnant of STIF, adjacent to the Georges Creek corridor. Other smaller, more disturbed and isolated remnants would be removed.

Details of compensatory off-set works would need to be determined in consultation with DECC and/or Council. It would seem to be possible that such works could be accommodated within the ICMP.

Blue Gum High Forest

Blue Gum High Forest (BGHF) is listed as a 'critically endangered ecological community' under the TSC Act. The distribution of this community is illustrated on Figure 2A.

Areas of BGHF which are in moderate to good condition should be retained and protected within the study area.

The significance of highly degraded remnants of BGHF is currently a subject of debate within the Ecological Consultants Association of NSW, following recent findings of the NSW Land & Environment Court.

At present, all remnants containing Sydney Blue Gum *Eucalyptus saligna* are of significance, regardless of size, condition, resilience or regeneration potential. This includes small groups of trees with no native understorey or groundcover vegetation, and isolated paddock/garden specimens.

It would clearly not be practicable to retain all individual Blue Gum trees within the study area. A good ecological outcome could be achieved through improvement of the condition, extent and/or security of the larger and more intact remnants of BGHF within the study area, with compensatory off-set revegetation works in strategic locations to improve connectivity and management of these larger remnants.

The ICMP would retain the larger and more intact remnants of BGHF, generally along the Georges Creek corridor, and its southern tributary. Smaller, more disturbed remnants, and most isolated trees would be removed.

Considerable revegetation of the Blue Gum High Forest community would be required to off-set the loss of numerous individual and small stands of trees. This revegetation could occur in a corridor that also improves linkage of vegetation within the site to the Dooral Dooral Creek vegetation corridor to the northwest of the study area. Such a corridor could be accommodated within the ICMP, but would need to be located and designed following further more detailed studies at a later stage of planning.

Details of compensatory off-set works would need to be determined in consultation with DECC and/or Council. However, it would seem to be possible that such works could be accommodated within the ICMP.

4.2 Commonwealth Environment Protection & Biodiversity Conservation Act 1999

4.2.1 General

The Commonwealth Environment Protection & Biodiversity Conservation Act 1999 requires that an action which has, will have or is likely to have a significant impact upon one or more matters of National Environmental Significance (NES) must be referred to the Commonwealth Minister for Environment & Heritage for approval. These actions are referred to as 'controlled actions'.

Matters of NES include World Heritage properties, Ramsar Wetlands of international importance, listed threatened species and communities, listed migratory species, nuclear actions and Commonwealth marine areas.

4.2.2 Relevant Matters

Threatened fauna

Nine (9) fauna species listed as threatened under the EPBC Act have been recorded previously in the locality (NPWS Atlas). The majority of these species could theoretically occur within the study area either regularly or on occasions, based on consideration of habitats present.

Habitats and resources of potential value for threatened fauna species generally occur within the broad vegetation corridor along Georges Creek, and possibly also along its major tributary in the southern part of the study area.

Surrounding lands which contain scattered trees and small stands of highly disturbed vegetation are less likely to be of value for threatened fauna.

Further detailed survey work would be required to determine which threatened fauna species do utilise the study area, and to determine the relative importance of habitat and resources for threatened fauna species within the study area.

It should be assumed at this stage that the broad vegetation corridor along Georges Creek is of significance for one or more threatened fauna species.

It is probable that retention of the Georges Creek corridor as proposed within the ICMP would adequately protect threatened fauna species in the study area.

Migratory species

Twenty-seven (27) bird species listed as migratory under the EPBC Act are known to have occurred in the locality (Appendix 3). Most of these species could occur within the study area on occasions.

Habitats and resources of potential value for migratory species generally occur within the broad vegetation corridor along Georges Creek, and possibly also along its major tributary in the southern part of the study area.

Surrounding lands which contain scattered trees and small stands of highly disturbed vegetation are less likely to be of value for migratory species.

It should be assumed at this stage that the broad vegetation corridor along Georges Creek is of significance for migratory species.

It is probable that retention of the Georges Creek corridor as proposed within the ICMP would adequately protect migratory species habitats in the study area.

Turpentine - Ironbark Forest of the Sydney Basin Bioregion

Turpentine - Ironbark Forest of the Sydney Basin Bioregion (referred to as Sydney Turpentine Ironbark Forest under the TSC Act) is listed as a 'critically endangered ecological community' under the EPBC Act. The distribution of this community is illustrated on Figure 2A.

The following excerpt was taken from the *Nationally Threatened Species and Ecological Communities Information Sheet* (Department of the Environment and Heritage, September 2005):

"Many patches of Turpentine-Ironbark Forest have become degraded with the remaining ecological community now embedded within an urban environment. The listed ecological community includes patches with an intact vegetation structure, a tree canopy cover greater

than 10%, and an area greater than one hectare. Patches with less than 10% tree canopy cover are also included if they are more than one hectare in size and are part of a native vegetation remnant larger than five hectares."

Areas of Sydney Turpentine Ironbark Forest which meet the above criteria should be retained and protected within the study area.

Only one of the remnant stands of STIF in the study area is considered to meet the above criteria. This being the largest stand which would be retained in the ICMP adjacent to the Georges Creek corridor.

The ICMP would probably not significantly affect this EPBC Act listed community.

Blue Gum High Forest

Blue Gum High Forest (BGHF) is listed as a 'critically endangered ecological community' under the EPBC Act. The distribution of this community is illustrated on Figure 2A.

The following excerpt was taken from the *Nationally Threatened Species and Ecological Communities Information Sheet* (Department of the Environment and Heritage, September 2005):

"Many patches of Blue Gum High Forest have become degraded with the remaining ecological community now embedded within an urban environment. The listed ecological community includes patches with an intact vegetation structure, a tree canopy cover greater than 10%, and an area greater than one hectare. Patches with less than 10% tree canopy cover are also included if they are more than one hectare in size and are part of a native vegetation remnant larger than 5 hectares."

Areas of BGHF which meet the above criteria should be retained and protected within the study area.

The ICMP appears to retain the majority of BGHF meeting the above criteria within the study area. Further targeted surveys and GPS mapping would be required to accurately determine the extent of this community in relation to the ICMP.

The ICMP would probably not significantly affect this EPBC Act listed community.

4.3 Department of Water and Energy: Stream Classifications

4.3.1 General

The study area contains almost entirely the upper catchment of Georges Creek. The Department of Water and Energy (DWE) have classified the streams within the study area.

4.3.2 Relevant Matters

Georges Creek and one of its tributaries (tentatively linking to Dooral Dooral Creek to the west) are Category 1 streams, with a minimum riparian setback of 40m either side, plus an additional 10m wide buffer either side. This is equivalent to a 100m wide corridor, containing an 80m wide vegetated riparian corridor.

Other major tributaries are designated Category 2 streams, with a minimum riparian setback of 20m either side plus an additional 10m wide buffer either side. This is equivalent to a 60m wide corridor, containing a 40 m wide vegetated riparian corridor.

Several minor drainage lines at the upper limits of the Category 2 streams are designated as Category 3 streams, with a minimum riparian setback of 10m either side. This is equivalent to a 20m wide vegetated riparian corridor.

The minimum setback distances should be measured from top of the creek bank. These areas would need to be retained, managed and/or revegetated to achieve a relatively dense riparian vegetation corridor. There is very little flexibility in this regard.

Buffer areas can include grassed roadsides and parklands with scattered native trees and shrubs, and can be managed to meet bushfire asset protection zone requirements.

4.4 Hornsby Shire Council: concerns and issues

4.4.1 General

A review of correspondence and reports from Hornsby Shire Council pertaining to the request for rezoning of land within the study area identified the following concerns and issues:

- occurrence of two endangered ecological communities within the study area Blue Gum High Forest and Sydney Turpentine Ironbark Forest;
- occurrence of the threatened plant species, *Epacris purpurascens* var *purpurascens*;
- occurrence of threatened microchiropteran bat species, and the threatened Grey-headed Flying-fox;
- possible adverse impacts upon the Berowra Creek catchment via Georges Creek;
- requirement for a wetland to be created to manage water quality; and
- that the study area is of importance for its potential value in providing a wildlife corridor linking the Georges Creek vegetation corridor within the site to the Dooral Dooral Creek vegetation corridor to the west.

Council require that a rezoning proposal for the site provides the following:

- consideration of total catchment planning;
- consideration of potential impacts, including stormwater, loss of habitat, pollution, bushfire mitigation, introduction of exotic species and domesticated animals;
- consideration of the environmental footprint of an urban proposal for the study area, versus the environmental footprint of the current rural zoning of the study area; and
- appropriate buffers between development and retained bushland areas.

4.4.2 Relevant Matters

Discussion of the significance of threatened species and endangered ecological communities is provided in Chapters 4.1 and 4.2 above.

Water management issues are beyond the scope of this flora and fauna investigation. However, water issues are considered capable of satisfactory resolution through the application of water sensitive urban design (WSUB) principles.

There is potential for a broad wildlife corridor to be created within the study area which links extensive tracts of vegetation within the Hornsby area with tracts of vegetation in Baulkham Hills area. Such a link could be of immense ecological benefit to the region, but would need to be located and designed following further more detailed studies at a later stage of planning.

The increased density of development which would occur following rezoning of the study area would need to be off-set by appropriate development design and compensatory works which improve the condition, extent or security of areas of significant vegetation within the study area.

4.5 Sydney Metropolitan Strategy: Sustainability Criteria

4.5.1 General

The Sydney Metropolitan Strategy has set sustainability criteria such that no new land is to be released outside of the identified growth centres unless it meets strict sustainability criteria. The criteria will apply to any greenfield site planned for urban rezoning, regardless of scale or lot production, including rural, residential and employment developments.

Threshold Sustainability Criteria, Item 7 – Environmental Protection includes:

 maintains or improves areas of regionally significant terrestrial and aquatic biodiversity (as mapped and agreed by DEC and DPI). This includes regionally significant vegetation communities, critical habitat, threatened species, populations, ecological communities and their habitats.

4.5.2 Relevant Matters

The study area is known to contain one threatened plant species, two endangered ecological communities and potential habitat for approximately 30 threatened fauna species.

Any clearing of vegetation that affects these threatened biota would need to be off-set through compensatory works which improve the condition, extent or security of other areas of significant vegetation within the study area.

It is understood that the development scheme as reflected in the ICMP could fulfil the environmental protection sustainability criteria threshold, once the extent of compensatory off-set works have been determined following more detailed studies, and in consultation with DECC and/or Council.

5 SUMMARY OF CONSTRAINTS

5.1 Georges Creek Vegetation Corridor

The Georges Creek vegetation corridor contains:

- known habitat for the threatened plant *Epacris purpurascens* var *purpurascens*;
- potential habitat for 30 threatened fauna species;
- minimum riparian vegetation setbacks as required by the DWE. These generally equate to a riparian corridor of 100m in width along the main creekline, 60m in width along major tributaries, and 20m in width along minor upper sections of tributaries.

The existing broad vegetation corridor along Georges Creek is of significant ecological value, and should be retained to the extent that it continues to function as a wildlife corridor and provide habitat for threatened species. This will generally exceed the minimum requirements of the DWE.

The ICMP proposes retention of a broad vegetation corridor varying from approximately 100m in width at the upstream end of tributaries, to 200m in width along Georges Creek through the central part of the study area.

It is expected that this proposed corridor would continue to function ecologically in the long-term, and would continue to protect and provide for threatened flora and fauna species.

5.2 Endangered Ecological Communities

Areas of 'endangered' and 'critically endangered' ecological communities that are in moderate to good condition, or are within or adjacent to the main vegetated riparian corridors, are of significant ecological value and should be retained and protected.

Other patches of these communities that are in poor condition, with low resilience and low regeneration potential are also of significance, but cannot be practicably retained within the study area. The ICMP does not allow for retention of these smaller generally isolated remnants, nor individual trees.

It is recommended that off-set revegetation works are designed in consultation with DECC and/or Council, to provide adequate compensation for loss of these small patches of endangered ecological communities. It is envisaged that these works could be accommodated within the ICMP.

6 OPPORTUNITIES TO IMPROVE FLORA AND FAUNA VALUES

6.1 Wildlife Corridors

The study area includes lands that are located strategically such that an important and sought after wildlife corridor could be created, which connects vegetation in the Hornsby area on the eastern side of the study area with vegetation in the Baulkham Hills area on the western side of the study area.

Creation of such a wildlife corridor could provide an off-set to compensate for loss of vegetation elsewhere within the study area.

This opportunity is a valuable asset that could enable a rezoning of the study area to meet the Sydney Metropolitan Strategy sustainability criteria, and address many of Council's concerns.

6.2 Water Quality

The study area contains the upper catchment of Georges Creek. The creekline is currently exhibiting signs of degradation due to increased nutrient loads, which would be expected given the surrounding landuses (including agriculture, grazing and market gardens).

There is opportunity for development of the study area to improve the current water quality of Georges Creek, through thoughtful design of the development to minimise water management issues, and through implementation of WSUD practices.

Reduction of nutrient loads within Georges Creek and its tributaries would lessen current pressures on threatened species and their habitats, and upon endangered ecological communities present.

6.3 Weed Control and Native Vegetation Regeneration

There are areas of native vegetation in moderate to good condition within the study area which contain patches of invasive woody weeds such as Lantana and Privet. The removal of these weeds would lessen pressures on threatened species and their habitats, and upon endangered ecological communities.

Implementation of a native vegetation regeneration program for the study area would improve the condition and long term viability of native vegetation within the study area. There would be direct benefits to threatened species and their habitats, and to endangered ecological communities.

7 CONCLUSIONS/OVERVIEW

The study area contains ecological features and habitats of conservation significance. These include:

- riparian corridor values along Georges Creek, which occupies the central part of the study area;
- a population of the threatened plant *Epacris purpurascens* var *purpurascens* adjacent to Georges Creek in the northern part of the study area;
- the potential for a large number of threatened and/or migratory fauna species to utilise the study area on a regular, or occasional, basis;
- presence of two endangered ecological communities listed under both the TSC Act and the EPBC Act, namely Blue Gum High Forest and Sydney Turpentine Ironbark Forest.

In general, most of these ecological issues converge within the broad Georges Creek vegetation corridor.

Patches of endangered ecological community also occur outside of the main corridor, but as isolated and highly degraded remnants, and as individual trees.

The Indicative Concept Master Plan (ICMP) proposes that the broad Georges Creek corridor be retained at a width varying from 100-200m, that the southern tributary of Georges Creek also be retained at a width of approximately 100m, and that some additional adjacent areas of endangered ecological community also be retained.

Revegetation of a wildlife corridor that improves linkage of vegetation within the site to the Dooral Dooral Creek vegetation corridor to the northwest of the study area, could be accommodated within the ICMP, but would need to be located and designed following further more detailed studies at a later stage of planning.

Additional works would also be implemented to improve the quality and security of retained vegetation within the study area. This compensatory package would be designed in consultation with DECC and Council.

On balance, a positive and sustainable ecological outcome could be achieved within the study area, if urban development is sensitively pursued.

Beadle N, Evans O and Carolin R. 1982. Flora of the Sydney Region. Reed Books, Sydney.

- Benson D and Howell J. 1990. *Taken for Granted. The Bushland of Sydney and its Suburbs.* Kangaroo Press, Sydney.
- Benson D & Howell J. 1994. The natural vegetation of the Sydney 1:100,000 map sheet. Cunninghamia 3(4) 677-787.
- Benson D. 1992. The natural vegetation of the Penrith area. Cunninghamia 2(4): 503-662.
- Beruldsen G. 1995. Which Bird of Prey is that? Gordon Beruldsen, Kenmore Hills, Qld.
- Blakers M, Davies SJJF and Reilly PN. 1985. *The Atlas of Australian Birds*. Royal Australian Ornithologists Union/Melbourne University Press.
- Brooker MIH and Kleinig DA. 1990. Field Guide to Eucalypts Volume 1 Southeastern Australia. Inkata Press, Melbourne.
- Cogger HG. 1992. Reptiles and Amphibians of Australia. AH & AW Reed, Sydney.
- Cropper SC. 1993. Management of Endangered Plants. CSIRO, Melbourne.
- Environment Australia. 2000. EPBC Act Administrative Guidelines on Significance. Environment Australia.
- Fairley A and Moore P. 1995. Native Plants of the Sydney District. Kangaroo Press, Sydney.
- Griffiths K. 1987. Reptiles of the Sydney Region. Three Sisters Publications, Winmalee.
- Harden G (ed). 1990. Flora of New South Wales Vol 1. NSW University Press, Kensington.
- Harden G (ed). 1991. Flora of New South Wales Vol 2. NSW University Press, Kensington.
- Harden G (ed). 1992. Flora of New South Wales Vol 3. NSW University Press, Kensington.
- Harden G (ed). 1993. Flora of New South Wales Vol 4. NSW University Press, Kensington.
- Leonard G. 1993. Eucalypts: A Bushwalkers Guide. NSW University Press, Kensington.
- Lindsey TR. 1992. Encyclopaedia of Australian Animals: Birds. Australian Museum/Angus & Robertson.
- NPWS. 2002. *Native Vegetation Maps of the Cumberland Plain Western Sydney*. NSW National Parks and Wildlife Service, Hurstville.
- NPWS. 1997. Western Sydney Urban Bushland Biodiversity Survey. NSW National Parks and Wildlife Service, Hurstville.
- Robinson L. 1991. Field Guide to the Native Plants of Sydney. Kangaroo Press, Sydney.
- Robinson M. 1996. A Field Guide to Frogs of Australia. Australian Museum/Reed Books.
- Slater P, Slater P and Slater R. 1989. *The Slater Field Guide to Australian Birds*. Weldon Publishing, Sydney.
- Specht RL. 1970. Vegetation. In Leeper GW (ed). The Australian Environment. CSIRO Australia.

Strahan R (ed). 1995. The Mammals of Australia. Angus & Robertson Publishers, Sydney.

- Swan G. 1990. A Field Guide to the Snakes and Lizards of New South Wales. Three Sisters Publications, Winmalee.
- Triggs B. 1998. Tracks, Scats and Other Traces: A Field Guide to Australian Mammals. Oxford University Press, Melbourne.



Aerial view of the study area in relation to surrounding lands. FIGURE 1



FIGURE 2A Ecolgoical communities within the study area: northern.

	ooou condition	r oor condition
Blue Gum High Forest (CEEC)		
Blackbut Gully Forest		
Sydney Turpentine Ironbark Forest (CEEC)		

Good condition Poor condition


 FIGURE 2B
 Blue Gum High
 Good condition
 Poor condition

 Ecological communities within the study area: southern
 Blue Gum High
 Image: Southern
 Image: Southern

 Blackbutt Gully Forest
 Image: Southern
 Image: Southern
 Image: Southern
 Image: Southern

PROPOSED REZONING OF LAND AT SOUTH DURAL

FLORA AND FAUNA INVESTIGATION

APPENDIX 1

Threatened fauna species known from the locality

August 2008

Threatened fauna species known to have occurred within 10km of the study area at South Dural since 1980 (NPWS Atlas, data obtained August 2008)

Species	Habits/Requirements/Records in the locality	Occurrence in the study area
BIRDS		
Black-necked Stork <i>Ephippiorhynchus asiaticus</i> E (TSC)	 Usually inhabits swamps associated with river systems and large permanent pools (Blakers <i>et al</i> 1984). Inhabits tropical to warm temperate wetlands, lagoons, swamps, mud-flats and irrigated cropland (Lindsey 1992). Feeds in shallow water for fish and frogs (Blakers <i>et al</i> 1984). Nests high in a tree in a secluded swamp (Lindsey 1992). 1 record in the locality since 1980 (NPWS Atlas). 	The study area does not contain suitable habitat for this species. The Black-necked Stork would not be likely to occur within the study area.
Broad-billed Sandpiper <i>Limicola falcinellus</i> V (TSC)	The eastern form of this species breeds in northern Siberia before migrating southwards in winter to Australia. In Australia, Broad-billed Sandpipers overwinter on the northern coast, particularly in the north-west, with birds located occasionally on the southern coast. In NSW, the main site for the species is the Hunter River estuary, with birds occasionally reaching the Shoalhaven estuary. There are few records for inland NSW (DEC Profile). Broad-billed Sandpipers favour sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs as feeding and	The study area does not contain suitable habitat for this species. The Broad-billed Sandpiper would not be likely to occur within the study area.
	roosting habitat. Occasionally, individuals may be recorded in sewage farms or within shallow freshwater lagoons. Broad-billed Sandpipers roost on banks on sheltered sand, shell or shingle beaches (DEC Profile).	
	The species is an active forager, typically feeding by rapidly and repeatedly jabbing its bill into soft wet mud. Feeding also occurs while wading, often in water so deep that they have to submerge their heads and necks in order to probe the underlying mud. Their diet includes insects, crustaceans, molluscs, worms and seeds (DEC Profile).	
	Individuals are strongly migratory and only mildly gregarious when not breeding. Large flocks are seldom recorded and birds are often either encountered alone or feeding with other waders such as Red-necked Stints or Curlew Sandpipers (DEC Profile).	
	1 record in the locality since 1980 (NPWS Atlas).	

Species	Habits/Requirements/Records in the locality	Occurrence in the study area
Australasian Bittern <i>Botaurus poiciloptilus</i> V (TSC)	Widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west (DEC Profile). Common in the wetlands of the Murray-Darling basin (Lindsey 1992). Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (<i>Typha</i> spp) and spikerushes (<i>Eleoacharis</i> spp) (DEC Profile).	The study area does not contain suitable habitat for this species. The Australasian Bittern would not be likely to occur within the study area.
	Hides during the day amongst dense reeds or rushes, and feeds mainly at night on frogs, fish, yabbies, spiders, insects and snails. Feeding platforms may be constructed over deeper water from reeds trampled by the bird, and are often littered with prey remains (DEC Profile)	
	Breeding occurs in summer from October to January. Nests are built in secluded places in densely-vegetated wetlands on a platform of reeds (DEC Profile).	
	1 record in the locality since 1980 (NPWS Atlas).	
Black Bittern <i>Ixobrychus flavicollis</i> V (TSC)	A wide distribution across Australia. In NSW, the species is scattered along the east coast, with individuals rarely being recorded south of Sydney or inland. Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves (DEC Profile). Inhabits quiet pools and backwaters of meandering densely wooded coastal streams, always with dense vegetation (Lindsey 1992).	The study area does not appear to contain suitable habitat for this species. The Black Bittern would not be likely to occur within the study area.
	Feeds on frogs, reptiles, fish and invertebrates, including snails, dragonflies, shrimps and crayfish, with most feeding done at dusk and at night. During the day, roosts in trees or on the ground amongst dense reeds. When disturbed, freezes in a characteristic bittern posture (stretched tall, bill pointing up, so that shape and streaked pattern blend with upright stems of reeds), or will fly up to a branch or flush for cover where it will freeze again (NPWS Profile).	
	Generally solitary, but occurs in pairs during the breeding season, from December to March. Nests are built on a branch overhanging water and consist of a bed of sticks and reeds on a base of larger sticks.	
	The species has a characteristic booming call that is mainly heard during the breeding season, at day or night.	
	4 records in the locality since 1980 (NPWS Atlas).	

Species	Habits/Requirements/Records in the locality	Occurrence in the study area
Osprey <i>Pandion haliaetus</i> V (TSC)	The Osprey occurs around the entire coastline of Australia. The species is common around the northern coast, especially on rocky shorelines, islands and reefs, and uncommon to rare or absent from closely settled parts of south-eastern Australia (DEC Profile). It favours coastal areas, especially the mouths of large rivers, lagoons and lakes, and feeds on fish over clear, open water (DEC Profile). Nests high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea. Breeds from July to September in NSW (DEC Profile). 1 record in the locality since 1980 (NPWS Atlas).	The study area does not contain suitable habitat for this species. The Osprey would not be likely to occur within the study area.
Square-tailed Kite <i>Lophoictinia isura</i> V (TSC)	Has a widespread distribution across virtually all of mainland Australia, excepting waterless desert (NPWS 1999). Typically inhabits tropical and temperate coastal forests and woodlands, and also inland along timbered watercourses (NPWS 1999). Appears to migrate seasonally, south in summer, north in winter (Blakers <i>et al</i> 1984). In NSW, it is often associated with forests dominated by <i>Eucalyptus longifloria, Corymbia maculata</i> or <i>E elata, E smithii</i> . Also sighted within forests containing other eucalypts, <i>Angophora</i> spp and <i>Callitris</i> spp with a shrubby understorey and Box-Ironbark woodland (NPWS 1999). Feeds on passerine birds, especially honeyeaters, nestling birds, rabbits, reptiles and carrion (NPWS 1999; Lindsey 1992). Nests is a substantial structure of sticks, usually constructed in a fork or on a large	The study area contains potential foraging and nesting habitat for this species. The Square-tailed Kite may occur within the study area, potentially foraging and/or nesting in woodland areas along the main watercourses.
	horizontal limb of <i>Angophora</i> spp or <i>Eucalyptus</i> spp approx 15-20m above the ground, along or near watercourses (Lindsey 1992; NPWS 1999). 1 record in the locality since 1980 (NPWS Atlas).	

Species	Habits/Requirements/Records in the locality	Occurrence in the study area
Superb Fruit-dove <i>Ptilinopus superbus</i> V (TSC)	Inhabits rainforest and similar closed forests principally from NE Queensland to NE NSW. It is much less common further south, where it is largely confined to pockets of suitable habitat as far south as Moruya (DEC Profile).	The study area does not contain suitable habitat for this species. The Superb Fruit-dove would not be likely to occur within the study area.
	Forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees (DEC Profile).	
	Part of the population is migratory or nomadic. At least some of the population, particularly young birds, moves south through Sydney, especially in autumn.	
	Nests usually 5-30 metres up in rainforest and rainforest-edge tree and shrub species. Breeding takes place from September to January	
	4 records in the locality since 1980 (NPWS Atlas).	
Gang Gang Cockatoo <i>Callocephalon fimbriatum</i> V (TSC) E population (TSC)	Inhabits tall montane forests and woodlands in summer, particularly heavily timbered mature wet sclerophyll forests. Also occurs in sub-alpine Snow Gum woodland and occasionally in temperate rainforests. Undertakes nomadic and seasonal movements, and in winter tends to occur at lower altitudes in drier, more open eucalypt forest and woodland, particularly Box-Ironbark associations, and in dry forest in coastal areas	The study area contains potential habitat for this species, although the species may only be a winter migrant to the area. The Gang Gang Cockatoo may occur within the study area, foraging in the larger remnants of woodland.
	Feeds on green acacia seeds, eucalypt seeds, fruits and berries, including seeds, fruits and berries of introduced plant species (Lindsey 1992; Blakers <i>et al</i> 1984). Tends to exhaust one food supply before moving to another (Blakers <i>et al</i> 1984).	
	Nests in hollows in large old trees, usually close to water. Shows strong nest site fidelity. Breeding occurs mainly in tall mature wet sclerophyll forests with a dense understorey (NSW Scientific Committee).	
	46 records in the locality since 1980 (NPWS Atlas).	

Species	Habits/Requirements/Records in the locality	Occurrence in the study area
Glossy Black Cockatoo <i>Calyptorhynchus lathami</i> V (TSC)	 Inhabits drier eucalypt forest and woodland, characteristically on sites with low soil nutrient status (Blakers <i>et al</i> 1984; NPWS 1999; DEC 2004a). Prefers intact landscapes (NPWS 1999; DEC 2004a). Feeds almost exclusively on seeds of <i>Allocasuarina</i> spp - predominantly <i>A littoralis</i> and <i>A torulosa</i> (Lindsey 1992; Blakers <i>et al</i> 1984; NPWS 1999). Inland birds use a more diverse range of species, including <i>A cristata</i> (Blakers <i>et al</i> 1984). In the central west of NSW they also eat the seeds of Cypress Pine (DEC 2004a). Birds favour individual trees which produce seeds with high nutrient content, and may sample a few trees before selecting one to feed in (DEC 2004a). Lives in loose groups which occupy an area permanently (Blakers <i>et al</i> 1984) Nests in a large tree hollow (Lindsey 1992; NPWS 1999). 43 records in the locality since 1980 (NPWS Atlas). 	The study area contains potential foraging and nesting habitat for this species. The Glossy Black Cockatoo may occur within the study area, foraging and/or nesting in the larger and more intact woodland remnants along the main watercourse.
Swift Parrot <i>Lathamus discolor</i> E (TSC) E (EPBC)	 Breeds only in Tasmania, (Lindsey 1992, Blakers <i>et al</i> 1984; NSW Scientific Committee). Occurs in forests and woodlands of NSW from May to August (NSW Scientific Committee). Forages in the upper tree canopy for nectar, pollen and lerps (Blakers <i>et al</i> 1984). Lives in small flocks which appear in areas where eucalypts are flowering in profusion (Blakers <i>et al</i> 1984). Dependent on flowering resources across a wide range of habitats in its wintering grounds of NSW (NSW Scientific Committee). 20 records in the locality since 1980 (NPWS Atlas). 	The study area contains potential wintering habitat for this species. The Swift Parrot may occur within the study area on occasions, foraging in the larger remnants of woodland.

Species	Habits/Requirements/Records in the locality	Occurrence in the study area
Turquoise Parrot <i>Neophema pulchella</i> V (TSC)	Inhabits open eucalypt woodland and forest, especially with a grassy understorey and rocky outcrops (Lindsey 1992). Prefers the edge of eucalypt woodland adjoining clearings and also timbered ridges and creeklines in farmland (Blakers <i>et al</i> 1984; NPWS 1999). Birds may move from eucalypt woodland to pasture after the breeding season in some places (Blakers <i>et al</i> 1984).	The study area does not contain typical habitat for this species. However, due to loss and constriction of habitat in the region, it is possible that the Turquoise Parrot could occur
	Usual forests/woodlands have mixed assemblages of Cypress Pine <i>Callitris</i> sp and a variety of eucalypts including White Box, Yellow Box, Red Box, Blakely's Red Gum, Red Stringybark, Bimble Box or Mulga Ironbark (NPWS 1999).	shelter, and adjacent lightly timbered pasture land for foraging.
	Usually occurs in small family groups, forages on the ground for seeds (native and introduced) (Lindsey 1992; Blakers <i>et al</i> 1984). Requires a reliable drinking supply (NPWS 1999).	
	Nests may be located in hollows of small trees, in holes or stumps of dead eucalypts, fence posts or even logs lying on the ground (NPWS 1999).	
	Suffered a major decline in numbers early this century (NPWS 1999; Lindsey 1992), possibly due to competition with livestock during drought and/or trapping (Blakers <i>et al</i> 1984). Appears now to have regained much of its former range (Blakers <i>et al</i> 1984; Lindsey 1992).	
	2 records in the locality since 1980 (NPWS Atlas).	
Superb Parrot Polytelis swainsonii	The Superb Parrot predominantly inhabits woodland dominated by River Red Gum in the interior of NSW (Lindsey 1992; Blakers <i>et al</i> 1984). In the west of its range it is	The study area is outside of the usual range of this species, and does not contain likely habitat.
V (TSC) V (EPBC)	restricted to near watercourses due to the dry plains in between. In the east of its range it may range into lightly timbered areas between watercourses (Blakers <i>et al</i> 1984). Also occurs in box or mixed box woodlands, and White Cypress Pine woodlands (Lindsey 1992).	The Superb Parrot would not be likely to occur within the study area, other than as a rare vagrant or aviary escapee.
	Lives in small flocks foraging on the ground or in trees. Feeds on seeds, nectar, blossoms, fruits and insects, and also on spilled cereal grains (Lindsey 1992).	
	Nests in a deep tree hollow, high in a large River Red Gum, near water (Lindsey 1992).	
	3 records in the locality since 1980 (NPWS Atlas).	

Species	Habits/Requirements/Records in the locality	Occurrence in the study area
Powerful Owl <i>Ninox strenua</i> V (TSC)	Inhabits tall moist productive eucalypt forests of the eastern tableland edge, and the mosaic of wet and dry sclerophyll forests occurring on undulating, gentle terrain near the coast. Ideally with a tall shrub layer and/or abundant hollows supporting a high density of arboreal marsupials (DEC 2005a; Blakers <i>et al</i> 1984; Lindsey 1992). A nocturnal sedentary species which lives alone or in pairs, occupies permanent territories up to 1500 ha in size which contain several roost sites (Blakers <i>et al</i> 1984; Lindsey 1992; DEC 2005a).	The study area contains potential habitat for this species. The Powerful Owl is likely to utilise the site for foraging, and could potentially roost within the main vegetated gully within the study area.
	Roosts by day in dense foliage of mid-canopy trees (including <i>Allocasuarina</i> spp, rainforest species, Turpentine and eucalypts), often amongst groves of up to 2ha of similar-sized trees in the height range of 3-15m (DEC 2005a), in sheltered gullies, often along streams and wide creek flats between ridges covered with eucalypt forest (DEC 2005a; Blakers <i>et al</i> 1984).	
	Prefers to forage in moist unlogged forest in gully systems, but also forages in dry and regrowth forest. Preys on arboreal mammals (80% of diet), birds (18%) and insects and some terrestrial mammals (2%) (Blakers <i>et al</i> 1984). The Common Ringtail Possum is a primary prey species in lowland areas, and the Greater Glider in highland areas (DEC 2005a).	
	Nests in a large tree-hollow (greater than 45cm wide and 100cm deep), usually high (at least 20m from the ground) in a very large eucalypt (with a DBH of at least 80cm) (Lindsey 1992; DEC 2005a). Nesting sites are typically in unlogged unburnt gullies and lower slopes, within 100m of streams, and surrounding by trees or tall shrubs (DEC 2005a).	
	122 records in the locality since 1980 (NPWS Atlas).	

Species	Habits/Requirements/Records in the locality	Occurrence in the study area
Masked Owl <i>Tyto novaehollandiae</i> V (TSC)	Inhabits eucalypt forest and woodland from the coast to the western plains (DEC 2005a). It is most abundant within 300km of the coast (DEC 2005a; Blakers <i>et al</i> 1984). Optimal habitat includes a mosaic of sparse (grassy) and dense (shrubby) groundcover on gentle terrain (DEC 2005a).	The study area contains potential habitat for this species. The Masked Owl could utilise the site for foraging, and could potentially roost within the main vegetated gully
	A sedentary species which occupies permanent territories 500-1000 ha in size (Blakers <i>et al</i> 1984).	
	Nocturnal, roosts by day in hollows, in cover of dense vegetation in gullies or in caves (Blakers <i>et al</i> 1984; Lindsey 1992; DEC 2005a). Roosts at least 5m above the ground (DEC 2005a). Forages at forest edges or in partial clearing for small terrestrial mammals including rabbits, supplemented by some arboreal mammals, bats and birds (Blakers <i>et al</i> 1984; Lindsey 1992; DEC 2005a)).	
	Nests in tree hollows greater than 40cm wide and greater than 100cm deep. No relationship with distance to streams. Entrances are at least 3m above the ground in trees with DBH of at least 90cm. Generally faithful to traditional hollows (DEC 2005a).	
Sooty Owl <i>Tyto tenebricosa</i> V (TSC)	Inhabits tall moist eucalypt forests and rainforests of the escarpment and coastal areas along the southeastern coastline of Australia (DEC 2005a; Lindsey 1992). Sooty Owls are strongly associated with sheltered gullies, particularly those with a tall dense understorey (DEC 2005a)	The study area contains potential habitat for this species. The Sooty Owl could utilise the site for foraging, and could potentially roost within the main vegetated gully within the study area
	Nocturnal, feeds mainly on terrestrial mammals, to a lesser extent arboreal mammals and occasionally birds (Blakers <i>et al</i> 1984). A sedentary species which occupies permanent territories 200-800 ha in size (Blakers <i>et al</i> 1984). Generally roosts in dense foliage in rainforest gullies, caves, and crevices in cliffs, in the darkest and most secluded positions in the forest, usually less than 100m from streams (DEC 2005a).	
	Nests in a large high tree cavity greater than 40cm wide and 100cm deep, usually in a live tree but occasionally in stags, surrounded by canopy. Also nests in caves (DEC 2005a; Lindsey 1992). Nest sites are generally in unlogged unburnt gullies and lower slopes within 100m of streams. Faithful to traditional hollows (DEC 2005a).	
	4 records in the locality since 1980 (NPWS Atlas).	

Species	Habits/Requirements/Records in the locality	Occurrence in the study area
Barking Owl <i>Ninox connivens</i> V (TSC)	Lives in pairs in forests and woodlands typically dominated by eucalypts, often Red Gum species in temperate and semi-arid areas (Blakers <i>et al</i> 1984; NPWS 2003b). Has been recorded in remnant patches on farms and golf courses (NPWS 2003b).	The study area contains potential habitat for this species. The Barking Owl could utilise the site for foraging, and
	Usually roosts in or under dense foliage in large trees including rainforest species, <i>Casuarina</i> and <i>Allocasuarina</i> spp, eucalypts, <i>Angophora</i> spp or <i>Acacia</i> spp. Roost sites are often near watercourses or wetlands (NPWS 2003b).	within the study area.
	Forages from dusk to dawn (occasionally in daylight) for a variety of birds, mammals and insects (Blakers <i>et al</i> 1984; Lindsey 1992; NPWS 2003b). Most prey birds and mammals are hollow-dependent, prefers native arboreal mammals, but will also prey on rabbits (NPWS 2003b; Lindsey 1992).	
	Nests in a large open hollow, often vertical or sloping, in large eucalypts or paperbarks. Nest entrances are usually 2-35m above the ground, with a diameter of 20-46cm and depth of 20-300cm (NPWS 2003b). Nests are usually near watercourses or wetlands (NPWS 2003b).	
	Presumed to breed in traditional permanent territories ranging in size from 30ha up to 200ha in southern Qld (Blakers <i>et al</i> 1984; NSW Scientific Committee; NPWS 2003b). Forages over a larger area (Blakers <i>et al</i> 1984).	
	10 records in the locality since 1980 (NPWS Atlas).	
Brown Treecreeper	Inhabits a variety of drier vegetation types across eastern Australia, commonly eucalypt	The study area contains potential habitat for this species.
Victoriae V (TSC)	woodland, sometimes adjacent forest where there is dead timber (Lindsey 1992; Blakers <i>et al</i> 1984). Mainly occurs in the central-west of NSW. Prefers open woodland lacking a dense understorey (NSW Scientific Committee).	The Brown Treecreeper could occur within the study area, and in this case, could be wholly dependent upon the study area.
	A sedentary species that lives in small groups and occupies permanent home territories of about 5-10ha (Blakers <i>et al</i> 1984; Lindsey 1992).	
	Forages on tree trunks and amongst leaf litter for insects, spending approx half of its time on the ground (NSW Scientific Committee; Blakers <i>et al</i> 1984). Nests in a tree-hollow (Lindsey 1992).	
	1 record in the locality since 1980 (NPWS Atlas).	

Species	Habits/Requirements/Records in the locality	Occurrence in the study area
Hooded Robin <i>Melanodryas cucullata cucullata</i> V (TSC)	 Occurs throughout SE Australia, although mainly west of the Great Dividing Range, in a range of drier eucalypt woodlands, acacia shrublands and open forests, often in or near clearings (Blakers <i>et al</i> 1984; Lindsey 1992). Possibly seasonally migratory in some areas (Blakers <i>et al</i> 1984). Lives in small family groups within large home ranges (NSW Scientific Committee). Forages mainly on open ground by pouncing from a perch. Forages in areas with a mix of bare ground, ground cover and litter (Blakers <i>et al</i> 1984; NSW Scientific Committee). Nests in a cup of grass in a fork or small tree hollow usually within a few metres of the ground (Lindsey 1992). 1 record in the locality since 1980 (NPWS Atlas). 	The study area contains potential habitat for this species. The Hooded Robin could occur within the study area, and in this case, could be wholly dependent upon the study area.
Diamond Firetail <i>Stagonopleura guttata</i> V (TSC)	 Inhabits eucalypt woodland, forests and mallee where there is a grassy understorey, including agricultural land, mainly inland of the Great Dividing Range (Lindsey 1992; Blakers <i>et al</i> 1984; NSW Scientific Committee). Generally sedentary, lives in pairs or small groups, consolidating into flocks during winter (Lindsey 1992; Blakers <i>et al</i> 1984; NSW Scientific Committee). Forages on the ground for grass seeds, other plant material and insects (NSW Scientific Committee; Lindsey 1992; Blakers <i>et al</i> 1984). Nests in a bulky flask-shaped structure with a side entrance approached by a woven tunnel, usually placed in dense foliage in a bush or mistletoe clump, several metres from the ground (Lindsey 1992). 1 record in the locality since 1980 (NPWS Atlas). 	The study area is outside of the usual range of this species, but does contain some potential habitat. The Diamond Firetail could occur within the study area, and in this case, could be wholly dependent upon the study area.

Species	Habits/Requirements/Records in the locality	Occurrence in the study area
Black-chinned Honeyeater <i>Melithreptus gularis gularis</i> V (TSC)	 Inhabits mainly eucalypt forest and woodland, paperbark woodland, acacia scrub and spinifex, particularly where there are patches of flowering shrubs, across northern and eastern Australia (Lindsey 1992; Blakers <i>et al</i> 1984). In NSW, it occurs generally inland of the Great Dividing Range, mainly in eucalypt woodlands containing Box-Ironbark associations and River Red Gum (Blakers <i>et al</i> 1984; NSW Scientific Committee). A sedentary species which lives in small groups which maintain permanent, extensive territories. It is an active bird, forever on the move, and forages high in the tree canopy (Lindsey 1992). Feeds on nectar, honeydew and insects (Blakers <i>et al</i> 1984). Occurs mainly in larger remnants, reportedly affected by competition for food and by nest predation in smaller remnants (NSW Scientific Committee). 2 records in the locality since 1980 (NPWS Atlas). 	The study area is outside of the usual range of this species. However, the Black-chinned Honeyeater could occur in the study area on occasions, at times when the shrubs are flowering in profusion. This species would be more likely to utilise the larger woodland remnants along the major watercourses.
Regent Honeyeater <i>Xanthomyza phrygia</i> E (TSC) E (EPBC)	 Semi-nomadic, usually recorded on western slopes of the Great Dividing Range, in open eucalypt forest and woodland. Usually recorded in box-ironbark associations, also wet lowland coastal forests. Forages in the upper canopy of flowering eucalypts for nectar, fruits and insects (NPWS 1999; Lindsey 1992; Blakers <i>et al</i> 1984). Nectar taken from approximately 16 species of eucalypt (NPWS 1999). A noisy, aggressive and conspicuous species, gregarious when not breeding. Observed bathing in roadside puddles. Nests in the fork of a tree 1-20m above the ground (Lindsey 1992). Specific requirements in mature Ironbark and Red-Yellow Box communities (NPWS 2003). 1 record in the locality since 1980 (NPWS Atlas). 	The study area is outside of the usual range of this species. However, the Regent Honeyeater could occur in the study area on occasions, at times when the trees present are flowering in profusion. This species would be more likely to utilise the larger woodland remnants within the study area.

Species	Habits/Requirements/Records in the locality	Occurrence in the study area
REPTILES		
Rosenberg's Goanna <i>Varanus rosenbergi</i> V (TSC)	Occurs in heath, open forest and woodland, on the Sydney Sandstone in Wollemi National Park to the north-west of Sydney, in the Goulburn and ACT regions, and near Cooma in the south. There are records from the South West Slopes near Khancoban and Tooma River (DEC Profile). Individuals require large areas of habitat, and shelters in hollow logs, rock crevices and in burrows, which they may dig for themselves, or they may use other species' burrows, such as rabbit warrens (DEC Profile). Feeds on carrion, birds, eggs, reptiles and small mammals (DEC Profile). Nests in termite mounds, and these are a critical habitat component (DEC Profile). Is generally slow moving, and on the tablelands is likely only to be seen on the hottest days. Runs along the ground when pursued (as opposed to the Lace Monitor, which climbs trees) (DEC Profile).	The study area contains potential habitat for this species, but may not be large or connected enough to provide suitable habitat. Rosenberg's Goanna could theoretically occur within the study area.
AMPHIBIANS		
Red-crowned Toadlet <i>Pseudophryne australis</i> V (TSC)	Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones, within the Sydney Basin (Pokolbin in the north, the Nowra area to the south, and west to Mt Victoria in the Blue Mountains) (DEC Profile). Inhabits periodically wet drainage lines below sandstone ridges, that often have shale lenses or cappings. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter (DEC Profile). Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters (DEC Profile). 166 records in the locality since 1980 (NPWS Atlas).	The study area contains areas of sandstone escarpment, and watercourses that may provide habitat for this species. The Red-crowned Toadlet may occur within the study area.

Species	Habits/Requirements/Records in the locality	Occurrence in the study area
Green & Golden Bell Frog <i>Litoria aurea</i> E (TSC) E (EPBC)	Has been recorded in a wide variety of both ephemeral and permanent water bodies, including marshes, dams and stream-sides (NPWS 2005; NPWS 1999).	The study area contains numerous farm dams and a variety of watercourses.
	Apparently prefers unshaded water with plenty of emergent vegetation, particularly bullrushes <i>Typha</i> spp or spikerushes <i>Eleocharis</i> spp (NPWS 2005, NPWS 1999, Robinson 1998; Cogger 1996), with nearby grassy areas and diurnal sheltering sites such as rocks or tussocky vegetation (NPWS 1999).	It is possible that the Green & Golden Bell Grog could occur within the study area.
	Does not usually occur in conjunction with the predatory fish Plague Minnow <i>Gambusia holbrooki</i> (NPWS 1999).	
	Once abundant along the whole coast of NSW and extending up into tableland areas, most surviving populations are now coastal (NPWS 1999).	
	5 records in the locality since 1980 (NPWS Atlas).	
Giant Burrowing Frog Heleioporus australiacus	In the Sydney area there is a marked preference for sandstone ridgetop habitat and broader upland valleys. In these locations the frog is associated with small headwater	The study area contains areas of sandstone escarpment, and watercourses that may provide habitat for this species.
V (TSĆ) V (EPBC)	creeklines and along slow flowing to intermittent creeklines. The vegetation is typically woodland, open woodland and heath, and may be associated with 'hanging swamp' seepage lines and where small pools form from the collected water. They have also been observed occupying artificial ponded structures such as fire dams, gravel 'borrows', detention basins and box drains that have naturalised over time and are still surrounded by other undisturbed habitat (DEC Profile).	The Giant Burrowing Frog may occur within the study area.
	Limited observations on this species suggest an ability to range widely, frequently being observed on roads at considerable distance from suitable riparian breeding, or other moist habitat (DEC Profile).	
	17 records in the locality since 1980 (NPWS Atlas).	

Species	Habits/Requirements/Records in the locality	Occurrence in the study area
MAMMALS		
Southern Brown Bandicoot <i>Isoodon obesulus obesulus</i> E (TSC) E (EPBC)	Generally only found in heath or open forest with a heathy understorey, on sandy or friable soils. Has a patchy distribution, and in NSW is found in the south-east, east of the Great Dividing Range and south from the Hawkesbury River (DEC Profile). Southern Brown Bandicoots are largely crepuscular (DEC Profile), and prefer to stay close to cover (Braithwaite 1995). Males have a home range of approximately 5-20 hectares whilst females forage over smaller areas of about 2-3 hectares. Feeds on a variety of ground-dwelling invertebrates and the fruit-bodies of hypogeous (underground-fruiting) fungi. Their searches for food often create distinctive conical holes in the soil (DEC Profile; Braithwaite 1995). Relies on the high abundance of insects present in vegetation newly regenerating after fire, and therefore requires a mosaic of areas being burnt regularly (Braithwaite 1995). Nests in a shallow depression in the ground covered by leaf litter, grass or other plant material (DEC Profile; Braithwaite 1995). Nests may be located under Grass trees <i>Xanthorrhoea sp.</i> , blackberry bushes and other shrubs, or in rabbit burrows. The upper surface of the nest may be mixed with earth to waterproof the inside of the nest (DEC Profile).	The study area provides potential habitat for this species. The Southern Brown Bandicoot could occur within the study area.
Spotted-tailed Quoll <i>Dasyurus maculatus</i> V (TSC) E (EPBC)	 Variety of habitats including sclerophyll forest and woodlands, coastal heathlands and rainforest (NPWS 1999; Edgar & Belcher 1995). Occasionally sighted in open country, grazing lands, rocky outcrops and other treeless areas (NPWS 1999). Usually nocturnal, partly arboreal (Edgar & Belcher 1995; NPWS 1999). Apparently defines its territory with 'latrines' (Edgar & Belcher 1995). Requires suitable den sites (<i>eg</i> hollow logs, tree-hollows, rock crevices or caves), an abundance of food (small terrestrial birds and mammals, up to the size of small wallabies), and relatively large areas of intact vegetation for foraging (NPWS 1999; Edgar & Belcher 1995). Uses numerous den sites within its home range, which is estimated to be between 800ha and 20km² (NPWS 1999). A highly mobile species recorded travelling several kilometres overnight (NPWS 1999). 11 records in the locality since 1980 (NPWS Atlas). 	The main vegetated gully of the study area contains potential habitat for this species, but may not be large or connected enough to be of value. It would be expected that any Spotted-tailed Quolls resident or regularly occurring within this area would have been sighted by local residents and farmers on lands surrounding the gully, and reported. The Spotted-tailed Quoll could theoretically occur within the study area.

Species	Habits/Requirements/Records in the locality	Occurrence in the study area
Koala <i>Phascolarctos cinereus</i> V (TSC)	In NSW the Koala occurs mainly on the north coast and central coast, extending west of the Great Dividing Range along inland rivers (NPWS 1999). Koalas inhabit eucalypt forest and woodland, and are influenced in distribution by size and species of tree present, soil nutrients, climate, rainfall, and size and disturbance history of habitat patches (NPWS 1999). Although solitary in appearance, Koalas live in complex groups with individuals having overlapping territories (NPWS 1999). Koalas are relatively sedentary, and spend the majority of their time resting in the forks of trees (NPWS 1999; Martin & Handasyde 1995). Koalas are generally most active at dusk (NPWS 1999). Koalas feed almost exclusively on the leaves of a wide range of eucalypts, although within any one area Koalas will prefer only a small number of species (NPWS 1999; Martin & Handasyde 1995). 3 records in the locality since 1980 (NPWS Atlas).	The main vegetated gully of the study area contains potential habitat for this species, but may not be large or connected enough to be of value. It would be expected that any Koalas resident or regularly occurring within this area would have been sighted by local residents and farmers on lands surrounding the gully, and reported. The Koala could theoretically occur within the study area.
Eastern Pygmy-possum <i>Cercartetus nanus</i> V (TSC)	 Inhabits rainforest, sclerophyll forest, and tree heath in coastal areas and at higher elevations in NSW (Strahan 1995; NSW Scientific Committee). The Eastern Pygmy-possum is an agile climber, and feeds mainly on pollen and nectar from banksias, eucalypts and understorey plants, and also insects (NSW Scientific Committee; Strahan 1995). Trapping is most successful in areas of flowering banksias (NSW Scientific Committee). A nocturnal species which shelters and nests in very small spaces during the day, in tree hollows, disused bird nests, shredded bark in the forks of tea-trees <i>etc</i> (Strahan 1995). 7 records in the locality since 1980 (NPWS Atlas). 	The study area provides potential habitat for this species. The Eastern Pygmy-possum could occur within the study area.
Yellow-bellied Glider <i>Petaurus australis</i> V (TSC)	Inhabits tall mature forests in areas of high rainfall along the east coast of Australia (Menkhorst & Knight 2001). Prefers areas where year-round food resources are available from a mixture of eucalypt species (NPWS 1999). Plant and Insect exudates make up the bulk of its diet (Russell 1995). Makes characteristic triangular or V-shaped incisions in tree trunks to obtain sap (NPWS 1999; Menkhorst & Knight 2001). Nocturnal, it rests by day in a den in a hollow branch. Usually occurs in very low densities. Its home range is in the order of 30-65ha (NPWS 1999; Russell 1995). 31 records in the locality since 1980 (NPWS Atlas).	The main vegetated gully of the study area contains potential habitat for this species, but may not be large or connected enough to be of value. The Yellow-bellied Glider could theoretically occur within the study area.

Species	Habits/Requirements/Records in the locality	Occurrence in the study area
Grey-headed Flying-fox <i>Pteropus poliocephalus</i> V (TSC) V (EPBC)	Occurs in rainforest, tall sclerophyll forests and woodlands, heaths and swamps along the east coast of Australia from Bundaberg to Melbourne, generally to the east of the Great Dividing Range (NPWS 2001). Also recorded in urban gardens and cultivated fruit crops (NPWS 2001). Forages on pollen, nectar and fruits of native trees (in particular <i>Melaleuca, Eucalyptus</i> and <i>Banksia</i>), and is an important pollinator and seed-disperser of native trees (NPWS 2001). Partly migratory in response to food availability. Roosts in large congregations or 'camps' during the day (NPWS 2001; Strahan 1995), which are generally located within 20km of a regular food source, in stands of riparian rainforest paperbark or casuarina forest (NPWS 2001). Camp site fidelity is high. 92 records in the locality since 1980 (NPWS Atlas).	The study area contains potential habitat for this species, although is not known to contain a 'camp' or primary roost site. The Grey-headed Flying Fox would be likely to forage within the study area on occasions.
Large-eared Pied Bat <i>Chalinolobus dwyeri</i> V (TSC) V (EPBC)	Inhabits dry sclerophyll forests and woodlands to the east and west of the Great Dividing Range, from Queensland to Bungonia. Has also been recorded occasionally in sub-alpine woodlands above 1500m, and at the edge of rainforest and moist eucalypt forest (Hoye & Dwyer 1995). First recorded in a dis-used mine tunnel near Copeton, NSW in early 1960's. Probably forages for insects below the forest canopy (Hoye & Dwyer 1995). Roosts by day in tree-hollows, caves and dis-used mine-tunnels (DEC NRMAS-7 2004; Hoye & Dwyer 1995). In caves it often selects positions close to the entrance in the 'twilight zone'. Appears to hibernate during winter (Hoye & Dwyer 1995). 2 records in the locality since 1980 (NPWS Atlas).	The study area contains potential habitat for this species, although is not known to contain caves or important roost sites. The Large-eared Pied Bat could occur within the study area.
Eastern False Pipistrelle <i>Falsistrellus tasmaniensis</i> V (TSC)	 Thought to forage above the forest canopy, in open woodland or over water. Occurs along the Great Dividing Range of SE Australia, and east to the coast. Is more common at cooler elevations (Phillips 1995). Has been recorded roosting in tree hollows (Phillips 1995). Occasionally found in caves (DEC NRMAS-7 2004). Apparently hibernates during winter, and may sexually segregate for part of the year (Phillips 1995). 5 records in the locality since 1980 (NPWS Atlas). 	The study area contains potential habitat for this species. The Eastern False Pipistrelle could occur within the study area.

Species	Habits/Requirements/Records in the locality	Occurrence in the study area
Large-footed Myotis <i>Myotis adversus</i> V (TSC)	Occurs in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers (DEC Profile).	The study area contains potential habitat for this species. The Large-footed Myotis could occur within the study area.
	Generally roosts in groups of 10 - 15 close to water in caves, mine shafts, hollow- bearing trees, storm water channels, buildings, under bridges and in dense foliage (DEC Profile). Colonies never occur far from bodies of water, ranging from rainforest streams to large lakes and reservoirs (Richards 1995b).	
	Forage over streams and pools catching insects and small fish by raking their feet across the water surface (DEC Profile; Richards 1995b).	
	Males roost alone and defend territories when not breeding. Torpid in winter in roosts separate to maternity sites (Richards 1995b).	
	9 records in the locality since 1980 (NPWS Atlas).	
Eastern Freetail Bat <i>Mormopterus norfolkensis</i> V (TSC)	Usually recorded in dry eucalypt forest and woodland east of the Great Dividing Range, but has also been recorded in rainforest and wet sclerophyll forest (Allison & Hoye 1995).	The study area contains potential habitat for this species. The Eastern Freetail Bat could occur within the study area.
	Apparently solitary. Predominantly tree-dwelling, but has been recorded roosting in the roof of a hut (Allison & Hoye 1995).	
	19 records in the locality since 1980 (NPWS Atlas).	
Yellow-bellied Sheath-tail Bat	Occurs throughout eastern and northern Australia, foraging above the canopy in eucalypt forests, and closer to the ground in mallee or open country (Richards 1995a).	The study area contains potential habitat for this species.
<i>Saccolaimus flaviventris</i> V (TSC)	Usually solitary, occasionally occurring in colonies of less than 10 individuals (Richards 1995a).	study area.
	Roosts in tree hollows (Richards 1995a), occasionally in caves (DEC NRMAS-7 2004), and has been found in the abandoned nests of Sugar Gliders (Richards 1995a). Possibly migratory in southern Australia (Richards 1995a).	
	3 records in the locality since 1980 (NPWS Atlas).	

Species	Habits/Requirements/Records in the locality	Occurrence in the study area
Greater Broad-nosed Bat <i>Scoteanax rueppellii</i> V (TSC)	Inhabits gullies and river systems draining the Great Dividing Range, occurs in a variety of woodland and forest habitats, from open eucalypt woodland to rainforest. Open woodlands suit its direct flight pattern, in denser rainforests it favours creekline corridors for foraging (Hoye & Richards 1995).	The study area contains potential habitat for this species. The Greater Broad-nosed Bat could occur within the study area.
	Usually roosts in tree-hollows, but has been found in old buildings (Hoye & Richards 1995).	
	7 records in the locality since 1980 (NPWS Atlas).	
INVERTEBRATES		
Land Snail Meridolum corneovirens	Appears to be restricted to the Cumberland Plain and Castlereagh Woodlands of Western Sydney, and also along the fringes of River-flat Forest (NPWS 1999).	The study area does not contain suitable habitat for this species.
E (ISC)	Typically occurs in moist loose soil under logs and other debris, amongst leaf and bark accumulations around the base of trees, and sometimes under grass clumps (NPWS 1999).	The land snail <i>Meridolum corneovirens</i> is not likely to occur within the study area.
	Apparently burrows deeply into soil during dry conditions (R Hayes pers obs).	
	36 records in the locality since 1980 (NPWS Atlas).	

PROPOSED REZONING OF LAND AT SOUTH DURAL

FLORA AND FAUNA INVESTIGATION

APPENDIX 2

Inventory of flora species recorded

August 2008

APPENDIX 2 Flora species recorded in the study area at South Dural during recent field surveys.

Sydney Turpentine Ironbark Forest

Canopy:

Eucalyptus pilularis Blackbutt *Angophora costata* Sydney Red Gum *Syncarpia glomulifera* ssp *glomulifera* Turpentine *Eucalyptus paniculata* Grey Ironbark *Eucalyptus punctata* Grey Gum

Sub-canopy:

Acacia decurrens Black Wattle Acacia parramattensis Sydney Green Wattle Pittosporum undulatum Sweet Pittosporum

Understorey:

Hibbertia aspera Rough Guinea Flower Leucopogon juniperinus Prickly Beard-heath Ozothamnus diosmifolius Rice Flower Persoonia linearis Narrow-leaved Geebung Platysace lanceolata Shrubby Platysace Polyscias sambucifolia Elderberry Panax Zieria smithii Sandfly Zieria *Lantana camara Lantana

Groundcover:

Cheilanthes sieberi ssp sieberi Mulga Fern Imperata cylindrica Blady Grass Lomandra obliqua Microlaena stipoides var stipoides Weeping Grass Parsonsia straminea Common Silkpod Phyllanthus hirtellus Pratia purpurascens Whiteroot Xanthosia pilosa Woolly Xanthosia

Blackbutt Gully Forest

Canopy:

Eucalyptus pilularis Blackbutt Angophora costata Sydney Red Gum Syncarpia glomulifera ssp glomulifera Turpentine Eucalyptus saligna Sydney Blue Gum Corymbia gummifera Red Bloodwood Corymbia eximia Yellow Bloodwood *Pinus radiata Radiata Pine

Sub-canopy:

Allocasuarina littoralis Black She-oak Ceratopetalum gummiferum Christmas Bush Pittosporum undulatum Sweet Pittosporum

Understorey:

Acacia linifolia White Wattle Leptospermum spp

Pittosporum undulatum Sweet Pittosporum Polyscias sambucifolia Elderberry Panax *Lantana camara Lantana *Ochna serrulata Mickey Mouse Plant *Ligustrum sinense Small Leaved Privet *Ligustrum lucidum Large Leaved Privet Solanum mauritianum Wild Tobacco Pittosporum undulatum Sweet Pittosporum

Groundcover:

Adiantum aethiopicum Common Maidenhair Calochlaena dubia Soft Bracken Eustrephus latifolius Wombat Berry Lomandra longifolia Spiny-headed Mat-rush Oplimenus spp Pteridium esculentum Common Bracken *Tradescantia fluminensis Wandering Jew

Blue Gum High Forest

Canopy:

Eucalyptus saligna Blue Gum Eucalyptus pilularis Blackbutt Syncarpia glomulifera ssp glomulifera Turpentine Eucalyptus acmenoides White Mahogany Eucalyptus paniculata Grey Ironbark Eucalyptus punctata Grey Gum

Sub-canopy:

Pittosporum undulatum Sweet Pittosporum

Understorey:

Bursaria spinosa Blackthorn

Groundcover:

Microlaena stipoides var *stipoides* Weeping Grass *Geranium homeanum* Native Geranium

PROPOSED REZONING OF LAND AT SOUTH DURAL

FLORA AND FAUNA INVESTIGATION

APPENDIX 3

Fauna species from the locality

August 2008

KEY	
Status	
*	Introduced species
М	Migratory species listed under the Commonwealth EPBC Act
E (TSC)	Endangered species listed on the NSW TSC Act
V (TSC)	Vulnerable species listed on the NSW TSC Act
E (EPBC)	Endangered species listed on the Commonwealth EPBC Act
V (EPBC)	Vulnerable species listed on the Commonwealth EPBC Act
Record	
А	Species recorded opportunistically within the study area during recent surveys
В	Species listed as occurring within 5km of the study area (NPWS Atlas)

Status	COMMON NAME	SCIENTIFIC NAME	Α	В
	BIRDS			
	Phasianidae Brown Quail	Coturnix ypsilophora		\checkmark
M M * M M	Anatidae Pacific Black Duck Chestnut Teal Grey Teal Mallard Musk Duck Australian Wood Duck	Anas superciliosa Anas castanea Anas gracilis Anas platythynchos Biziura lobata Chenonetta jubata		$ \begin{array}{c} \checkmark \\ \checkmark $
	Podicepedidae Australasian Grebe	Tachybaptus novaehollandiae		\checkmark
*	Columbidae Emerald Dove White-headed Pigeon Rock Dove Bar-shouldered Dove Peaceful Dove Wonga Pigeon Topknot Pigeon Brown Cuckoo-dove Crested Pigeon Brush Bronzewing Common Bronzewing Superb Fruit-dove Spotted Turtledove	Chalcophaps indica Columba leucomela Columba livia Geopelia humeralis Geopelia placida Leucosarcia melanoleuca Lopholaimus antarcticus Macropygia amboinensis Ocyphaps lophotes Phaps elegans Phaps chalcoptera Ptilinopus superbus Streptopelia chinensis		$\checkmark \checkmark \checkmark$
	Podargidae Tawny Frogmouth	Podargus strigoides		\checkmark
	Aegothelidae Australian Owlet-nightjar	Aegotheles cristatus		✓
М	Apodidae Fork-tailed Swift White-throated Needletail	Apus pacificus Hirundapus caudacutus		✓ ✓
	Phalacrocoracidae Great Cormorant Little Pied Cormorant Little Black Cormorant Pied Cormorant	Phalacrocorax carbo Phalacrocorax melanoleucos Phalacrocorax sulcirostris Phalacrocorax varius		\checkmark

Status	COMMON NAME	SCIENTIFIC NAME	Α	В
	Pelecanidae Australian Pelican	Pelecanus conspicillatus		\checkmark
V (TSC)	Ardeidae Great Egret Cattle Egret White-necked Heron White-faced Heron Black Bittern	Ardea alba Ardea ibis Ardea pacifica Egretta novaehollandiae Ixobrychus flavicollis		$\begin{array}{c} \checkmark \\ \checkmark \\ \checkmark \\ \checkmark \\ \checkmark \\ \checkmark \end{array}$
	Threskiornithidae Royal Spoonbill Australian White Ibis Straw-necked Ibis	Platalea regia Threskiornis molucca Threskiornis spinicollis		✓ ✓ ✓
M M M M M M M V (TSC) M M	Accipitridae Collared Sparrowhawk Brown Goshawk Grey Goshawk Wedge-tailed Eagle Pacific Baza Black-shouldered Kite White-bellied Sea-eagle Whistling Kite Square-tailed Kite Little Eagle Black Kite	Accipiter cirrocephalus Accipiter fasciatus Accipiter novaehollandiae Aquila audax Aviceda subcristata Elanus axillaris Haliaeetus leucogaster Haliastur sphenurus Lophoictinia isura Hieraaetus morphnoides Milvus migrans		$ \begin{array}{c} \checkmark \\ \checkmark $
M M M V (TSC)	Falconidae Nankeen Kestrel Australian Hobby Peregrine Falcon Brown Falcon Grey Falcon	Falco cenchroides Falco longipennis Falco peregrinus Falco berigora Falco hypoleucos		✓ ✓ ✓ ✓
	Rallidae Dusky Moorhen Purple Swamphen Spotless Crake	Gallinula tenebrosa Porphyrio porphyrio Porzana tabuensis		✓ ✓ ✓
м	Charadriidae Masked Lapwing	Vanellus miles		~
	Turnicidae Painted Button-quail	Turnix varius		\checkmark
	Laridae Silver Gull Crested Tern	Larus novaehollandiae Thalasseus bergii		√ √
V (TSC) V (TSC) E(TSC)	Cacatuidae Galah Sulphur-crested Cockatoo Little Corella Long-billed Corella Glossy Black Cockatoo Gang Gang Cockatoo Gang Gang Cockatoo population in the Hornsby & Ku-ring-gai LGA's Yellow-tailed Black Cockatoo	Cacatua roseicapilla Cacatua galerita Cacatua sanguinea Cacatua tenuirostris Calyptorhynchus lathami Callocephalon fimbriatum Callocephalon fimbriatum Calyptorhynchus funereus		$\begin{array}{c} \checkmark \\ \checkmark $
E (TSC)	Psittacidae Australian King Parrot Australian Ringneck [Mallee Ringneck] Musk Lorikeet Little Lorikeet Swift Parrot	Alisterus scapularis Barnardius zonarius Barnardius zonarius barnardi Glossopsitta concinna Glossopsitta pusilla Lathamus discolor		$\begin{array}{c} \checkmark \\ \checkmark \end{array}$

Status	COMMON NAME	SCIENTIFIC NAME	Α	В
V (TSC)	Psittacidae cont Blue Bonnet Eastern Rosella Crimson Rosella Superb Parrot Red-rumped Parrot Scaly-breasted Lorikeet Rainbow Lorikeet	Northiella haematogaster Platycercus eximius Platycercus elegans Polytelis swainsonii Psephotus haematonotus Trichglossus chlorolepidotus Trichoglossus haematodus		$ \\ \checkmark $
	Cuculidae Fan-tailed Cuckoo Brush Cuckoo Horsfield's Bronze-cuckoo Shining Bronze-Cuckoo Black-eared Cuckoo Pallid Cuckoo Oriental Cuckoo Pacific Koel Channel-billed Cuckoo	Cacomantis flabelliformis Cacomantis variolosus Chalcites basalis Chalcites lucidus Chalcites osculans Cuculus pallidus Cuculus saturatus Eudynamys orientalis Scythrops novaehollandiae		$\checkmark \checkmark \checkmark \checkmark \checkmark \checkmark \checkmark \checkmark \checkmark$
V (TSC) V (TSC)	Strigidae Southern Boobook Barking Owl Powerful Owl	Ninox boobook Ninox connivens Ninox strenua		✓ ✓ ✓
V (TSC) V (TSC)	Tytonidae Masked Owl Sooty Owl	Tyto novaehollandiae Tyto tenebricosa		✓ ✓
	Alcedinidae Azure Kingfisher Laughing Kookaburra Sacred Kingfisher	Alcedo azurea Dacelo novaeguineae Todiramphus sanctus		✓ ✓ ✓
	Coraciidae Dollarbird	Eurystomus orientalis		\checkmark
	Menuridae Superb Lyrebird	Menura novaehollandiae		✓
	Climacteridae White-throated Treecreeper	Cormobates leucophaeus		✓
	Ptilonorhynchidae Satin Bowerbird	Ptilonorhynchus violaceus		✓
	Maluridae Superb Fairy-wren Variegated Fairy-wren Southern Emu-wren	Malurus cyaneus Malurus lamberti Stipiturus malachurus		\checkmark
	Acanthizidae Brown Thornbill Striated Thornbill Yellow-rumped Thornbill Yellow Thornbill Buff-rumped Thornbill Brown Gerygone White-throated Gerygone Rockwarbler White-browed Scrub-wren Weebill	Acanthiza pusilla Acanthiza lineata Acanthiza chrysorrhoa Acanthiza nana Acanthiza reguloides Gerygone mouki Gerygone olivacea Origma solitaria Sericornis frontalis Smicrornis brevirostris		$ \\ \checkmark $
	Pardalotidae Spotted Pardalote Striated Pardalote	Pardalotus punctatus Pardalotus striatus		√ √

Status	COMMON NAME	SCIENTIFIC NAME	Α	В
V (TSC)	Meliphagidae Eastern Spinebill Red Wattlebird Little Wattlebird Yellow-faced Honeyeater Fuscous Honeyeater White-eared Honeyeater White-lolumed Honeyeater White-plumed Honeyeater Noisy Miner Bell Miner Lewin's Honeyeater Black-chinned Honeyeater White-naped Honeyeater Scarlet Honeyeater Noisy Friarbird Little Friarbird White-cheeked Honeyeater New Holland Honeyeater Begent Honeyeater	Acanthorhynchus tenuirostris Anthochaera carunculata Anthochaera chrysoptera Lichenostomus chrysops Lichenostomus fuscus Lichenostomus leucotis Lichenostomus penicillatus Manorina melanocephala Manorina melanocephala Manorina melanophrys Meliphaga lewinii Melithreptus gularis gularis Melithreptus lunatus Myzomela sanguinolenta Philemon corniculatus Philemon citreogularis Phylidonyris nigra Phylidonyris novaehollandiae Xanthomyza phygia		$ \begin{array}{c} \checkmark \\ \checkmark $
L (130)	Psophodidae Eastern Whipbird	Psophodes olivaceus		√
	Neosittidae Varied Sittella	Daphoenositta chrysoptera		\checkmark
	Campephagidae Cicadabird White-winged Triller White-bellied Cuckoo-shrike Black-faced Cuckoo-shrike	Coracina tenuirostris Lalage tricolor Coracina papuensis Coracina novaehollandiae		\checkmark
	Pachycephalidae Grey Shrike-thrush Eastern Shrike-tit Golden Whistler Rufous Whistler	Colluricincla harmonica Falcunculus frontatus Pachcephala pectoralis Pachycephala rufiventris		\checkmark
	Oriolidae Olive-backed Oriole Australasian Figbird	Oriolus sagittatus Sphecotheres vieilloti		\checkmark
	Artamidae Dusky Woodswallow Masked Woodswallow White-browed Woodswallow Pied Butcherbird Grey Butcherbird Australian Magpie Grey Currawong Pied Currawong	Artamus cyanopterus Artamus personatus Artamus superciliosus Cracticus nigrogularis Cracticus torquatus Gymnorhina tibicen Strepera versicolor Strepera graculina		$\begin{array}{c} \checkmark \\ \checkmark $
	Dicruridae Spangled Drongo	Dicrurus bracteatus		\checkmark
М	Rhipiduridae Grey Fantail Rufous Fantail Willie Wagtail	Rhipidura albiscapa Rhipidura rufifrons Rhipidura leucophrys		\checkmark \checkmark
	Corvidae Australian Raven	Corvus coronoides		\checkmark
М	Monarchidae Magpie-lark Black-faced Monarch Satin Flycatcher	Grallina cyanoleuca Monarcha melanopsis Myiagra cyanoleuca		\checkmark

Status	COMMON NAME	SCIENTIFIC NAME	Α	В
Μ	Monarchidae cont Restless Flycatcher Leaden Flycatcher Spectacled Monarch	Myiagra inquieta Myiagra rubecula Symposiarchus trivirgatus		✓ ✓ ✓
	Corcoracidae White-winged Chough	Corcorax melanoramphos		\checkmark
V (TSC)	Petroicidae Eastern Yellow Robin Scarlet Robin Red-capped Robin Flame Robin Pink Robin Rose Robin	Eopsaltria australis Petroica boodang Petroica goodenovii Petroica phoenicea Petroica rodinogaster Petroica rosea		\checkmark
М	Cisticolidae Golden-headed Cisticola	Cisticola exilis		~
	Timaliidae Silvereye	Zosterops lateralis		~
	Hirundinidae White-backed Swallow Welcome Swallow	Cheramoeca leucosterna Hirundo neoxena		\checkmark
*	Pycnonotidae Red-whiskered Bulbul	Pycnonotus jocosus		\checkmark
*	Turdidae Bassian Thrush Unidentified ground thrush Eurasian Blackbird/Common Blackbird	<i>Zoothera</i> lunulata <i>Zoothera</i> sp <i>Turdus merula</i>		\checkmark \checkmark
* *	Sturnidae Common Starling Common Myna	Sturnus vulgaris Acridotheres tristis		\checkmark
	Nectariniidae Mistletoebird	Dicaeum hirundinaceum		\checkmark
V (TSC)	Estrildidae Chestnut-breasted Mannikin Nutmeg Mannikin Red-browed Finch Double-barred Finch Zebra Finch Diamond Firetail	Lonchura castaneothorax Lonchura punctulata Neochmia temporalis Taeniopygia bichenovii Taeniopygia guttata Stagonopleura guttata		$ \begin{array}{c} \checkmark \\ \checkmark $
*	Passeridae House Sparrow	Passer domesticus		\checkmark
	Motacillidae Australian Pipit	Anthus australis		\checkmark
*	Fringillidae European Goldfinch	Carduelis carduelis		\checkmark
	REPTILES			
	Chelidae Eastern Snake-necked Turtle	Chelodina longicollis		\checkmark
	Varanidae Lace Monitor	Varanus varius		\checkmark
	Gekkonidae Eastern Stone Gecko/Wood Gecko	Diplodactylus vittatus		\checkmark

Status	COMMON NAME	SCIENTIFIC NAME	Α	В
	Gekkonidae cont Lesueur's Velvet Gecko Broad-tailed Gecko Thick-tailed Gecko	Oedura lesueuri Phyllurus platurus Underwoodisaurus		√ √ √
	Agamidae Eastern Bearded Dragon Eastern Water Dragon	Pogona barbata Physignathus lesueurii		* *
	Pygopodidae Common Scaly-foot	Pygopus lepidopodus		~
	Scincidae Cream-striped Shinning-skink Robust Ctenotus Copper-tailed Ctenotus/Skink Cunningham's Spiny-tailed Skink Eastern Water Skink Barred-sided Forest Skink Dark-flecked Garden Sun-skink Pale-flecked Garden Sun-skink Unidentified grass skink Yellow-bellied Three-toed Skink Weasel Sunskink Shingle-back	Cryptoblepharus virgatus Ctenotus robustus Ctenotus taeniolatus Egernia cunninghamii Eulamprus quoyii Eulamprus tenuis Lampropholis delicata Lampropholis guichenoti Lampropholis sp. Saiphos equalis Saproscincus mustelina Tiliaua rugosa		* * * * * * * * * * *
	Eastern Blue-tongue Lizard	Tiliqua scincoides		~
	Diamond Python	Morelia spilota spilota		~
	Typhlopidae Blackish Blind Snake	Ramphotyphlops nigrescens		~
	Elapidae Golden-crowned Snake Yellow-faced Whip Snake Red-naped Snake Eastern Brown Snake Red-bellied Black Snake Bandy-bandy	Cacophis squamulosus Demansia psammophis Furina diadema Pseudonaja textilis Pseudechis porphyriacus Vermicella annulata		
	AMPHIBIANS			
*	Bufonidae Cane Toad	Bufo marinus		~
V (TSC)	Myobatrachidae Common Eastern Froglet Giant Burrowing Frog Bullfrog/Eastern Banjo Frog Ornate Burrowing Frog Striped Marsh Frog/Brown-striped Frog	Crinia signifera Heleioporus australiacus Limnodynastes dumerilii Limnodynastes ornatus Limnodynastes peronii		$\begin{array}{c} \checkmark \\ \checkmark \\ \checkmark \\ \checkmark \\ \checkmark \\ \checkmark \end{array}$
	Spotted Marsh Frog/Spotted Grass Frog	Limnodynastes tasmaniensis		~
V (TSC)	Red-crowned Toadlet Smooth Toadlet	Pseudophryne australis Uperoleia laevigata		✓ ✓
E (TSC)	Hylidae Green & Golden Bell Frog Kefersteins Tree Frog/Bleating Tree Frog	Litoria aurea Litoria dentata		√ √
	Eastern Dwarf Tree Frog Jervis Bay Tree Frog Broad-palmed Frog Peron's Tree Frog	Litoria fallax Litoria jervisiensis Litoria latopalmata Litoria peronii		\checkmark

Status	COMMON NAME	SCIENTIFIC NAME	Α	В
	Hylidae cont Green Stream Frog/Leaf-green Tree	Litoria phyllochroa		\checkmark
	Verreaux's Tree Frog	Litoria verreauxii		\checkmark
	MAMMALS			
	Tachyglossidae Short-beaked Echidna	Tachyglossus aculeatus		~
V (TSC)	Phascolarctidae Koala	Phascolarctos cinereus		\checkmark
V (TSC)	Dasyuridae Brown Antechinus Dusky Antechinus Spotted-tailed Quoll Common Dunnart	Antechinus stuartii Antechinus swainsonii Dasyurus maculatus Sminthopsis murina		$\checkmark \\ \checkmark \\ \checkmark \\ \checkmark \\ \checkmark$
	Peramelidae Long-nosed Bandicoot Unidentified bandicoot	Perameles nasuta Isoodon /Perameles sp.		✓ ✓
	Acrobatidae Feathertail Glider	Acrobates pygmaeus		\checkmark
	Petauridae Sugar Glider	Petaurus breviceps		\checkmark
	Pseudocheiridae Common Ringtail Possum Greater Glider	Pseudocheirus peregrinus Petauroides volans		✓ ✓
	Phalangeridae Short-eared Possum Brushtail Possum Common Brushtail Possum	Trichosurus caninus Trichosurus sp Trichosurus vulpecula		✓ ✓ ✓
	Macropodidae Unidentified macropod Eastern Grey Kangaroo Red-necked Wallaby Swamp Wallaby	Macropod sp. Macropus giganteus Macropus rufogriseus Wallabia bicolor		\checkmark
	Muridae Bush Rat	Rattus fuscipes		\checkmark
V (TSC)	Pteropodidae Grey-headed Flying-fox Little Red Flying-fox Flying-fox	Pteropus poliocephalus Pteropus scapulatus Pteropus sp.		✓ ✓ ✓
V (TSC)	Emballonuridae Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris		\checkmark
V (TSC)	Molossidae Little Northern Freetail-bat Eastern Freetail-bat Undescribed Mastiff-bat Undescribed Freetail-bat White-striped Freetail-bat	<i>Mormopterus loriae Mormopterus norfolkensis Mormopterus norfolkensis/</i> sp 1 <i>Mormopterus</i> sp 2 <i>Tadarida australis</i>		\checkmark
V (TSC) V (TSC) V (TSC)	Vespertilionidae Large-eared Pied Bat Gould's Wattled Bat Chocolate Wattled Bat Eastern False Pipistrelle Eastern Bent-wing Bat	Chalinolobus dwyeri Chalinolobus gouldii Chalinolobus morio Falsistrellus tasmaniensis Miniopterus schreibersii oceanis		\checkmark

Status	COMMON NAME	SCIENTIFIC NAME	Α	В
V (TSC) V (TSC)	Vespertilionidae cont Large-footed Myotis Lesser Long-eared Bat Gould's Long-eared Bat Unidentified Long-eared Bat Greater Broad-nosed Bat Eastern Broad-nosed Bat Large Forest Bat Eastern Forest Bat Southern Forest Bat Unidentified Eptesicus Little Forest Bat	Myotis adversus Nyctophilus geoffroyi Nyctophilus gouldi Nyctophilus sp Scoteanax rueppellii Scotorepens orion Vespadelus darlingtoni Vespadelus pumilus Vespadelus regulus Vespadelus sp. Vespadelus sp.		$ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$
* * * * * *	Introduced Mammals European Cattle Horse Dingo Dog Cat Fox Rabbit House Mouse Black Rat	Bos taurus Equus caballus Canis lupus Canis lupus familiaris Felus catus Vulpes vulpes Oryctolagus cuniculus Mus musculus Rattus rattus		$\diamond \diamond $
	THREATENED INVERTEBRATES			
E (TSC)	Camaenidae Cumberland Plain Land Snail	Meridolum corneovirens		\checkmark

Appendix F Bushfire Investigation





Bushfire Planning Investigation Proposed rezoning of land at South Dural

Proposal prepared for South Dural Land Owners Group

13 January 2009









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BUSHFIRE PLANNING INVESTIGATION

Our Reference: B2080012

Proposed rezoning of land at South Dural

Hornsby Shire Council

Prepared January 2009

for

South Dural Land Owners Group

PROJECT TEAM: David Peterson

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EXECUTIVE SUMMARY

The aim of this study was to investigate the capability of the South Dural lands to accommodate future urban land use with the appropriate bushfire protection measures as guided by the relevant legislation and policy into bushfire planning and design of new development precincts within bushfire prone land in NSW. This report will guide more detailed technical investigations into bushfire planning at a rezoning stage.

The study area is approximately 240 hectares in size located in South Dural in the Hornsby Shire. The area is comprised of 130 separate land titles and bounded by Old Northern Road to the north, west and south, and Hastings Road and New Line Road to the east.

When investigating the capability of lands for future rezoning or preparing a draft Local Environment Plan (LEP) the Minister for Planning (under Section 117 ministerial directions) requests councils to consult the Commissioner of the RFS under Section 62 of the *Environmental Planning and Assessment Act 1979* and have regard to the planning principles within the document 'Planning for Bushfire Protection'. This report provides an introduction to such an assessment.

The investigation consisted primarily of a desktop analysis relying on previous information gathered and supplied (e.g. GIS layers such as contours, land use features, constraints and biophysical characteristics, and aerial photography), a ground-truthing exercise, and the local experience and expertise of the author.

The study area is dominated by a broad bushland/riparian corridor associated with Georges Creek and associated tributaries consisting of open forest and a bushland-development interface areas on downslopes. The likely Asset Protection Zones (APZ) to be applied to these bushland corridors ranges from 35 m to 50 m for residential development and 85 m to 100 m for Special Fire Protection Purpose (SFPP) developments. The APZ is to be appropriately managed to achieve fuel load and structure specifications and is to include a public perimeter road for those higher density areas outside of large rural lots. The access design and construction is also to allow safe access for firefighters while residents are evacuating the area, and the road system is to be equipped with the appropriate services.

The investigation into bushfire planning constraints of the study area as they relate to future possible rezoning and subsequent development has demonstrated that the study area is suitable and capable to be developed for urban use whilst accommodating the minimum bushfire protection measures as required by NSW legislation and policy, namely 'Planning for Bushfire Protection' (PBP).

1. INTRODUCTION

This report has been prepared by Eco Logical Australia Pty Ltd at the request of Pascoe Planning Solutions and on behalf of the South Dural Land Owners Group. The report presents the findings and recommendations of a preliminary bushfire planning investigation into the potential rezoning of land at South Dural for future development and use.

1.2 The Study Area

The study area for the purposes of this report is an area of land of approximately 240 hectares in size located in South Dural in the Hornsby Shire, as located in Figure 1. The area is comprised of 130 separate land titles and bounded by Old Northern Road to the north, west and south, and Hastings Road and New Line Road to the east (Figure 1).

1.3 Aim and Objectives

The aim of this study is to investigate the capability of the South Dural lands to accommodate future urban land use with the appropriate bushfire protection measures as guided by the relevant legislation and policy into bushfire planning and design of new development precincts in NSW.

The objectives of this study are to:

- a) Provide a statement as to the capability of the study area to achieve the required minimum bushfire protection measures for future development;
- b) Investigate the application of Asset Protection Zone (APZ) building setbacks to vegetation/bushland likely to be retained for all types of development and report on the location and dimensions of any required APZ;
- c) Provide input into the creation of an Indicative Concept Master Plan (ICMP);
- d) Provide guidance on the establishment and maintenance requirements of APZs on public and private land and in an environmental impact context;
- e) Provide guidance on the access and egress requirements for public road design and construction;
- Provide guidance on other bushfire protection measures such as the provision of utilities.

Figure 1: Location of South Dural study area



2. METHODOLOGY

2.1 Review of Existing Data

The following documents were reviewed as past of the investigation:

- South Dural Future Urban Release Area, prepared by McKenzie Land Planning Services, April 2002;
- Land Capability Planning Context Report, submission to Hornsby Shire Council, prepared by Michael Brown & Associates for the South Dural Land Owners Group, March 2007; and
- Hornsby Shire Council Executive Manager's Report No. PLN191/07, Rezoning Request of Land in South Dural Area.

2.2 Desktop analysis

The investigation was largely a desk-top analysis and review suitable for the level of planning and the creation of an ICMP. This desk-top approach involved detailed analysis of an aerial photography and topographic contours layer in Geographical Information Systems (GIS) as well as review of vegetation mapping and constraints layers produced by the consulting ecologist (Hayes Environmental).

2.3 Field reconnaissance

An inspection of the study area, including the bushland gullies and remnants and surrounding bushland areas, was undertaken to ground-truth the findings of the desk-top review.

2.4 Consultation with ecologist

Consulting ecologist, Rebecca Hayes (Hayes Environmental) prepared a similar style report investigating the rezoning constraints in regards to flora and fauna, including vegetation communities and riparian corridors (Hayes Environmental 2008). The bushfire protection measures and constraints discussed within this report are based on the ecological constraints indicated within the ecological investigation.

2.5 Expert knowledge

The analysis and investigation were combined with the local experience and expert knowledge of the author to provide bushfire planning requirements and design principles applicable to the study area.

3. BUSHFIRE PLANNING FRAMEWORK

The study area has been identified as containing Bush Fire Prone Land as mapped by Hornsby Shire Council and the NSW Rural Fire Service (RFS) under a requirement of the *Rural Fires Act 1997*. In NSW, Bush Fire Prone Lands are those identified as lands that can support a bushfire or are likely to be subject to bushfire attack and are generally lands that contain or are within 100 m of significant stands of bushland.

When investigating the capability of lands for future rezoning or preparing a draft Local Environment Plan (LEP) for land identified as Bush Fire Prone Land, the Minister for Planning (under Section 117 ministerial directions) requests councils to consult the Commissioner of the RFS under Section 62 of the *Environmental Planning and Assessment Act 1979* and have regard to the planning principles within 'Planning for Bushfire Protection' (RFS 2006) hereafter referred to as PBP. Appendix 1 contains the full written ministerial direction.

After the rezoning stage, future subdivision of land (and the construction of Special Fire Protection Purpose development) also requires an assessment against PBP under EP&A Act Section 91 and RF Act Section 100B. These assessments are more detailed and specify an accurate APZ based on the known retention and management of bushland along with a compliant access design. The construction of dwellings and other buildings such as commercial and industrial development requires an assessment against PBP under EP&A Act Section 79BA and these are similar to an assessment done for a subdivision but require an analysis of building construction standards based on known building siting and design.

4. DESCRIPTION OF BUSHFIRE HAZARD

An analysis of the bushfire hazard (vegetation and bushland) within and adjoining the study area is essential in determining the location and extent of necessary bushfire protection measures such as APZs. An assessment of the hazard is based on an understanding of the vegetation type (fuels) that currently occur and are likely to occur in the future, and the topography or slope upon which the vegetation is found.

Certain characteristics of the vegetation can influence bushfire behaviour and may need to be considered in the design of bushfire protection measures. Such characteristics include vegetation type (as a surrogate for fuel structure, moisture and loading), location with reference to the development, size (i.e. possible length of fire run), and orientation and exposure to the development. Similarly, slope of terrain with respect to where the vegetation is found is also important to consider, such as the gradient of the slope (e.g. steeper slopes can significantly increase the rate of spread of fires), the length of the slope, effect of cliff lines, and whether the slope is upslope or downslope leading away from the development.

The study area is dominated by a broad bushland/riparian corridor associated with Georges Creek that has its headwaters in the northern section of the study area and drains south-east towards the intersection of Hastings and New Line Road. The spatial distribution of this bushland can be appreciated from the aerial photograph in Figure 1. The vegetation within this main gully has been assessed by Hayes Environmental (2008) as relatively intact and undisturbed with some large patches of weed infestations and the usual edge effects where the bushland abuts existing development and rural land. Several tributaries also support bushland/riparian vegetation, including one larger one flowing from south-west towards the intersection of Hastings and New Line Roads. The large bushland corridor continues eastward out of the study area.

Three native vegetation communities previously mapped within the study area and confirmed by Hayes Environmental (2008) are Blackbutt Gully Forest, Sydney Turpentine Ironbark Forest and Blue Gum High Forest. All three communities fall into the broad vegetation and fuel categorisation of 'forest' under PBP.

The topography of the bushland areas are very much associated with the creek and gully formations of Georges Creek and its tributaries. Therefore most, if not all bushland interface areas are on downslopes leading away from the interface into the bushland with a general fall to the south-east in the direction of flow. The gradient of the slopes ranges between 5 and 15 degrees.

5. BUSHFIRE PROTECTION MEASURES

This section details the bushfire protection measures recommended to be included in the future preparation of an LEP and subsequent development. The measures and recommendations follow the Acceptable Solutions of PBP. The bushfire protection measures most relevant for this investigation and discussed below include the provision of Asset Protection Zones (APZ), access and services.

5.1 Asset Protection Zones (APZ)

PBP identifies three groups or types of development, each requiring a different level of bushfire protection, hence requiring a different method of assessment and application of Asset Protection Zones (APZ):

- APZ for residential subdivision can be based on the Acceptable Solutions contained within Appendix 2, Table A2.4 of PBP;
- 2. APZ for Special Fire Protection Purpose Development (SFPP) can be based on the Acceptable Solutions within Appendix 2, Table A2.6 of PBP; and
- 3. APZ for Class 5 to 8 and 10 buildings (such as commercial and industrial development) is not specified within PBP, however, aims and objectives of PBP to be satisfied which includes an appropriate separation from the bushfire hazard, defendable space and adequate access.

As it is proposed to have predominantly housing within the study area and at bushland interface areas (refer to ICMP in Figure 2), this assessment focuses on the bushfire protection standard for residential subdivision, however, the detail necessary for the planning of SFPP developments (such as schools) and other developments (such as shopping centres and employment lands) is also included.

Residential subdivision means the subdivision of land for future housing and may include multi-housing developments such as townhouses. Subdivision is integrated development as recognised under Section 100B of the RF Act, and therefore an application is to be referred to the NSW Rural Fire Service for assessment and the issuing of a Bush Fire Safety Authority. Development applications for single dwellings are assessed by the local council under Section 79BA of the EP&A Act which calls for an assessment of the proposed development against PBP.

Based on a preliminary and desk-top assessment, Appendix 2 Table A2.4 of PBP requires a minimum APZ ranging from 35 m to 50 m for residential development adjacent the retained bushland corridor areas. Table 1 calculates the APZ and Figure 2 shows the APZ within the study area on the ICMP.

Unless managed accordingly, smaller internal bushland parks or remnants may also require an APZ depending on their size, width and proximity to the bushland corridors. Generally, remnants less than 1 hectare or corridors less than 50 m in width could be categorised as 'low hazard' vegetation and may attract an APZ much smaller than those quoted in Table 1.

Special Fire Protection Purpose (SFPP) developments require a higher standard of bushfire protection due to the vulnerability of the occupants and the potential need for assisted evacuation. The RF Act and *Rural Fires Regulation 2008* identify SFPP developments to include:

- School;
- Child care centre;
- Hospital;
- Hotel, motel or other tourist accommodation;
- Building for mentally incapacitated persons;
- Housing for older people (SEPP Seniors Living) or disability (SEPP 5);
- Group homes (SEPP 9);
- Retirement village;
- Estates under SEPP 36;
- Employment areas solely for employees with disabilities;
- Respite care centres or similar; and
- Accommodation associated with an educational institution.

These types of developments are recognised under Section 100B of the RF Act as integrated development, and therefore a development application is to be referred to the NSW Rural Fire Service head office for assessment and the issuing of a Bush Fire Safety Authority.

Based on a preliminary and desk-top assessment, Appendix 2 Table A2.6 of PBP requires a minimum APZ ranging from 85 m to 100 m for SFPP development adjacent the retained bushland corridor areas. Table 1 calculates the APZ.

Class 5, 6, 7, 8 and 10 buildings (which include offices, factories, warehouses and other commercial or industrial facilities) do not have specific bushfire performance requirements under the BCA and as such building construction standards under AS 3959 'Construction of Buildings in Bushfire Prone Areas' (Standards Australia 2000) do not apply as a set of deemed to satisfy provisions. The general fire safety constructions provisions within the BCA are taken as acceptable solutions, but the aim and objectives of PBP apply in relation to other matters such as access, water and services, emergency planning, and landscaping/vegetation management. The objectives of PBP are:

- a) Afford occupants of any building adequate protection from exposure to bushfire;
- b) Provide for defendable space to be located around buildings;
- c) Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition;

- d) Ensure that safe operation access and egress for emergency service personnel and residents is available;
- e) Provide for ongoing management and maintenance of bushfire protection measures, including fuel loads in the asset protection zone (APZ); and
- f) Ensure that utility services are adequate to meet the needs of firefighters (and others assisting in bushfire fighting.

To satisfy the above objectives, an acceptable solution would be to provide an Asset Protection Zone as for residential development to prevent flame contact and ignition of external building materials (see objective c). An alternative option, and one more reliant on a detailed assessment of the bushfire attack at a specific location and for a specific building, is to provide an APZ of a size where it acts as 'defendable space' only. PBP defines 'defendable space' as "an area within the asset protection zone that provides an environment in which a person can undertake property protection after the passage of a bushfire within some level of safety". This option relies on the high standard of construction (with respect to bushfire protection) inherent within commercial and industrial buildings common to employment lands, and is appropriate for the style of the development (i.e. not a dwelling or SFPP development). A minimum defendable space of 10 m is recommended and is to consist of a perimeter road compliant with the acceptable solutions listed in Section 5.2 of this report.

It is important to note that the calculation of these APZs have been based primarily on a desk-top analysis at a landscape scale and will require refinement in subsequent planning stages. For example, a site specific slope measurement based on a purpose built contour layer or ground measurement may reduce or increase the APZ dimension in some places. The information presented in this report does, however, act as a good guide to create an indicative concept master plan to assist a capability assessment and future rezoning exercises.

Location description	Slope class of most influence ¹	Predominant vegetation community ²	Residential APZ ³	SFPP APZ ⁴
Georges Creek corridor (as marked on ICMP in Figure 2)	Downslope 10 - 15°	Forest	50 m (25 m OPA)	100 m (30 m OPA)
South-west tributary (as marked on ICMP in Figure 2)	Downslope 5 - 10°	Forest	35 m (15 m OPA)	50 m (25 m OPA)
Smaller, isolated remnants	Varies	Low Hazard vegetation (forest)	10 – 15 m (OPA not allowed)	30 - 50 m (OPA not allowed)

Table 1: APZ calculation,	location and dimensions for	or South Dural lands
---------------------------	-----------------------------	----------------------

¹ Slope class most significantly influencing fire behaviour where the vegetation (bushfire hazard) is found over 100 m from the development boundary.

² Predominant vegetation is the most predominant and problematic vegetation over 140 m from the development boundary.

³ PBP required setback for residential subdivision.

⁴ PBP required setback for Special Fire Protection Purpose (SFPP) development.

Figure 2: Indicative Concept Master Plan (ICMP)



5.1.1 APZ management

The APZ is to be measured from the edge of the unmanaged bushland to the most external building point of a building and the APZ can contain managed vegetation and can be utilised as areas of public open space, recreational areas such as sportsgrounds, access ways such as roads, and ancillary parts of development such as yards and car parks. Hayes Environmental (2008) also supports the use of riparian buffers as Outer Protection Areas (OPA) of the APZ.

Appropriate landscaping and vegetation and fuel management is started at the planning phase and carried through construction to occupation of dwellings and future maintenance. Landscaping within the APZ may differ between the Outer Protection Area (OPA) and Inner Protection Area (IPA). The OPA is a relatively smaller portion of the total APZ and extends from the bushfire source towards the IPA, which is adjacent the building. The purpose of the OPA is to reduce the rate of spread of fire, and reduce the likelihood of crown fire whilst providing a slightly denser tree canopy than the IPA to filter embers. The IPA offers more protection for defendable space and managing heat intensities at the building. The dimension of the OPA depends on the type of development and effective slope. These dimensions are indicated in Table 1.

The APZ, including differences in OPA and IPA management, should be landscaped and managed in the following manner:

- No part of a building is to be within the APZ.
- Mature canopy trees may be within the OPA providing crowns and canopies (which may include small clumps of crowns or a single grove of trees) do not overlap and have an overall canopy cover of less than 30%.
- Mature canopy trees may be within the IPA providing crowns and canopies (e.g. a small clumps of crowns or a single grove of trees) are separated and have an overall canopy cover of less than 15%.
- Understorey saplings, shrubs and groundcovers within both the OPA and IPA are to be managed in the following manner:
 - The saplings provide a sparse scatter of individuals useful for the long-term replacement of canopy species typically retained within the APZ;
 - The saplings and shrubs are well spread out and do not form a contiguous pathway from the bushfire source to a dwelling;
 - A minimal ground fuel is to be maintained to include either mown/slashed grass, mulch, managed groundcovers, organic matter, bare or sealed ground, providing the final groundcover does not exceed 4 tonnes per hectare of fine fuel (*i.e.* material less than 6 millimetres in diameter). The OPA may have up to 8 tonnes per hectare of fine fuel;
 - Landscaped and garden areas with higher fuel loads can be within the APZ providing they are within well-defined and managed garden beds that do not provide a continuous pathway of fuels from the bushfire source to a dwelling.

5.1.2 Perimeter access within the APZ

All bushland/development interface areas within the study area that require an APZ are to contain a perimeter access road linked to the internal road network at regular intervals. These roads should be in the form of public perimeter roads designed and constructed in compliance with the specifications listed in Section 5.2 of this report. It is not essential to provide a public perimeter road to larger rural lifestyle lots as long as fire tanker access can be provided to the hazard side of a dwelling using a private property access road or fire trail standard.

5.2 Access

The design and construction of public roads within the study area are recommended to meet the accepted provisions within PBP (RFS 2006; pg 21), as listed below. The performance criterion of the road system is to allow safe access for firefighters while residents are evacuating the area.

- Public roads are two-wheel drive, all weather roads
- Urban perimeter roads are two-way, that is, at least two traffic lane widths (carriageway 8 metres minimum kerb to kerb), allowing traffic to pass in opposite directions. Roads that are not perimeter roads can comply with the road widths within Table 2 below;
- The perimeter road is linked to the internal road system at an interval of no greater than 500 metres in urban areas;
- Traffic management devices are constructed to facilitate access by emergency services vehicles;
- Public roads have a cross fall not exceeding 3 degrees;
- Public roads are through roads. Dead end roads are not recommended, but if unavoidable, dead ends are not more than 200 metres in length, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end and direct traffic away from the hazard;
- Curves of roads (other than perimeter roads) are a minimum inner radius of six metres and minimal in number, to allow for rapid access and egress;
- The minimum distance between inner and outer curves is 6 metres;
- Maximum grades for sealed roads do not exceed 15 degrees and an average grade of not more than 10 degrees or other gradient specified by road design standards, whichever is the lesser gradient;
- There is a minimum vertical clearance to a height of 4 metres above the road at all times;
- The capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles (approximately 15 tonnes for areas with reticulated water, 28 tonnes or 9 tonnes per axle for all other areas). Bridges clearly indicated load rating;
- Public roads greater than 6.5 metres wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water for fire suppression;

- Public roads between 6.5 metres and 8 metres wide are No Parking on one side with the services (hydrants) located on this side to ensure accessibility to reticulated water for fire suppression;
- Public roads up to 6.5 metres wide provide parking within parking bays and located services outside of the parking bays to ensure accessibility to reticulated water for fire suppression;
- One way only public access roads are no less than 3.5 metres wide and provide parking within parking bays and located services outside of the parking bays to ensure accessibility to reticulated water for fire suppression;
- Parking bays are a minimum of 2.6 metres wide from kerb to kerb edge to road pavement. No services or hydrants are located within the parking bays.

Curve radius (inside edge)	Swept path width	Single lane width	Two way width
< 40 m	3.5 m	4.5 m	8.0 m
40 – 69 m	3.0 m	3.9 m	7.5 m
70 – 100 m	2.7 m	3.6 m	6.9 m
> 100 m	2.5 m	3.5 m	6.5 m

Table 2: Minimum road widths for roads that are not perimeter roads

Private property roads, such as those used in larger rural lots, should be designed and constructed in accordance with the PBP specifications listed below:

- At least one alternative property access road is provided for individual dwelling (or groups of dwellings) that are located more than 200 metres from a public through road;
- Bridges clearly indicate load rating and pavements and bridges are capable of carrying a load of 15 tonnes;
- Roads do not traverse a wetland or other land potentially subject to periodic inundation (other than a flood or storm surge);
- A minimum carriageway width of four metres for rural-residential areas, rural landholdings or urban areas with a distance of greater than 70 metres from the nearest hydrant point to the most external part of a proposed building (or footprint);

Note: No specific access requirements apply in a urban area where a 70 metres unobstructed path can be demonstrated between the most distant external part of the proposed dwelling and the nearest part of the public access road (where the road speed limit is not greater than 70kph) that supports the operational use of emergency firefighting vehicles (i.e. a hydrant or water supply.

- In forest, woodland and heath situations, rural property access roads have passing bays every 200
 metres that are 20 metres long by two metres wide, making a minimum trafficable width of six metres
 at the passing bay;
- A minimum vertical clearance of four metres to any overhanging obstructions, including tree branches;
- Internal roads for rural properties provide a loop road around any dwelling or incorporate a turning circle with a minimum 12 metre outer radius;
- Curves have a minimum inner radius of six metres and are minimal in number to allow for rapid access and egress;
- The minimum distance between inner and outer curves is six metres;
- The crossfall is not more than 10 degrees;
- Maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads;

Note: Some short constrictions in the access may be accepted where they are not less than the minimum (3.5m), extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed. The gradients applicable to public roads also apply to community style development property access roads in addition to the above

• Access to a development comprising more than three dwellings have formalised access by dedication of a road and not by right of way.

5.3 Services

5.3.1 Water supply

Reticulated water (e.g. hydrant spacing, sizing and pressures) is to be supplied throughout the development in accordance with to comply with AS 2419-2005 'Fire hydrant installations – System design, installation and commissioning'. Hydrants are not to be located within any road carriageway and the provisions of parking and hydrant locations in the public road access specifications in Section 5.2 above are to be met.

Dwellings within larger rural lots that are separated from hydrants so that they do not comply with AS 2419-2005 will require a static water supply made available for fire fighting.

The tank volume ranges from 5,000 litres to 20,000 litres depending on lot size, bushfire threat and distance to the nearest hydrant.

5.3.2 Electricity

Where practicable, electrical transmission lines are to be underground. If above ground, they are to be installed with short pole spacing (e.g. 30 metres) and no part of a tree is closer to a powerline than the distance set out in accordance with the specifications in 'Vegetation Safety Clearances' issued by Energy Australia (NS179, April 2002).

5.3.3 Gas

Reticulated or bottled gas is installed and maintained in accordance with AS/NZS1596:2008 'The storage and handling of LP gas' and the requirements of relevant authorities.

6. CONCLUSIVE STATEMENTS

The investigation into bushfire planning constraints of the study area as they relate to future possible rezoning and subsequent development has demonstrated that the study area is suitable and capable to be developed for urban use whilst accommodating the minimum bushfire protection measures as required by NSW legislation and policy, namely 'Planning for Bushfire Protection' (PBP).

The retention of the Georges Creek bushland and riparian corridor, including its associated tributaries, creates a bushfire hazard that requires detailed assessment to design the appropriate bushfire protection measures. The preliminary investigation undertaken has identified the need for Asset Protection Zones (APZ) ranging in width from 35 m to 50 m for residential development around the bushland corridors. Special Fire Protection Purpose (SFPP) development would require an APZ of approximately 85 m to 100 m.

Areas requiring an APZ will also require a public perimeter road to be linked to an internal road system also capable of allowing safe access for firefighters while residents are evacuating the area. The road system is to be equipped with the appropriate services.

From this preliminary investigation it is concluded that the South Dural study area could be developed to comply with 'Planning for Bushfire Protection' so long as the guiding principles within this report are followed.

REFERENCES

Hayes Environmental (2008). *Proposed Rezoning of Land – Old Northern Road, Hastings Road and New Line Road, South Dural.* A report prepared for South Dural Land Owners Group.

RFS (2006). *Planning for Bushfire Protection: A Guide for Councils, Planners, Fire Authorities, Developers and Home Owners*. Australian Government Publishing Service, Canberra.

Standards Australia (2000). *Construction of Buildings in Bushfire Prone Areas, AS 3959*, Second edition 1999 and Amendment 1, 2000, Standards Australia International Ltd, Sydney.

Standards Australia. 2005. *Fire hydrant installations - System design, installation and commissioning*, AS2419.1, Fourth edition 2005, Standards Australia International Ltd, Sydney

Standards Australia. 2005. *The storage and handling of LP Gas*, AS/NZS 1596:2008, Fourth edition 2005, Standards Australia International Ltd, Sydney.

APPENDIX 1: Section 117 ministerial direction – Planning for Bushfire Protection

4.4 Planning for Bushfire Protection

Objectives

(1) The objectives of this direction are:

(a) to protect life, property and the environment from bush fire hazards, by discouraging the establishment of incompatible land uses in bush fire prone areas, and

(b) to encourage sound management of bush fire prone areas.

Where this direction applies

(2) This direction applies to all councils that are required to prepare a bush fire prone land map under section 146 of the Environmental Planning and Assessment Act 1979 (the EP&A Act), or, until such a map has been certified by the Commissioner of the NSW Rural Fire Service, a map referred to in Schedule 6 of that Act.

When this direction applies

(3) This direction applies when a council prepares a draft LEP that affects, or is in proximity to land mapped as bushfire prone land.

What a council must do if this direction applies

(4) In the preparation of a draft LEP a Council shall consult with the Commissioner of the NSW Rural Fire Service under section 62 of the EP&A Act, and take into account any comments so made,

- (5) A draft LEP shall:
- (a) have regard to Planning for Bushfire Protection 2006,

(b) introduce controls that avoid placing inappropriate developments in hazardous areas, and

(c) ensure that bushfire hazard reduction is not prohibited within the APZ.

(6) A draft LEP shall, where development is proposed, comply with the following provisions, as appropriate:

(a) provide an Asset Protection Zone (APZ) incorporating at a minimum:

(i) an Inner Protection Area bounded by a perimeter road or reserve which circumscribes the hazard side of the land intended for development and has a building line consistent with the incorporation of an APZ, within the property, and

(ii) an Outer Protection Area managed for hazard reduction and located on the bushland side of the perimeter road,

(b) for infill development (that is development within an already subdivided area), where an appropriate APZ cannot be achieved, provide for an appropriate performance standard, in consultation with the NSW Rural Fire Service. If the provisions of the draft LEP permit Special Fire Protection Purposes (as defined under section 100B of the Rural Fires Act 1997), the APZ provisions must be complied with,

(c) contain provisions for two-way access roads which links to perimeter roads and/or to fire trail networks,

(d) contain provisions for adequate water supply for firefighting purposes,

(e) minimise the perimeter of the area of land interfacing the hazard which may be developed,

(f) introduce controls on the placement of combustible materials in the Inner Protection Area.

Consistency

(7) A draft LEP may be inconsistent with the terms of this direction only if council can satisfy the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General) that the council has obtained written advice from the Commissioner of the NSW Rural Fire Service, to the effect that, notwithstanding the non-compliance, the NSW Rural Fire Service does not object to the progression of the draft LEP.

Appendix G Infrastructure Report

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MAUNSELL AECOM

Mr Graham Pascoe Pascoe Planning Solutions PO Box 774 Camden NSW 2570

12 January 2009

Dear Graham

South Dural Servicing Infrastructure Memo Report

1.0 Background Information

South Dural development area is located south of Round Corner/Dural and is bounded by Old Northern Road to the west, Hastings Road to the south and New Line Road to the east. The area is currently zoned as Rural BA (Small Landholdings – Agricultural Landscapes), Environmental Protection B (River Catchment) and Special Uses A (Community Purposes). The area comprises approximately 240 hectares.

As part of this servicing review Maunsell AECOM consulted with Sydney Water, Alinta, AGL, Telstra, Integral Energy and Energy Australia. A Dial Before You Dig search was also undertaken.

The results of this review are detailed in this report

1.1 Concept Master Plan

The Preliminary dated 14 July 2008 details the following potential land uses and dwellings. Maunsell AECOM has used this plan to estimate the equivalent population and demands for servicing.

Land Use	Number of Dwellings/ Area	Estimated Equivalent Population (EP)
Large Lots (1,000 – 2,500m ²)	100	350
Conventional Lots (600 - 800m ²)	800	2800
Cottage Lots (400- 599m ²)	240	840
Integrated Housing (250m ² site area / dwelling)	1800	6300
Local Centre	1000m ²	16
Parkland		
Total		10306

Table 1 Estimated Dwellings and Equivalent Population (EP)

Based on 3.5 EP = 1 Equivalent Tenement (ET), the equivalent number of dwellings is estimated to be approximately 2900.

2.0 Potable Water Supply

2.1 Existing Potable Water Infrastructure

The South Dural development area is within the Dural Water Supply System. The Dural Water Supply System currently supplies approximately 16600ha including the areas of West Pennant Hills, Castle Hill and Cherrybrook. This supply system is fed from the Prospect North and East Ryde Delivery Systems. Water is pumped via Water Pumping Station WP129 from the 1200mm diameter Prospect to Thornleigh main into the three Dural South Reservoirs (R112, R158 and R288) located at the north east corner of the development area. The reservoirs also provide a water supply via Dural South Pumping Station WP14 to Dural Elevated Reservoir R39 in Galston Road, Dural that serves the large rural areas north of Round Corner as well as the villages of Round Corner, Galston and Glenorie. The Full Service Level of the existing Dural Surface Reservoir and the Elevated Reservoir is 224m AHD and 247m AHD respectively.

2.2 BASIX

BASIX (the Building Sustainability Index) requires that all new residential dwellings incorporate features to reduce potable water consumption by up to 40% (compared to the metropolitan average). Whilst this applies to single residential and multi unit dwellings there are as yet no requirements for commercial and industrial developments.

The Government announced as part of the 2006 Metropolitan Water Plan that *"it is committed to providing recycled water via dual reticulation to all new homes to be built in new suburbs in Sydney's North West and South West growth centres over the next 25 years."* However, it is understood that this mandate does not apply to existing MDP lands that are outside of the Growth Centres. This means that whilst the BASIX requirement must be met, the provision of a dual reticulation system may not be mandatory for South Dural.

The BASIX requirements can be achieved by the incorporation of a combination of rainwater tanks, stormwater harvesting and dual reticulated recycled water schemes.

There are currently no recycled water mains servicing the immediate adjacent developments in the surrounding area. The following demand calculations consider two servicing options where the alternative source of water could either be rainwater tanks or by dual reticulated recycled water system.

2.3 Potable and Recycled Water Demands

The potable and recycled water demand estimates are initial calculations based on the proposed future land use which will yield approximately 2900 equivalent residential lots over say 160 net ha.

ltem	Design Criteria [kL/net ha/day]		Estimated Demand MLD
Residential	Average Day Demand	18	2.9
	Max Day Demand	41	6.6
	Max Hr Demand	90	14.4

Table 2 Potable Water Demand Rates with Rainwater Tanks

Item	Design Criteria (kL/dwelling/day) ¹		Estimated Demand MLD
Drinking	Average Day Demand	0.28	0.8
Water Residential	Max Day Demand	1.0	2.9
	Max Hr Demand	3.4	9.9
Recycled	Average Day Demand	0.48	1.4
Water Residential	Max Day Demand	1.5	4.4
	Max Hr Demand	6.9	20.0

Table 3 Potable Water and Recycled Water Demands with a Dual Reticulation System.¹

1. Based on the Sydney Water Design Criteria for Dual Reticulation Systems (2007) used for initial option studies in the South West Growth centre.

2. Assumes recycled water used for gardens, toilet flushing and washing machines.

2.4 Capacity of Existing Potable System

Sydney Water has advised that the existing potable water infrastructure in the area is insufficient to supply the development area. Sydney Water has indicated that the construction of an additional 4ML Elevated Reservoir located at the existing elevated reservoir site at Dural on Galston Road would be required for the development area to be serviced. The existing water pumping stations at Pennant Hills (WP129) and South Dural (WP014) will also require upgrading. New inlet /outlet mains to the new reservoir and amplifications to existing watermains in Galston Road and Old Northern Road are required.

Maunsell AECOM has reviewed Sydney Water's proposed initial servicing strategy and the basis of its sizing and estimated cost of proposed works. They are considered reasonable at this stage. It should be noted however, that these costs are indicative order of cost estimates and more detailed modelling will be required to further refine the options and costing.

2.5 Potable Water System without Dual Reticulation.

Sydney Water has provided indicative infrastructure upgrades and corresponding costs which are detailed in Table 4 below.

System Component	Description of Works	Preliminary Cost Estimate (\$Million)
Pennant Hills WP129	Upsize 4 pumps	1.00
Dural South WP014	Upsize 4 pumps	0.95
Dural Elevated Reservoir	Construction of new 4ML Elevated Reservoir	5.60
Trunkmains	From Dural South Reservoir to development area 3km of 375mm pipe.	4.40
Galston Road main amplification	610m (amplify from 375mm to 500mm)	1.30
Inlet/Oulet mains to Dural Elevated	200m of 600mm pipe.	0.50
Old Northern Road DSP main	655m of 300mm pipe.	0.75
1	14.50	
Cos	\$5,000	

Table 4 Potable Water Upgrade Costs

Notes 1. Cost data provided by Sydney Water.

2. Does not include reticulation cost to be borne by the developer.

2.6 Existing Dual Reticulation Infrastructure

There is currently no Recycled Water infrastructure in the South Dural area or any surrounding areas.

2.7 Dual Reticulation System Servicing Options

The ability to proceed with this option is predicated on the ability to receive recycled water from a nearby sewage treatment plant (STP). This requires the development of a recycled water scheme based around an existing STP. The two nearest STP's to the development area are at Castle Hill which is approximately 6km away and at West Hornsby which is approximately 13km away. Land availability at West Hornsby STP is limited, however it is believed that there is sufficient land for recycled water facilities. This will be subject to further onsite survey and investigations.

Sydney Water also advised that it hasn't looked at sourcing recycled water from Castle Hill STP at this stage but it is an option that should be considered if the development is approved. Sydney Water further advised that the current inflow into Castle Hill STP is about 6.5MLD. Therefore if Castle Hill STP was considered as an option for recycled water there would be sufficient product.

Dual reticulation scheme costs below are based on recycled water sourced from West Hornsby STP. They do not include STP upgrades or treatment costs. There may be up to \$7 million in savings on the estimated costs detailed below if the option of providing recycled water from Castle Hill STP is found to be viable in the future. This is because the length of the rising main from Castle Hill STP is approximately 7 km shorter

2.8 Cost of Dual Reticulation system

System Component	Description of Works	Preliminary Cost Estimate (\$Million)
Rising Main	From West Hornsby STP to Elevated Reservoir site (15.3km of 250mm pipe)	14.70
West Hornsby STP RWPS	100kW Recycled Water Pumping Station	1.80
Elevated Reservoir	Construction of new 3 ML Reservoir	5.00
Eastern Outlet Main 1km of 375mm pipe		1.46
Western Outlet Main	1.8km of 375mm pipe	2.63
Internal Ring Road	3.8km of 300mm pipe	4.30
Internal Ring Road	2.2km of 200mm pipe	1.80
1	31.69	
Cost per lot		\$11,000

Table 5 Recycled Water Costs

Notes 1. Cost data provided by Sydney Water.

2. Does not include reticulation cost to be borne by the developer.

2.9 Conclusions & Recommendations

Based on advice from Sydney Water, there is insufficient capacity in the existing water supply system to service the proposed development. Sydney Water has indicated that there is a viable option to bring potable water into the site. This involves the construction of a new 4ML elevated reservoir on the existing elevated reservoir site at Dural on Galston Road, construction of inlet/outlet mains and the amplification of water pumping stations at Pennant Hills and Dural South. The developer will also be required to lay approximately 3km of trunk main from the new reservoir to the development site and amplify existing watermains in Galston Road and Old Northern Road.

The provision of recycled water for a dual reticulation option from West Hornsby STP may be cost prohibitive. If this is the case an alternative source of water will need to be provided using rainwater tanks. Further analysis of the viability of this option will need to be undertaken in the detailed planning phase.

3.0 Wastewater Servicing

3.1 Existing Wastewater Infrastructure

The development area is located at the boundary between the West Hornsby and Castle Hill Sewerage Systems. The area naturally gravitates towards the West Hornsby Sewerage System. The surrounding areas, which include parts of Castle Hill and Dural, drain via the 450mm Georges Creek Carrier to SPS641. SPS641 pumps to the Elouera Carrier and flows are then transferred via gravity to the Thornleigh Submain and to SPS541. SPS541 pumps directly to the inlet works of West Hornsby Sewerage Treatment Plant (STP).

West Hornsby STP has a total plant capacity of 13.9ML/day with an approved operational capacity of 12.6ML/day. The STP is currently running at a capacity of 11.5ML/day. Sydney Water has no planned capital works for West Hornsby STP.

3.2 Wastewater System Demands

Table 6 Wastewater Flow Calculations

Land Use	EP	ADWF (L/sec)	PDWF (L/sec)	DWWF (L/sec)
2900 ET @ 3.5	10,150	21	49	120
EP per ET				

These previous table of values was calculated using the Association of Australia (WSAA) – Sewerage Code of Australia

3.3 Capacity of Existing Works

Sydney Water has advised that West Hornsby STP has sufficient capacity to service the proposed 2500 ET development at South Dural.

Sydney Water further advises that preliminary hydraulic wastewater modelling that was undertaken indicated that the existing carrier main discharging to SPS641 has sufficient capacity to service the proposed development. This modelling was based on the existing pumping station and rising main capacity, therefore the existing pump station and rising main has sufficient capacity to service the development site.

3.4 Wastewater System Servicing Options

As previously stated the existing Georges Creek Carrier draining to SPS641 and the SPS and rising main have spare capacity to serve the development. The end of the carrier is located just south of the intersection of Hastings Road and New Line Road and finishes just within the development site. An extension of the carrier main will most likely be required to service the northern parts of the site.

At this stage the future wastewater system sizing and indicative costs have not been considered.

3.5 Conclusions and Recommendations

Based on advice from Sydney Water the existing wastewater collection system, transfer system and the West Hornsby STP appear to have spare capacity to serve the proposed development. Further hydraulic modelling will need to be undertaken in the detailed planning phase of this project to determine the sizing and staging of infrastructure required and the impact on the adjacent sewerage systems.

4.0 Power Servicing

Power servicing options have not changed greatly since the GHD Report of March 2007.

4.1 Existing Infrastructure

The development area is located on the boundary between Integral Energy and Energy Australia. Integral Energy's area is west of New Line Road, and Energy Australia is to the east of New Line Road. Integral Energy has several Zone Substations (ZS) serving the surrounding area including Kenthurst ZS, Kellyville ZS and Castle Hill ZS. See Attachment D.

4.2 Capacity of Existing Infrastructure

Integral Energy has indicated that their current network is at capacity and power to the area is likely to be delivered by Energy Australia. However, it is believed that Energy Australia's network is also close to capacity.

4.3 Servicing Options

Estimated electrical demand based on 2900 lots is approximately 12.5MVA. Possible servicing options are by Integral Energy via the new substation at Glenhaven 1.5km away or by Energy Australia via proposed substation at Galston approximately 5km away. New underground feeder mains from either of these substations would need funded by the developer.

5.0 Telecommunications

Telephones are considered an essential service and are supported under the Universal Services Obligation (USO), set out under the Federal Telecommunications (Consumer Protection and Services Standards) Act 1999, to provide to all people in Australia, reasonable access, on an equitable basis, to standard telephone services and payphones.

The universal service regime also includes the digital data service obligation, which is the obligation to ensure that either general digital data services or special digital data services are reasonably accessible to all people in Australia on an equitable basis. The general digital data service is a carriage service that provides a basic rate ISDN (Integrated Services Digital Network) capable of transmission speeds up to 64kbps. Both voice telephony and data are provided using copper cable.

Telstra is the primary universal service provider which means it has the obligation to provide these services including the installation of conduits and cables (not including trenching) for future telephone connections. It is cost effective for the developer if the laying of cabling can be coordinated with the power and gas installation so that the services share a common trench. The separation of the services within the trench would be in accordance with Australian Standard AS/ACIF S009:2006.

At the other end of the spectrum a fibre optic network is also available to the developer. This alternative provides faster data transmission speeds, free-to-air digital TV and has the capacity to handle multiple telephone lines. However, this option will incur additional costs to the developer and an assessment of value added versus capital outlay needs to be performed.

5.1 Existing Telecommunications Infrastructure

Currently there is limited telecommunications infrastructure within the South Dural development area. The current infrastructure has only sufficient capacity to service the existing area and it will require augmentation to service further development. There is extensive telecommunication infrastructure in the surrounding area. The development site shares two Exchange Service Areas (ESA's). The satellite image below provided by Telstra indicates the ESA boundary across the site.



Figure 1 – Red line indicating ESA boundary

The area north of the red line is part of the Dural ESA and the area south of the red line is part of the Castle Hill ESA. The location of the exchange for the Dural ESA is 969 Old Northern Road Dural while the location of the exchange for the Castle Hill ESA is 4 Castle Street Castle Hill.

5.2 Mobile Networks

The network company is responsible for any development of infrastructure required to accommodate the additional loading to the area. At this stage, according to Telstra's website and personal correspondence there is a large portion of the site where 3G network coverage is available while some areas are only able to receive GSM network access (**Figure 2**). The establishment of new mobile repeater towers will follow the standard development procedures and the network providers themselves fully fund all infrastructure.



Figure 2 – Telstra Mobile Phone Network Coverage

Similarly the site is also within Optus' 3G mobile network, providing 3G coverage throughout the whole site. A map of the Optus mobile network in the area is also provided below.



Optus Network

Figure 3 – Optus Mobile Network Coverage

5.3 Telecommunication Network Demands

As stated earlier Telstra is wholly responsible for standard copper cable infrastructure up to the point of connection. Telecommunications network demand is calculated on a land use basis, which is performed by Telstra.

5.4 Telecommunication Network Servicing Options

Option 1 – Standard Copper Cabling

Telstra, as the primary universal service provider has an obligation to provide at no cost single line voice telephony and a basic 64kbps ISDN connection to each lot. Telstra will provide ADSL1 as standard in preference to the basic ISDN thus providing limited broadband services at no extra cost. Costs associated with these services are operationally based not based on capital.

ADSL1 (Asymmetric Digital Subscriber Line) provides data rates of up to 8 Mbps at the exchange. However, the actual speeds experienced at the user's point of connection will depend on a number of factors including; network configuration, line quality & length, exchange type, customer premises interference, traffic and equipment.

Over time Telstra may upgrade this service to ADSL2+, a high-speed broadband internet service that can achieve data rates of up to 20Mbps at the exchange, subject to the same de-rating factors and commercial viability.

Standard deployment is provided by Telstra at no cost to the developer provided that the developer provides a suitable trench that complies with Telstra's specifications. It is cost effective for the developers to coordinate the laying of cables with the power and gas installation so that the services share a common trench. The shared trench would be within the standard footpath allocation and will follow the subdivision road layout.

Option 2 – Fibre Optic Cable

If Telstra determines upgrading the proposed system to be feasible and the developer considers upgrades to be of importance, the most logical upgrade would be to upgrade the standard copper cable to a fibre optic cable. Installation of fibre optic cable provides high speed broadband scalable to 100 Mbps, free to air digital TV, Foxtel and 4 telephone services for each lot. It also provides the option of possible upgrades such as gaming, interactive education, business from home applications at office speeds should the future customer require it. It is more expensive for the developer but does provide a far superior service which makes the site more appealing to prospective buyers. As the development area is split across two ESA's the fibre optic cable would come from Castle Hill exchange for the south of the site and Dural exchange for the north of the site. Due to the sharing of the ESA's the cost of servicing with fibre optic cable could potentially be increased. This study has not looked further into costing of the telecommunications infrastructure, Telstra should be approached for further information.

5.5 Telstra Smart Community

Telstra recommends the developer lodge the development with the Telstra Smart Community website www.telstrasmartcommunity.com as soon as possible to initiate Telstra's reticulation process. Subject to sufficient lead time, Telstra's network build would be carried out in a timeframe to meet expected first service requirements in the estate (network construction timeframe is generally 6-9 months for equipment of this nature, depending on the scope required).

Registration with Telstra on their web site requires the following information;

- Total lots and type of service required;
- A hard and digital copy of the development plan;

- Staging details;
- A copy of the proposed construction plan including indicative trench opening dates;
- First customer required service date; and

Telstra advised six months in advance to supply and construction of technology

5.6 Conclusions & Recommendations

It has been determined that telecommunication services can be provided within the South Dural development area. Telstra currently meets its regulatory requirements to the area by providing voice services which could possibly provide a limited Broadband service and at this stage can only provide ADSL1(Asymmetric Digital Subscriber Line) of up at 8 Mbps at best. To provide a standard copper cable service the telecommunications network in the area requires upgrade.

Should the developer wish to do so, a commercial agreement can be entered into with Telstra where improved data services in the form of fibre optic cable would be provided to the site. It should be noted that this agreement would be on a commercial basis and would need to be negotiated.

It is recommended that further discussions are held with Telstra regarding detailed costing and timings for the provision of a fibre to the home network expansion as detailed planning for the development progresses. To initiate the process it is recommended that the developer inform Telstra of likely commencement of this development and to register this development on the Telstra Smart Community website: http://www.telstrasmartcommunity.com.

Telstra require a lead time of approximately 3 months from trench open date for the estate reticulation. If any display homes are to be constructed, or telecommunications requirements are expected in advance of the release of lots to the public, this should be communicated to Telstra as early as possible.

6.0 Gas Servicing

6.1 Introduction

Alinta is currently the main gas utility provider for the area. It should be noted that gas is a non essential service and as such Alinta provides gas services to meet system demands on a commercial basis.

It is however, generally accepted that properties are more marketable with both gas and electricity available. Gas is also more energy efficient for water heating and therefore assists the development to achieve its BASIX requirements for energy efficiency.

6.2 Existing Gas Infrastructure

Currently there is existing gas infrastructure in all the areas adjacent to the development area. Alinta has indicated that the networks extending along Old Northern Road and New Line Road are currently at their maximum servicing capacity. There is currently no gas network along Hastings Road or within the development area.

6.3 Gas Network Servicing Options

Should AGL (via its contracting arm Alinta) decide that servicing the development area is feasible, Alinta has indicated that at this stage there is only one gas servicing option for the development area. That is, by augmentation of the existing network. Alinta has indicated that the implementation of gas servicing would occur on a staged basis once more accurate dwelling numbers are determined. They have also stated that "the current mains would require supply from the high pressure network in Castle Hill".

Gas reticulation infrastructure is generally laid within common services (telecommunications, electricity) trenching to reduce construction costs and avoid disorganised service layout. To further explore utility requirements, it is recommended the developer contact Alinta to arrange for the design of the extension of the local gas mains to the estate on completion of a fixed site layout and preliminary electrical utility design.

6.4 Costs

As stated previously, Alinta have advised that costs to the developer can arise if the returns are insufficient to cover the infrastructure costs. Alinta also advised that it is their preference to attempt to provide gas at no cost to the developer although this is not always the case. Factors that could influence costs being borne by the developer include (but are not limited to):

- Lot frontages Lots having larger frontages require additional piping compared to smaller lots and thus are less financially beneficial to Alinta. Developer contributions could be required following negotiations with Alinta.
- Lot Layout and Electrical Services Design generally gas utilities are designed to compliment the electrical layout to utilise common trenching, however some developments require designs where this is not feasible. Some contributions could be required pending consultation with Alinta.

For Alinta to accurately provide cost estimates and hence developer contributions for the installation of gas services, they require frozen (or near complete) lot layout plans and associated service design drawings (i.e. telecommunications and electrical). This will enable them to compile a design that best suits the development.

6.5 Conclusions & Recommendations

Alinta has indicated that servicing of the proposed South Dural development area is possible through the augmentation of the existing network.

It is recommended that negotiations with Alinta commence regarding the cost of the provision of gas services for South Dural. The installation of the services within the site should be coordinated so that they are laid in a common trench. This reduces construction costs as well as minimises the impact on the existing surface.

Yours sincerely

Monafhini .

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Attachment List

Attachment A	Contact List
Attachment B	Sydney Water - Wastewater System Drawings
Attachment C	Potential Water & Recycled Water Pipeline Route (Hornsby)
Attachment D	Potential Recycled Water Pipeline Route (Castle Hill)
Attachment E	Power Infrastructure Drawing

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Dural Elevated Reservoir Site Dural South Reservoir Site able & Recy Main Route West Hornsby STE WP\$ 14 South Dural Development Area Proposed Route WPS 129 Google

Attachment C Potential Water & Recycled Water Pipeline Routes (Hornsby)

Attachment C 20 August 2008 k:\60044833_south_dural\6. draft docs\6.1. reports\civil servicing\attachments\word docs\5 attachment c potential water.doc

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Attachment D Potential Recycled Water Pipeline Route (Castle Hill)



Attachment D 3 September 2008 k:\60044833_south_dural\6. draft docs\6.1. reports\civil servicing\attachments\word docs\attachment d castle hill.doc

Attachment E – Power Infrastructure Drawing



Appendix H

Traffic, Transport and Accessibility



South Dural Urban Release Area

Traffic, Transport and Accessibility Assessment

South Dural Residents and Ratepayers Group 15 January 2009

South Dural Urban Release Area

Prepared for

South Dural Residents and Ratepayers Group

Prepared by

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15 January 2009

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Quality Information

Document South Dural Urban Release Are
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Ref 60044833

Date 15 January 2009

Prepared by Isla Robertson

Reviewed by Andy Yung

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Revision	Date	Details	Name/Position	Signature			
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1.0 Introduction

1.1 Background

Maunsell Australia Pty Ltd (Maunsell) has been appointed by South Dural Residents and Ratepayers Group Incorporated (SDRRG) to prepare a Traffic Impact Assessment (TIA) for the proposed rezoning of 240 ha of land at South Dural. The TIA will assist in the development of a Concept Structure Plan for the Department of Planning (DoP).

The South Dural Urban Release Area (South Dural) is located within the Local Government Area (LGA) of Hornsby. Old Northern Road to the west of the study area forms the boundary of Hornsby LGA and Baulkham Hills LGA. The release area is approximately 6km to the north east of Baulkham Hills, 11km to the west of Hornsby, and 25km to the north west of Sydney. The study area is approximately 240 ha and the proposed housing strategy for the area would yield approximately 2,300 residential dwellings and a local neighbourhood centre. The study area in its regional context is shown in **Figure 1.1**.



Figure 1.1: Regional Context of South Dural Urban Release Area

Source: UBD, 2008

1.2 Purpose and Scope

The purpose of this report is to provide a review of the potential traffic impacts of the proposed 2,300 residential dwellings on the external road network. The assessment involves determining the level of trip generation associated with the proposed development within the study area and will provide recommendations on the traffic requirement as a result of the development trips. The report also provides a proposed access strategy for the study area and recommends the geometric layouts required for all access points.

D R A F T

1.3 Report Framework

The report has been structured into the following sections:

- Section 2 details the existing transport conditions in the locality for all modes of transport;
- Section 3 reviews the impacts of changes to the traffic flow and road network, prior to future development of South Dural;
- Section 4 describes the details of the proposed development within the study area;
- Section 5 details the access strategy for the development;
- Section 6 provides a traffic impact assessment of the proposed development and surrounding road network and identifies appropriate transport infrastructure to cater for the forecast traffic flows; and
- Section 6 provides summary and conclusions of the report.

2.0 Existing conditions

2.1 Site Description

South Dural is located between Round Corner and Castle Hill, to the north west of Sydney. The site area is approximately 240 ha. The study area is surrounded by existing residential area in Castle Hill, Glenhaven and Cherrybrook. There is a small retail centre in Round Corner and a light industrial area to the east of the study area, north of Sebastian Drive.

The study area is bounded by Old Northern Road to the north, south and west and by Hastings Road and New Line Road to the east. The location of the site is shown in **Figure 2.1**.



Figure 2.1: Location of South Dural

Source: UBD, 2008

The site is currently occupied by rural residential dwellings with the remaining area being open grass land and woodland. Most of the current dwellings or properties have direct access to Old Northern Road or New Line Road. Wayfield Road and Franlee Road form the current internal road network of the site as well as providing access to some properties from Old Northern Road.

2.2 Travel Behaviour

2.2.1 Journey to Work data

Journey to Work data (JTW) includes details of the origin and destination of trips, together with characteristics of the journey such as mode of travel. 2006 JTW data has been analysed to determine the current distribution of trips from the study area.

South Dural is located on the boundary of the Baulkham Hills and Hornsby LGAs. Therefore, the existing (2006) JTW data for all modes of transport from Baulkham Hills and Hornsby LGA has been analysed and is summarised in **Table 2.1** and **Table 2.2**.

Destination	Total Trips	Proportion		
Baulkham Hills	23,890	31%		
Parramatta	9,204	12%		
Sydney	8,309	11%		
Blacktown	6,218	8%		
Hornsby	4,440	6%		
Ryde	4,174	5%		
Auburn	2,250	3%		
Holroyd	1,800	2%		
Willoughby	1,760	2%		
North Sydney	1,760	2%		
Fairfield	1,397	2%		
Other Areas	10,977	16%		
Total	76,179	100%		

Table 2.1: Journey to Work destinations from Baulkham Hills LGA (all modes)

Source: Journey to Work (2006)

Table 2.2: Journey to Work destinations by any mode from Hornsby LGA (all modes)

Destination	Total Trips	Proportion
Hornsby	20,901	30%
Sydney	11,483	17%
Ryde	5,461	8%
Baulkham Hills	4,462	6%
Ku-ring-gai	4,297	6%
Willoughby	3,919	6%
Parramatta	3,683	5%
North Sydney	3,154	5%
Blacktown	1,418	2%
Auburn	1,264	2%
Warringah	1,239	2%
Other Areas	8,110	12%
Total	69,391	100%

Source: Journey to Work (2006)

The JTW data for both LGAs shows that a high proportion of trips are self contained within the Baulkham Hills (31%) and Hornsby (30%). Other major destinations that people travelled to work include Parramatta, Sydney, Blacktown and Ryde.

2.3 Pedestrian and Cycle Facilities

There is a dedicated shared path on the western side of Old Northern Road between Glenhaven Road and Kenthurst Road, as shown in **Figure 2.2**. Cyclists are allowed to cycle on road along other sections of Old Northern Road and New Line Road in the vicinity of the study area.

Pedestrian footpaths are provided on the northern end of Old Northern Road between Kenthurst Road and New Line Road, in the vicinity of Round Corner. There are also footpaths along New Line Road near the commercial areas and function centre to the east of the study area. No footpaths are provided on Hastings Road.

There are currently no dedicated pedestrian crossings at Old Northern Road, New Line Road and Hastings Road, except at the intersection of Old Northern Road/Kenthurst Road.



Figure 2.2: Cycle Map

Source: Hornsby Shire Cycling Map 2008

2.4 Bus Facilities

Hillsbus runs 7 public bus routes (Routes 636 -641) that currently service the study area and its vicinity. The bus routes and bus stop locations in the vicinity of the site are shown in **Figure 2.3**.





Source: Maunsell 2008

The bus routes travel along Old Northern Road, New Line Road and Hastings Road and there are bus stops located along the length of these roads. The details and service frequencies of each bus route are summarised in **Table 2.3**.

Table 2.3: Frequency of bus routes

Pouto and bug convice	AM peak	(0700-0	900)	PM peak	(1600-1	800)	Off peak (1000-1500)		
Route and bus service	Weekday	Sat	Sun	Weekday	Sat	Sun	Weekday	Sat	Sun
636 Glenhaven to Castle Hill and Pennant Hills	4	1	1	3	2	2	5	5	5
636 Pennant Hills and Castle Hill to Glenhaven	0	1	0	4	2	3	6	5	5
637 Dural and Round Corner to Castle Hill and Pennant Hills	1	-	-	0	-	-	0	-	-
637 Glenorie to Castle Hill and Pennant Hills (via Old Northern Rd)	5	1	1	2	0	1	3	3	2
637 Glenorie to Castle Hill and Pennant Hills (via New Line Rd)	2	-	-	0	-	-	0	-	-
637 Pennant Hills and Castle Hill to Glenorie (via Old Northern Rd)	2	0	0	3	1	1	3	2	2
637 Pennant Hills and Castle Hill to Glenorie (via New Line Rd)	0	-	-	3	-	-	1	-	-
638 Berrilee and Galston to Castle Hill and Pennant Hills (via Old Northern Rd)	3	1	0	1	0	1	0	2	0
638 Berrilee and Galston to Castle Hill and Pennant Hills (via New Line Rd)	2	-	-	1	-	-	-	0	-
638 Pennant Hills and Castle Hill to Galston and Berrilee (via Old Northern Rd)	2	0	0	6	1	1	3	4	2
638 Pennant Hills and Castle Hill to Galston and Berrilee (via New Line Rd)	1	-	-	1	-	-	0	-	-
639 Pitt Town Rd, Kenthurst to Castle Hill and Pennant Hills (via Old Northern Rd)	3	1	-	0	0	-	1	2	-
639 Pennant Hills and Castle Hill to Pitt Town Rd, Kenthurst	0	0	-	4	0	-	1	2	-
640 Porters Rd, Kenthurst to Castle Hill and Pennant Hills (via Old Northern Rd)	3	1	-	1	0	-	1	2	-
640 Porters Rd, Kenthurst to Castle Hill and Pennant Hills (via New Line Rd)	1	-	-	0	-	-	0	-	-
640 Pennant Hills and Castle Hill to Porters Rd, Kenthurst (via Old Northern Rd)	0	0	-	4	0	-	1	2	-
641 Annangrove Rd to Castle Hill and Pennant Hills	2	1	-	1	0	-	2	1	-
641 Pennant Hills and Castle Hill to Annangrove Rd	0	0	-	4	0	-	1	2	-

Source: Hillsbus.com.au, 2008

The bus timetable shows that the study area is well serviced in the weekday peak hours however there are limited bus services on the weekend.

2.5 Rail Facilities

The closest train station is located approximately 10km east of the study area at Pennant Hills. Pennant Hills station is serviced by the Northern Line which runs between Hornsby and North Sydney via Strathfield. The bus routes described in Section 2.4 connect Pennant Hills station to the study area and are timetabled to coincide with the train services. The frequency of trains servicing Pennant Hills station is shown in **Table 2.4**.

Direction	AM peak (0700-0900)			PM peak (1600-1800)			Off peak (1000-1500)		
Direction	Weekday	Sat	Sun	Weekday	Sat	Sun	Weekday	Sat	Sun
Pennant Hill to City	7	4	4	7	4	4	11	10	10
City to Pennant Hills	7	4	4	10	4	4	11	10	10

Table 2.4: Frequency of train services at Pennant Hills Station

Source: Cityrail.info, 2008

During the weekdays, rail services operate between Pennant Hills and City at approximately every 15 minutes in the AM peak Additional outbound train services operate during the PM peak from City to Pennant Hills. During the weekday off peak hours and weekends, trains run in either direction at approximately every 30 minutes.

2.6 Road Network

The main roads in the vicinity of the study area are Old Northern Road, New Line Road and Hastings Road. Glenhaven Road and Gilbert Road connect to Old Northern Road and provide links to the surrounding areas including Castle Hill and Kellyville.

2.6.1 Old Northern Road

Old Northern Road runs along the southern, western and northern boundary of the study area. It runs in north-south direction from Castle Hill Road to Kenthurst Road and in east-west direction between Kenthurst Road and New Line Road. Old Northern Road is a sealed road with predominantly one lane in each direction in the vicinity of the study area. However, the road widens to 2 lanes in each direction at the intersections. Gilbert Road and Kenthurst Road intersect with Old Northern Road and both intersections are controlled by traffic signals. New Line Road meets Old Northern Road at a two lane roundabout. **Figure 2.4** shows a typical cross-section of Old Northern Road in the vicinity of the study area.

Figure 2.4: Old Northern Road south of Glenhaven Road (looking south)



Source: Maunsell, 2008

The majority of the road in the vicinity of the study area has a speed limit of 60km/hr, except there is a 40km/hr school zone south of Malabar Road. The school zone is operational on school days between 8am and 9.30am and 2.30pm and 4pm. Parking is not permitted along the section of the road bordering the site.

2.6.2 New Line Road

New Line Road is an arterial road that runs in a north-south direction from Old Northern Road at the north-eastern corner of the study area to the Cumberland Highway. It has one lane in each direction between Old Northern Road and Hastings Road. Roundabouts are located at the intersections of Old Northern Road, Sebastian Drive as well as the access to Bunnings. The speed limit along New Line Road is 60km/hr. There are no parking lanes along the road. **Figure 2.5** shows a section of New Line Road.

Figure 2.5: New Line Road approaching Old Northern Road roundabout (looking north)



Source: Maunsell, 2008

2.6.3 Hastings Road

Hastings Road is a 4 lane road that connects Old Northern Road to New Line Road. Parking is not permitted along its entire length and it has a speed limit of 60km/hr. The intersection of Hastings Road and New Line Road is controlled by traffic signals. **Figure 2.6** shows a section of Hastings Road.

Figure 2.6: Hastings Road north of Old Northern Road (looking north)



Source: Maunsell, 2008

2.6.4 Glenhaven Road

Glenhaven road provides access to Glenhaven and Kellyville to the west of the study area. At the section east of Evans Road, it has one lane in each direction with a parking lane on the southern side of the carriageway. It has a speed limit of 60km/hr and a load limit of 8 tonnes. Glenhaven Road connects with Old Northern Road at a priority-controlled intersection.

2.6.5 Gilbert Road

Gilbert Road is a collector road that provides a link between Old Northern Road and Showground Road to the south west of the study area. It has a 4 lane carriageway with two trafficable lanes and two parking lanes. It has a speed limit of 60km/hr. Vehicles 8 tonnes and over are not permitted to use Gilbert Road.

2.7 Traffic Volumes

2.7.1 Daily Traffic Counts

RTA Traffic Volume Data has been obtained to determine the historical traffic growth and current midblock traffic flows in the surrounding area. **Table 2.5** shows historical Average Annual Daily Traffic (AADT) volumes at stations in the vicinity of the proposed development site. The location of the stations and the AADT for 2005 at these stations is shown in **Figure 2.7**.

Station Number	Location	1993	1996	1999	2002	2005	% growth
73118	Old Northern Road	14975	15787	17332	18630	19269	2.12%
74446	New Line Road	21649	24131	26378	26261	26382	1.66%
73075	Old Northern Road	18844	20783	22844	23210	24739	2.29%
72047	Old Northern Road	-	45557	43025	47609	48217	0.63%

Table 2.5: Historical Traffic Volumes and Growth

Source: RTA Traffic Volume Data

The data shows that between 1993 and 2005, there has been an average yearly growth rate of 1.68% in the surrounding area.



Figure 2.7: 2005 AADT data in the vicinity of the site

Source: RTA Traffic Volume Data 2005

The 2005 AADT shows that there were approximately 19,000 vehicles per day on Old Northern Road and approximately 26,000 vehicles daily on New Line Road in the vicinity of the study area.

2.7.2 Intersection counts

Manual traffic counts were undertaken by Australasian Traffic Surveys (ATS) at the AM (6:30 to 9:30) and PM (16:30 to 18:30) peak hours on 15th May 2008 at the following intersections:

- Old Northern Road / Glenhaven Road;
- Old Northern Road / Gilbert Road;
- Old Northern Road / Hastings Road; and
- New Line Road / Hastings Road.

Traffic counts at the intersection of Old Northern Road and New Line Road were taken on 6th June 2008 during the same peak hour time period. SCATS data for the signalised intersection of Old Northern Road and Kenthurst Road (TCS site 2954) on 15th May 2008 was provided by the RTA.

Analysis of the data shows that the AM peak period for the network was between 7.30am and 8.30am and the PM peak was between 5pm and 6pm.

The surveyed traffic data and a summary of the network turning traffic flows within the study area are included as **Appendix A**.

The latest traffic data shows that traffic flow in the peak hour traffic direction on Old Northern Road is approaching 1,000 veh/hr and that of New Line Road has exceeded 1,000 veh/hr. This implies that both roads are approaching capacity for a two lane road during the peak hours. Traffic flow on Hastings Road is relatively low (approximately 500 to 700 veh/hr) compared to the rest of the road network surrounding the study area.

2.8 Intersection Assessment

Intersection assessment based on the surveyed traffic data has been carried out using SIDRA 3.2, a computer based modelling package which calculates isolated intersection performance.

The main performance indicators for SIDRA 3.2 include:

- Degree of saturation (DoS) a measure of the ratio between traffic volumes and the capacity of the intersection;
- Average delay how long in seconds the average vehicle waits at the intersection; and
- Level of service (LoS) a measure of the overall performance of the intersection (Table 2.6).

Level of Service	Average Delay Traffic Signals and Roundabouts (secs/veh)		Give Way and Stop Signs
А	Less than 14	Good Operation	Good Operation
В	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
С	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals incidents will cause excessive delays	At capacity; requires other control mode
F	>70	Roundabouts require other control mode	At capacity; requires other control mode

Table 2.6: Performance Criteria for Intersections

Source: Guide to Traffic Generating Developments, RTA, 2002

The existing performance of the following intersections has been assessed:

- Old Northern Road / Hastings Road (priority controlled T intersection);
- Old Northern Road / Gilbert Road (signalised intersection);
- Old Northern Road / Glenhaven Road (priority controlled T intersection);
- Old Northern Road / Kenthurst Road (signalised intersection);
- Old Northern Road / New Line Road (roundabout); and
- New Line Road / Hastings Road (signalised intersection).

Table 2.7 summarises the existing intersection operation in the AM peak period and **Table 2.8**summarises the existing intersection operation of the PM peak period. More detailed results arepresented as **Appendix B**.

Intersection	Int Type	LoS	DoS	Ave Delay (s)	Worst Movement delay (s)	Longest Queue (m)	Longest Queue Movement
Old Northern Rd / Hastings Rd	Priority	F*	0.983	15.1	130.2	93	Hastings Road right turn
Old Northern Rd / Gilbert Rd	Signals	с	0.900	31.6	49.7	182	Gilbert Road right turn
Old Northern Rd / Glenhaven Rd	Priority	F*	0.936	10.9	96.7	67	Glenhaven Road right turn
Old Northern Road / Kenthurst Road	Signals	В	0.782	24.5	51.3	167	Old Northern Road eastbound thru
Old Northern Road / New Line Road	Round about	A	0.792	12.7	17.2	68	Old Northern Road eastbound left turn
New Line Rd / Hastings Rd	Signals	В	0.847	26.2	48.0	183	New Line Road northbound

Table 2.7: AM Peak Hour Intersection Performance

Source: Maunsell, 2008

LoS – Level of Service, DoS – Degree of Saturation

* Level of Service for Priority intersections is based on the worst movement average delay.

Level of Service for Signalised intersections is based on average intersection delay.

The SIDRA results for the AM peak suggest that most of the intersections surrounding the study area are operating at/close to capacity (DoS > 0.8). The priority intersections at Glenhaven Road and Hastings Road with Old Northern Road operate unsatisfactorily and have significant delays and queuing at the minor approaches as it is very difficult to find a gap to enter into the main stream traffic at Old Northern Road.

At the intersection of Old Northern Road/Gilbert Road, it is observed that large amount of green time has been given to the traffic on Old Northern Road. This has caused significant queuing on the Gilbert Road approach, especially the right turn movement into Old Northern Road.

The intersections of Old Northern Road/Kenthurst Road, Old Northern Road/New Line Road and New Line Road/Hastings Road operate with small amount of spare capacity.

Intersection	Int Type	LoS	DoS	Ave Delay (s)	Worst Movement delay (s)	Longest Queue (m)	Longest Queue Movement
Old Northern Rd / Hastings Rd	Priority	F*	0.956	11.9	119.2	72	Hastings Road right turn
Old Northern Rd / Gilbert Rd	Signals	С	0.867	31.3	52.1	184	Old Northern Road northbound
Old Northern Rd / Glenhaven Rd	Priority	D*	0.824	9.4	47.6	62	Old Northern Road southbound right turn
Old Northern Road / Kenthurst Road	Signals	В	0.882	27.7	43.7	154	Old Northern Road westbound right turn
Old Northern Road / New Line Road	Round about	А	0.467	9.8	14.9	26	New Line Road northbound
New Line Rd / Hastings Rd	Signals	С	0.909	32.1	55.3	207	New Line Road northbound

Table 2.8: PM Peak Hour Intersection Performance Assessment

Source: Maunsell, 2008

LoS - Level of Service, DoS - Degree of Saturation

* Level of Service for Priority intersections is based on the worst movement average delay.

Level of Service for Signalised intersections is based on average intersection delay.

The SIDRA results for the PM peak suggest that all the intersections are operating at/close to capacity (DoS > 0.8), except the roundabout at Old Northern Road/New Line Road. The priority intersections are not performing satisfactorily due to delays experienced on the minor approaches. Significant queuing is observed on the northbound direction at other intersections at Old Northern Road and New Line Road with heavy traffic movements returning home in this direction.

3.0 Future Transport Conditions

This section reviews the likely impacts of changes to the traffic flows and the road network for the future assessment year before any proposed development occurs in South Dural. Future year assessment will be undertaken for 2018 (10 years from existing) when it is anticipated that the development would be completed and fully occupied by this time.

3.1 Background Traffic Growth

A growth rate of 1.68% per annum has been determined based on historical RTA Traffic Volume Data. This yearly growth rate has been applied to the existing network flows to determine the future traffic conditions in 2018 (without the proposed development). There are no significant development sites within the immediate vicinity of the site. Therefore, it is assumed that this background growth rate will cover any traffic generation associated with other proposed local in-fill developments. The estimated traffic volumes at key intersections under this scenario (2018 without development) are presented in **Appendix C**.

3.2 Mitigation Measures

To cater for the background traffic growth in the vicinity of the study area, local infrastructure upgrades are required for the road network to continue to operate effectively.

Old Northern Road and New Line Road are currently approaching capacity during the peak hours. With the background traffic growth, it is assumed that both roads in the vicinity of the study area will need to be duplicated before 2018.

It is understood that the RTA is planning for the signalisation of intersection at Old Northern Road/Hastings Road, due to its current poor level of service. Therefore, it is assumed that this intersection will be upgraded to traffic signals with additional turning lanes for any future year assessment. The proposed layout of this intersection is shown in **Figure 3.1**.

With the duplication of Old Northern Road, more delays are expected for traffic from Glenhaven Road to be able to find a gap to enter the main road. To maintain a reasonable level of service for this intersection while maintaining all traffic movements, it is proposed that this intersection will be signalised with additional turning lanes when Old Northern Road is duplicated. The proposed layout of this intersection is shown in **Figure 3.2**.







Source: Maunsell, 2008

Source: Maunsell, 2008

Apart from the above major intersection upgrades, a short left turn lane of 100m is required on the western approach of the Old Northern Road/New Line Road and on the southern approach of Old Northern Road/Gilbert Road to maintain reasonable level of service in the future year. Intersection layouts for the 2018 without development scenario are included as **Appendix C**.

3.3 Intersection Assessment

The intersections within the study area with the proposed upgrades discussed in **Section 3.3** have been assessed using SIDRA Intersection 3.2. The results are presented in **Table 3.1** and **Table 3.2** for the future year scenario. Detailed results are provided in **Appendix D**.

Intersection	Int Type	LoS	DoS	Ave Delay (s)	Worst Movement delay (s)	Longest Queue (m)	Longest Queue Movement
Old Northern Rd / Hastings Rd	Signals	в	0.701	23.6	44.3	129	Hastings Road left turn
Old Northern Rd / Gilbert Rd	Signals	С	0.717	29.3	42.3	129	Gilbert Road right turn
Old Northern Rd / Glenhaven Rd	Signals	В	0.630	19.0	42.2	101	Old Northern Road northbound thru
Old Northern Road / Kenthurst Road	Signals	В	0.807	24.8	40.7	139	Old Northern Road westbound right turn
Old Northern Road / New Line Road	Round about	В	0.968	24.6	54.0	248	New Line Road northbound
New Line Rd / Hastings Rd	Signals	В	0.751	20.0	49.5	132	New Line Road northbound

Table 3.1: 2018 AM Peak Intersection Performance - without proposed development

Source: Maunsell, 2008

LoS – Level of Service, DoS – Degree of Saturation

Level of Service for Signalised intersections is based on average intersection delay.

Table 3.2: 2018 PM	Peak Intersection	Performance -	without	proposed	development

Intersection	Int Type	LoS	DoS	Ave Delay (s)	Worst Movement delay (s)	Longest Queue (m)	Longest Queue Movement
Old Northern Rd / Hastings Rd	Signals	В	0.848	22.9	42.2	127	Old Northern Road southbound left turn
Old Northern Rd / Gilbert Rd	Signals	В	0.700	27.7	49.6	126	Old Northern Road northbound
Old Northern Rd / Glenhaven Rd	Signals	В	0.836	27.4	47.5	150	Old Northern Road southbound right turn
Old Northern Road / Kenthurst Road	Signals	С	0.910	34.5	60.1	227	Old Northern Road westbound right turn
Old Northern Road / New Line Road	Round about	А	0.703	11.3	16.7	62	New Line Road northbound
New Line Rd / Hastings Rd	Signals	В	0.836	25.2	58.7	177	New Line Road northbound

Source: Maunsell, 2008

LoS – Level of Service, DoS – Degree of Saturation

Level of Service for Signalised intersections is based on average intersection delay.

The SIDRA results show that all intersections with the proposed upgrades will be operating with small amount of spare capacity and acceptable level of service in the future year scenario during both peak hour periods.

4.0 Proposed Development

The proposed development at South Dural is estimated to yield approximately 2,940 dwellings ranging from residential lots of various densities to integrated housing. The dwelling type and the number of lots of each type of housing are shown in **Table 4.1**. The estimates of residential dwellings have been prepared by Inspire Urban Design & planning.

Table 4.1: Proposed Dwelling Type and Number

Dwelling Type	Number of Dwellings (approximately)
Large Lots	100
Conventional Lots	800
Cottage Lots	240
Integrated Housing	1,800

Source: Inspire Urban Design and Planning, 2008

The total area of retail space within the proposed development is estimated to be approximately 1,000m². The proposed master plan for South Dural is shown in **Figure 4.1**.

Figure 4.1: Proposed Master Plan Layout



Source: Inspire Urban Design and Planning, 2009

5.0 Access Strategy

An access strategy for the site has been developed to determine the number of accesses the site requires to accommodate for the development traffic. This has been based on the number of trips expected to be generated by the development, the distribution of these trips to the surrounding areas and the internal road layout within the development.

5.1 Site Access

The site will generate approximately 1,900 vehicle movements in each peak hour. This would require 6 access locations to effectively manage traffic movements and to ensure that the environmental capacity levels for residential roads (approximately 300 vehicles per hour) are not exceeded. **Figure 5.1** shows the indicative location of proposed accesses and the lot catchment area for each access.



Figure 5.1: Access Strategy Plan

Source: Maunsell, 2008

Proposed access points to/from the development are situated at the following locations:

- Old Northern Road at existing signalised intersection opposite Gilbert Road (Access 1);
- Old Northern Road at proposed signalised intersection opposite Glenhaven Road (Access 2);
- Old Northern Road new signalised access south of Malabar Road (Access 3);
- Old Northern Road new signalised access north of Malabar Road (Access 4);
- New Line Road at existing roundabout with access to Bunnings (Access 5); and
- New Line Road at proposed roundabout with Sebastian Drive (Access 6).

Based on Journey to Work Data 2006, the majority of trips (64%) from the study area are assumed to travel south and east towards Sydney, Parramatta, Ryde and Blacktown. This means that the majority of trips could potentially enter and leave the development via Access 1.

To alleviate the amount of vehicles using Access 1 and to reduce the amount of vehicles travelling through the development, three additional accesses are proposed on Old Northern Road. These additional access locations are proposed at the intersection with Glenhaven Road, south of Malabar Road as well as north of Malabar Road (Accesses 2, 3 and 4). These accesses are also expected to accommodate vehicles travelling between the development and Round Corner as well as Baulkham Hills.

Two other accesses are proposed on New Line Road (Accesses 5 and 6) to accommodate for vehicle movements generated by the eastern side of the development.

All accesses should be designed or upgraded to provide safe access and egress for emergency vehicles to access the proposed development in the event of a bush fire.

5.2 Internal Road Network

The proposed master plan for South Dural shows the internal connecting roads between the various parts of the proposed development. It will be important to design the internal road layout to minimise opportunities for rat-running particularly for traffic using the internal collector road system as an alternative to avoid the heavy traffic flows on the external road network. The limited capacity at the intersection of Old Northern Road/Gilbert Road (Access 1), in particular the turning lanes in and out of the study area has been designed to avoid all southbound traffic during the AM peak using the internal road and this access as their preferred route and vice versa.

All internal roads should be designed or upgraded to provide safe access and egress for emergency vehicles to access the proposed development in the event of a bush fire. Perimeter roads following the proposed riparian corridor with appropriate setback zones should be allowed to promote effective bush fire management.

All the site access roads will connect to a main internal collector road as shown in **Figure 5.1**. This collector road will link neighbourhoods, local centre and the local streets within the proposed development.

5.3 Pedestrians and Cyclists

Internal cycle and pedestrian (shared) paths will be connected to existing shared path on Old Northern Road. The proposed traffic signals at Glenhaven Road (Access 2), Access 3 and Access 4 will improve pedestrian/cyclist connection between the study area and Round Corner.

Internal cycle and pedestrian paths will also be connected to existing footpaths and on-road cycle network on New Line Road. Footpaths may need to be provided at certain sections of roads surrounding the study area, especially from the access locations to bus stops.

5.4 Public Transport

The majority of the study area will be within the 400m catchment of current bus routes operating on Old Northern Road, New Line Road and Hastings Road. Therefore, most of the residents will be within a 400m safe walking distance of an existing or potential bus route operating on the external road network.

The proposed development may support the provision of improved service frequencies. There is potential to serve the site directly by diverting an existing bus route on Old Northern Road to operate along the internal collector road, if demand is sufficient when the whole site is completed. This proposal will be discussed with the bus operator and MoT.

If a bus route is to be operated along the internal collector road and some of the site accesses, these roads will need to be designed to accommodate bus movements.

6.0 Traffic Impact Assessment

This section assesses the likely traffic impacts of the proposed development on the local road network and recommends mitigation measures to alleviate any impacts.

6.1 Traffic Generation

The RTA Guide to Traffic Generating Developments (2002) has been used to determine the number of vehicle trips the development will generate.

It has been assumed that the lifestyle lots, conventional lots and cottage lots are of low density and the integrated housing is of medium density. Therefore the following peak hour (AM and PM peak) trip rates have been used:

- Low density residential 0.85 trips per dwelling; and
- Medium density residential 0.5 trips per dwelling.

Using these trip rates, the proposed development in South Dural will generate a total of 1,870 vehicle movements during each of the peak hours. It has been assumed that during the AM peak 80% of trips will be leaving the site and 20% will enter the site, due to the residential nature of the development. This distribution is reversed during the PM peak.

For the purpose of this analysis it has been assumed that trips generated by the local centre within the development will be self-contained and therefore have not been included in the assessment of the external road network.

6.2 Traffic Distribution and Assignment

Trip distribution and assignment for the development trips has been determined based on existing Journey to Work pattern, as described in **Section 2.2**. The traffic pattern of both Baulkham Hills and Hornsby LGAs has been taken into account of determining the trip distribution pattern of the proposed development. **Table 6.1** shows the destinations/travel directions and the proportion of development trips that will be travelling to.

Destination	% of trips
Baulkham Hills	19%
Hornsby	17%
South	56%
East	5%
West	2%

Table 6.1: Distribution of Proposed Development Trips

Source: Journey to Work (2006)

The total amount of development trips have been split between the six catchment areas of the proposed development, as seen in **Figure 5.1**. It has been assumed that vehicles will, in general, use the access associated with the catchment area. The distribution of trips in the AM peak has been reversed in the PM peak.

Development trips have been added to the 2018 base network according to the distribution pattern as illustrated in **Table 6.1**. The turning flows for all intersections are included as **Appendix E**.

6.3 Intersection Assessment

All the proposed access points and key intersections surrounding the study area have been modelled in SIDRA Intersection 3.2. The intersection performance results are shown in the following tables (**Table 6.2** and **Table 6.3**). Detailed results are provided in **Appendix F**.

Intersection	Int Type	LoS	DoS	Ave Delay (s)	Worst Movement delay (s)	Longest Queue (m)	Longest Queue Movement
Old Northern Rd / Hastings Rd	Signals	С	0.926	39.3	61.1	289	Hastings Road left turn
Old Northern Rd / Gilbert Rd / Access 1	Signals	D	0.869	44.4	71.0	166	Old Northern Road southbound
Old Northern Rd / Glenhaven Rd / Access 2	Signals	С	0.773	34.6	56.6	272	Old Northern Road southbound
Old Northern Road / Access 3	Signals	A	0.536	11.0	47.4	119	Old Northern Road northbound
Old Northern Road / Access 4	Signals	В	0.801	24.3	38.4	176	Old Northern Road northbound
Old Northern Road / Kenthurst Road	Signals	В	0.840	27.0	51.1	160	Old Northern Road westbound right turn
Old Northern Road /	Round about	ш	1.105	68.0	226.5	905	New Line Road northbound
New Line Road	Signals	D	0.950	44.8	78.9	242	Old Northern Road southbound right turn
New Line Road / Access to Bunnings / Access 5	Round about	А	0.540	6.9	15.4	48	New Line Road northbound
New Line Road / Sebastian Drive / Access 6	Signals	В	0.735	16.2	35.3	130	New Line Road northbound
New Line Rd / Hastings Rd	Signals	В	0.867	24.2	51.5	169	New Line Road northbound

Table 6.2: 2018 AM Peak Intersection Performance - with proposed development

Source: Maunsell, 2008

LoS - Level of Service, DoS - Degree of Saturation

Level of Service for Signalised intersections is based on average intersection delay.

Intersection	Int Type	LoS	DoS	Ave Delay (s)	Worst Movement delay (s)	Longest Queue (m)	Longest Queue Movement
Old Northern Rd / Hastings Rd	Signals	С	0.998	30.8	87.5	227	Old Northern Road northbound right turn
Old Northern Rd / Gilbert Rd / Access 1	Signals	D	0.834	50.8	75.0	211	Old Northern Road northbound
Old Northern Rd / Glenhaven Rd / Access 2	Signals	С	0.887	40.9	67.0	240	Old Northern Road southbound right turn

Table 6.3: 2018 PM Peak Intersection Performance - with proposed development

Intersection	Int Type	LoS	DoS	Ave Delay (s)	Worst Movement delay (s)	Longest Queue (m)	Longest Queue Movement
Old Northern Road / Access 3	Signals	A	0.530	14.5	53.8	126	Old Northern Road southbound
Old Northern Road / Access 4	Signals	A	0.597	13.1	69.7	176	Old Northern Road southbound
Old Northern Road / Kenthurst Road	Signals	E	1.000	57.8	120.1	449	Kenthurst Road right turn
Old Northern Road / New Line Road	Round about	A	0.819	13.4	21.0	97	New Line Road northbound
	Signals	С	0.846	33.5	47.4	126	Old Northern Road southbound right turn
New Line Road / Access to Bunnings / Access 5	Round about	А	0.760	7.0	16.7	110	New Line Road northbound
New Line Road / Sebastian Drive / Access 6	Signals	A	0.776	12.3	46.9	212	New Line Road northbound
New Line Rd / Hastings Rd	Signals	С	0.911	37.6	81.4	338	New Line Road northbound

Source: Maunsell, 2008

LoS - Level of Service, DoS - Degree of Saturation

* Level of Service for Priority intersections is based on the worst movement average delay.

Level of Service for Signalised intersections is based on average intersection delay.

The SIDRA analysis shows that intersections of Old Northern Road/Hastings Road and New Line Road/Hastings Road will both operate satisfactorily with the additional development traffic on the road network during both peak periods. Queueing at both intersections has increased when compared to the 2018 base case.

The intersection of Old Northern Road/New Line Road has been assessed as a roundabout (same geometry as in 2018 base case). However, the intersection will not operate satisfactorily (DoS >1) with extensive queueing on New Line Road during the AM peak. Therefore, the intersection has also been assessed as traffic signals and it operates satisfactorily with improved level of service during both peak hours. The proposed layout of the signalised intersection is shown in **Figure 6.1**.



Figure 6.1: Potential Traffic Signals Layout at Old Northern Road/New Line Road

Source: Maunsell, 2008

All the intersections associated with the proposed access locations will operate satisfactorily during the AM and PM peak periods in 2018, by introducing the access roads and additional turning lanes leading into the proposed development. Lengthening of the right turn lane onto Glenhaven Road to 150m is required to accommodate the high amount of right turning traffic in the PM peak period.

The intersection of Old Northern Road/Kenthurst Road operates adequately in the AM peak period however it operates at capacity in the PM peak period due to a heavy right turn from Old Northern Road to Kenthurst Road. The heavy right turn is not attributable to development traffic as it is evident in 2018 base case scenario.

At this stage, it is proposed that all movements are allowed at all the accesses, except a right turn ban is proposed from Old Northern Road into Access 2 opposite Glenhaven Road.

All proposed intersection layouts for 2018 (with development scenario) are included as Appendix E.

6.4 Infrastructure Funding

The costs of proposed infrastructure upgrades will be fully or partially contributed by the developers of South Dural in order to alleviate the impacts generated by their development. If the proposed upgrades offer sole benefits to the development (access roads and internal roads), then they would be fully funded by the developer.

If the upgrades satisfy not only the demand of the new development, but also some regional traffic demand or to make up some existing deficiency, then only a portion of the cost for the proposed upgrade will be apportioned to the developer.

Upon agreement of the proposed infrastructure package and an associated scope of works for each measure, a more through scrutiny of likely costs can be undertaken if appropriate within the context of the planning process.

7.0 Conclusion

Maunsell has prepared a TIA for the proposed development of South Dural in Sydney's north west. The proposed development includes approximately 2,940 residential dwellings and a small local centre at the southern edge of the proposed development. The proposed development in South Dural is not considered to have an adverse traffic impact on the surrounding road network.

7.1 Access Strategy

The development will require six access points on to the local road network. The number of accesses has been determined through the amount of trips the development is expected to generate and the environmental capacity of the access roads.

Four signalised access points will be provided along Old Northern Road opposite Gilbert Road, Glenhaven Road, south of Malabar Road and south of Kenthurst Road. These signalised intersections will formalise pedestrian crossing movements across Old Northern Road.

Two access points will also be provided on New Line Road to cater for the eastern side of the development. The proposed access opposite Bunnings will be controlled by a roundabout, while the other proposed access opposite Sebastian Drive will be controlled by traffic signals.

The internal road network will consist of a main collector road that runs through the site, connecting the neighbourhoods, the local centre and local streets within the development.

All internal roads should be designed or upgraded to provide safe access and egress for emergency vehicles to access the proposed development in the event of a bush fire. Perimeter roads following the proposed riparian corridor with appropriate setback zones should be allowed to promote effective bush fire management.

7.2 Intersection Performance

It is determined, as part of this study that road network upgrades are required to cater for the background traffic growth in the future years before the development of South Dural. These upgrades include:

- Duplication of Old Northern Road between Hastings Road and New Line Road;
- Duplication of New Line Road between Old Northern Road and Hastings Road;
- Signalisation of Old Northern Road/Hastings Road;
- Signalisation of Old Northern Road/Glenhaven Road;
- Addition of short (100m) left turn lane on the western approach of the Old Northern Road/New Line Road; and
- Addition of short (100m) left turn lane on the southern approach of Old Northern Road/Gilbert Road.

The infrastructure upgrades will provide additional capacity such that the road network can continue to operate effectively during both peak periods in 2018 before South Dural development occurs.

All intersections within the study area have been modelled with additional development trips and access roads and turning lanes leading to the proposed development. The SIDRA analyses confirm that all intersections and accesses will operate at appropriate level of service, with inherent reserve capacity.

7.3 Transport and Accessibility

Internal cycle and pedestrian (shared) paths will be connected to existing shared path on Old Northern Road. The proposed traffic signals at Glenhaven Road (Access 2), Access 3 and Access 4 will improve pedestrian/cyclist connection between the site and Round Corner.

Internal cycle and pedestrian paths will also be connected to existing footpaths and on-road cycle network on New Line Road. Footpaths may need to be provided at certain sections of roads surrounding the study area, especially from the access locations to bus stops.

The majority of the study area will be within the 400m catchment of current bus routes operating on Old Northern Road, New Line Road and Hastings Road. Therefore, most of the residents will be within a 400m safe walking distance of an existing or potential bus route operating on the external road network.

The proposed development may support the provision of improved service frequencies. There is potential to serve the site directly by diverting an existing bus route on Old Northern Road to operate along the internal collector road, if demand is sufficient when the whole site is completed. This proposal will be discussed with the bus operator and MoT.

If a bus route is to be operated along the internal collector road and some of the site accesses, these roads will need to be designed to accommodate bus movements.

Appendix A Surveyed Traffic Data and Existing Traffic Flows

2008 AM Peak Turning Flows



South Dural Urban Release Area K:\60044833_South_Dural\6. Draft docs\6.1. Reports\South Dural TIA_150109_Rev C.doc Revision C 15 January 2009 Page A-1
2008 PM Peak Turning Flows



South Dural Urban Release Area K:\60044833_South_Dural\6. Draft docs\6.1. Reports\South Dural TIA_150109_Rev C.doc Revision C 15 January 2009 Page A-2 Appendix B 2008 SIDRA Results



Glenhaven Road / Old Northern Road

2008 AM peak

Give-way

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	en Rd (:	south)								
1	L	110	5.5	0.383	8.4	LOS A	0	0.00	0.67	49.0
2	Т	587	10.7	0.384	0.0	LOS A	0	0.00	0.00	60.0
Approach		697	9.9	0.384	1.3	LOS A		0.00	0.11	57.9
Old North	ern Rd	(north)								
8	Т	680	6.3	0.363	0.0	LOS A	0	0.00	0.00	60.0
9	R	204	12.7	0.303	14.4	LOS A	14	0.68	0.94	43.4
Approach		884	7.8	0.363	3.3	LOS A	14	0.16	0.22	55.1
Glenhave	n Rd									
10	L	383	5.2	0.351	10.0	LOS A	13	0.51	0.82	47.1
12	R	160	3.1	0.936	96.7	LOS F	67	0.99	1.66	16.3
Approach		543	4.6	0.933	35.5	LOS C	67	0.65	1.07	30.5
All Vehicle	es	2124	7.7	0.936	10.9	Not Applicable	67	0.23	0.40	46.2

Symbols which may appear in this table:

Following Degree of Saturation # x = 1.00 for Short Lane with resulting Excess Flow * x = 1.00 due to minimum capacity

Following LOS # - Based on density for continuous movements

Following Queue # - Density for continuous movement



Site: 2008 AM (base) K:\60044833_South_Dural\4. Tech work area\4.3. Engineering\Traffic\SIDRA\with dev traffic\E_Glenhaven Rd_Old Northern Rd_v2_with dev_v2.aap Processed Aug 19, 2008 04:03:00PM

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Glenhaven Road / Old Northern Road

2008 PM peak

Give-way

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	en Rd (s	south)								
1	L	354	0.8	0.518	8.2	LOS A	0	0.00	0.67	49.0
2	Т	623	3.0	0.517	0.0	LOS A	0	0.00	0.00	60.0
Approach		977	2.3	0.518	3.0	LOS A		0.00	0.24	55.5
Old North	ern Rd ((north)								
8	Т	462	3.5	0.242	0.0	LOS A	0	0.00	0.00	60.0
9	R	411	0.5	0.824	28.9	LOS C	62	0.94	1.47	33.4
Approach		873	2.1	0.823	13.6	LOS A	62	0.44	0.69	43.7
Glenhave	n Rd									
10	L	226	1.8	0.233	10.0	LOS A	7	0.53	0.80	47.0
12	R	63	1.6	0.496	47.6	LOS D	15	0.94	1.05	25.9
Approach		289	1.7	0.495	18.2	LOS B	15	0.62	0.86	40.0
All Vehicle	es	2139	2.1	0.824	9.4	Not Applicable	62	0.26	0.51	47.7

Symbols which may appear in this table:

Following Degree of Saturation # x = 1.00 for Short Lane with resulting Excess Flow * x = 1.00 due to minimum capacity

Following LOS # - Based on density for continuous movements

Following Queue # - Density for continuous movement



Site: 2008 PM (base) K:\60044833_South_Dural\4. Tech work area\4.3. Engineering\Traffic\SIDRA\with dev traffic\E_Glenhaven Rd_Old Northern Rd_v2_with dev_v2.aap Processed Aug 19, 2008 01:37:09PM

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Gilbert Road / Old Northern Road

2008 AM peak

Signalised - Fixed time

Cycle Time = 70 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	ern Road	d (south eas	st)							
21	L	218	2.8	0.586	32.0	LOS C	79	0.91	0.83	31.9
22	Т	411	13.9	0.848	33.8	LOS C	111	0.98	0.98	31.1
Approach		629	10.0	0.848	33.2	LOS C	111	0.96	0.93	31.4
Old Northe	ern Road	d (north we	st)							
28	Т	576	6.1	0.371	12.5	LOS A	66	0.67	0.57	44.6
29	R	275	2.9	0.882	49.7	LOS D	92	1.00	1.09	25.3
Approach		851	5.1	0.882	24.5	LOS B	92	0.77	0.74	35.8
Gilbert Ro	ad									
30	L	201	5.5	0.183	14.7	LOS B	31	0.46	0.75	42.9
32	R	591	1.4	0.900	45.9	LOS D	182	1.00	1.15	26.4
Approach		792	2.4	0.900	38.0	LOS C	182	0.86	1.05	29.3
All Vehicle	es	2272	5.5	0.900	31.6	LOS C	182	0.86	0.90	32.1

Pedestrian Movements

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P13	50	22.4	LOS C	0	0.80	0.80
P15	50	26.6	LOS C	0	0.87	0.87
All Peds	100	24.5	LOS B	0	0.84	0.84

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS



Gilbert Road / Old Northern Road

2008 PM peak

Signalised - Fixed time

Cycle Time = 80 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old Northe	ern Road	d (south eas	st)							
21	L	301	1.0	0.614	28.9	LOS C	110	0.85	0.84	33.4
22	Т	737	2.4	0.867	32.3	LOS C	184	0.97	0.99	31.8
Approach		1038	2.0	0.867	31.3	LOS C	184	0.93	0.95	32.2
Old Northe	ern Road	d (north we	st)							
28	Т	376	6.4	0.222	10.2	LOS A	45	0.55	0.46	46.9
29	R	169	1.2	0.816	52.1	LOS D	64	1.00	0.96	24.6
Approach		545	4.8	0.816	23.2	LOS B	64	0.69	0.61	36.6
Gilbert Ro	ad									
30	L	217	0.9	0.235	20.4	LOS B	45	0.60	0.77	38.4
32	R	497	0.8	0.861	45.1	LOS D	157	1.00	1.05	26.7
Approach		714	0.8	0.861	37.6	LOS C	157	0.88	0.96	29.5
All Vehicle	s	2297	2.3	0.867	31.3	LOS C	184	0.86	0.87	32.2

Pedestrian Movements

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P13	50	27.2	LOS C	0	0.82	0.82
P15	50	22.5	LOS C	0	0.75	0.75
All Peds	100	24.9	LOS B	0	0.79	0.79

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS



Hastings Road / Old Northern Road

2008 AM peak

Give-way

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	ern Rd	(SE)								
22	Т	464	12.9	0.258	0.0	LOS A	0	0.00	0.00	60.0
23	R	206	2.4	0.601	27.4	LOS B	28	0.91	1.13	34.2
Approach		670	9.7	0.601	8.4	LOS A	28	0.28	0.35	48.7
Hastings	Road									
24	L	459	0.7	0.591	13.7	LOS A	25	0.76	1.06	43.5
26	R	170	1.2	0.983	130.2	LOS F	93	1.00	1.96	13.0
Approach		629	0.8	0.981	45.2	LOS D	93	0.83	1.31	26.7
Old North	ern Rd	(NW)								
27	L	364	0.8	0.619	8.2	LOS A	0	0.00	0.67	49.0
28	Т	797	4.9	0.619	0.0	LOS A	0	0.00	0.00	60.0
Approach		1161	3.6	0.619	2.6	LOS A		0.00	0.21	56.0
All Vehicle	es	2460	4.6	0.983	15.1	Not Applicable	93	0.29	0.53	42.4

Symbols which may appear in this table:

Following Degree of Saturation # x = 1.00 for Short Lane with resulting Excess Flow * x = 1.00 due to minimum capacity

Following LOS # - Based on density for continuous movements

Following Queue # - Density for continuous movement



Site: 2008 AM (base) K:\60044833_South_Dural\4. Tech work area\4.3. Engineering\Traffic\SIDRA\with dev traffic\Hastings Rd_Old Northern Rd_v2_with dev.aap Processed Aug 19, 2008 03:30:48PM

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Hastings Road / Old Northern Road

2008 PM peak

Give-way

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	ern Rd	(SE)								
22	Т	873	1.7	0.453	0.0	LOS A	0	0.00	0.00	60.0
23	R	270	0.4	0.447	16.6	LOS B	22	0.78	1.03	41.1
Approach		1143	1.4	0.453	3.9	LOS A	22	0.18	0.24	54.1
Hastings	Road									
24	L	393	0.3	0.343	10.2	LOS A	12	0.49	0.86	46.8
26	R	152	0.7	0.956	119.2	LOS F	72	0.99	1.72	13.9
Approach		545	0.4	0.954	40.6	LOS C	72	0.63	1.10	28.3
Old North	ern Rd	(NW)								
27	L	380	0.3	0.434	8.2	LOS A	0	0.00	0.67	49.0
28	Т	442	1.8	0.434	0.0	LOS A	0	0.00	0.00	60.0
Approach		822	1.1	0.434	3.8	LOS A		0.00	0.31	54.3
All Vehicle	es	2510	1.1	0.956	11.9	Not Applicable	72	0.22	0.45	45.2

Symbols which may appear in this table:

Following Degree of Saturation # x = 1.00 for Short Lane with resulting Excess Flow * x = 1.00 due to minimum capacity

Following LOS # - Based on density for continuous movements

Following Queue # - Density for continuous movement



Site: 2008 PM (base) K:\60044833_South_Dural\4. Tech work area\4.3. Engineering\Traffic\SIDRA\with dev traffic\Hastings Rd_Old Northern Rd_v2_with dev.aap Processed Aug 19, 2008 03:30:48PM

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Old Northern Rd / New Line Rd

2008 AM peak

Roundabout

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
New Line	Road									
1	L	33	6.1	0.579	10.7	LOS A	48	0.85	0.93	46.5
2	Т	572	7.0	0.584	9.5	LOS A	48	0.85	0.92	47.2
3	R	382	3.4	0.584	17.2	LOS B	45	0.85	0.99	41.9
Approach		987	5.6	0.584	12.5	LOS A	48	0.85	0.95	44.9
Industrial	Park									
4	L	29	10.3	0.104	9.1	LOS A	5	0.76	0.78	47.1
5	Т	48	10.4	0.104	8.0	LOS A	5	0.76	0.71	47.8
6	R	42	2.4	0.103	15.4	LOS B	5	0.75	0.91	43.2
Approach		119	7.6	0.104	10.9	LOS A	5	0.76	0.80	45.8
Old Northe	ern Rd N	l								
7	L	50	0.0	0.649	10.1	LOS A	56	0.82	0.88	46.7
8	Т	649	1.7	0.645	9.0	LOS A	56	0.82	0.86	47.4
9	R	565	3.2	0.645	16.7	LOS B	55	0.83	0.95	42.3
Approach		1264	2.3	0.645	12.4	LOS A	56	0.82	0.91	44.8
Old Northe	ern Road	W k								
10	L	653	4.4	0.792	13.2	LOS A	68	0.93	1.13	44.1
11	Т	21	19.0	0.269	9.3	LOS A	12	0.73	0.81	48.0
12	R	106	8.5	0.268	16.0	LOS B	12	0.73	0.92	42.9
Approach		780	5.4	0.792	13.5	LOS A	68	0.90	1.10	44.0
All Vehicle	es	3150	4.3	0.792	12.7	LOS A	68	0.85	0.96	44.7

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue # - Density for continuous movement



Old Northern Rd / New Line Rd

2008 PM peak

Roundabout

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
New Line	Road									
1	L	48	8.3	0.466	7.9	LOS A	26	0.63	0.68	47.9
2	Т	520	1.5	0.467	6.5	LOS A	26	0.63	0.59	48.7
3	R	416	1.7	0.467	14.1	LOS A	26	0.64	0.83	43.9
Approach		984	1.9	0.467	9.8	LOS A	26	0.64	0.70	46.4
Industrial	Park									
4	L	71	0.0	0.151	7.6	LOS A	7	0.63	0.67	47.9
5	Т	110	2.7	0.151	6.7	LOS A	7	0.63	0.61	48.7
6	R	74	2.7	0.151	14.0	LOS A	6	0.63	0.85	44.0
Approach		255	2.0	0.151	9.1	LOS A	7	0.63	0.70	47.0
Old North	ern Rd N									
7	L	40	5.0	0.400	8.3	LOS A	24	0.68	0.71	47.6
8	Т	437	1.8	0.400	7.0	LOS A	24	0.68	0.64	48.4
9	R	304	3.6	0.400	14.3	LOS A	23	0.68	0.82	43.8
Approach		781	2.7	0.400	9.9	LOS A	24	0.68	0.71	46.4
Old North	ern Road	W k								
10	L	343	0.6	0.384	8.3	LOS A	19	0.72	0.74	47.3
11	Т	19	15.8	0.207	8.3	LOS A	8	0.67	0.72	48.4
12	R	106	1.9	0.207	14.9	LOS B	8	0.67	0.90	43.6
Approach		468	1.5	0.384	9.8	LOS A	19	0.71	0.78	46.4
All Vehicle	es	2488	2.1	0.467	9.8	LOS A	26	0.66	0.72	46.5

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue # - Density for continuous movement



Kenthurst Rd / Old Northern Rd

2008 AM peak

Signalised - Fixed time

Cycle Time = 90 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	ern Rd e	ast								
5	Т	504	6.0	0.378	5.4	LOS A	76	0.43	0.38	52.2
6	R	380	6.1	0.769	43.8	LOS D	129	0.98	0.92	27.3
Approach		884	6.0	0.768	21.9	LOS B	129	0.66	0.61	37.5
Kenthurst	Rd									
7	L	502	6.0	0.541	15.7	LOS B	86	0.67	0.79	42.2
9	R	206	5.8	0.743	51.3	LOS D	81	1.00	0.90	24.9
Approach		708	5.9	0.743	26.1	LOS B	86	0.76	0.82	35.2
Old North	ern Rd w	vest								
10	L	234	6.0	0.266	17.7	LOS B	47	0.50	0.76	40.5
11	Т	538	5.9	0.782	29.8	LOS C	167	0.95	0.89	33.0
Approach		772	6.0	0.782	26.2	LOS B	167	0.82	0.85	34.9
All Vehicle	es	2364	6.0	0.782	24.5	LOS B	167	0.74	0.75	35.9

Pedestrian Movements

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P3	50	39.2	LOS D	0	0.93	0.93
P5	50	20.0	LOS B	0	0.67	0.67
All Peds	100	29.6	LOS C	0	0.80	0.80

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS



Kenthurst Rd / Old Northern Rd

2008 PM peak

Signalised - Fixed time

Cycle Time = 70 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	ern Rd e	ast								
5	Т	586	6.0	0.533	9.4	LOS A	99	0.65	0.58	47.7
6	R	523	5.9	0.856	40.2	LOS C	154	1.00	1.06	28.5
Approach		1109	6.0	0.856	23.9	LOS B	154	0.81	0.80	36.2
Kenthurst	Rd									
7	L	209	6.2	0.183	10.8	LOS A	19	0.44	0.70	46.6
9	R	366	6.0	0.846	43.7	LOS D	114	1.00	1.04	27.3
Approach		575	6.1	0.846	31.7	LOS C	114	0.80	0.91	32.2
Old North	ern Rd v	vest								
10	L	223	5.8	0.257	19.8	LOS B	44	0.62	0.78	38.9
11	Т	260	6.2	0.882	41.7	LOS C	90	1.00	1.09	28.0
Approach		483	6.0	0.882	31.6	LOS C	90	0.83	0.94	32.1
All Vehicle	es	2167	6.0	0.882	27.7	LOS B	154	0.81	0.86	34.1

Pedestrian Movements

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P3	50	26.6	LOS C	0	0.87	0.87
P5	50	27.5	LOS C	0	0.89	0.89
All Peds	100	27.0	LOS B	0	0.88	0.88

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS



Hastings Road / New Line Road

2008 AM peak

Signalised - Fixed time

Cycle Time = 80 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
New Line	Rd (sout	ih)								
1	L	372	0.5	0.847	39.0	LOS C	183	0.97	1.02	28.9
2	Т	795	5.8	0.846	32.4	LOS C	183	0.99	1.01	31.7
Approach		1167	4.1	0.846	34.5	LOS C	183	0.98	1.01	30.8
New Line	Rd (nort	h)								
8	Т	822	6.1	0.438	0.1	LOS C#	14#	0.00	0.00	59.9
9	R	262	0.4	0.808	48.0	LOS D	89	1.00	0.96	25.8
Approach		1084	4.7	0.808	11.7	LOS A	89	0.24	0.23	45.4
Hastings F	Rd									
10	L	190	1.1	0.206	20.2	LOS B	39	0.59	0.77	38.6
12	R	380	1.3	0.826	45.1	LOS D	121	1.00	0.99	26.8
Approach		570	1.2	0.826	36.8	LOS C	121	0.86	0.92	29.8
All Vehicle	es	2821	3.8	0.847	26.2	LOS B	183	0.67	0.69	34.9

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS # - Based on density for continuous movements

Following Queue # - Density for continuous movement

SIDRA SOLUTIONS

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Hastings Road / New Line Road

2008 PM peak

Signalised - Fixed time

Cycle Time = 80 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
New Line	Rd (sout	ih)								
1	L	279	0.7	0.892	46.9	LOS D	207	1.00	1.11	26.2
2	Т	935	3.9	0.893	39.3	LOS C	207	1.00	1.11	28.9
Approach		1214	3.1	0.893	41.0	LOS C	207	1.00	1.11	28.2
New Line	Rd (nort	h)								
8	Т	751	2.3	0.391	0.1	LOS C#	13#	0.00	0.00	59.9
9	R	263	0.4	0.874	53.6	LOS D	95	1.00	1.06	24.2
Approach		1014	1.8	0.874	14.0	LOS A	95	0.26	0.27	43.3
Hastings F	۶d									
10	L	229	1.3	0.249	20.5	LOS B	47	0.61	0.77	38.4
12	R	441	0.7	0.909	55.3	LOS D	157	1.00	1.16	23.8
Approach		670	0.9	0.909	43.4	LOS D	157	0.87	1.03	27.3
All Vehicle	es	2898	2.1	0.909	32.1	LOS C	207	0.71	0.80	31.9

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS # - Based on density for continuous movements

Following Queue # - Density for continuous movement

SIDRA SOLUTIONS

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Appendix C 2018 (without development) Traffic Flows and Intersection Layouts

2018 AM Peak (without development) Turning Flows



South Dural Urban Release Area K:\60044833_South_Dural\6. Draft docs\6.1. Reports\South Dural TIA_150109_Rev C.doc Revision C 15 January 2009 Page C-1

2018 PM Peak (without development) Turning Flows



South Dural Urban Release Area K:\60044833_South_Dural\6. Draft docs\6.1. Reports\South Dural TIA_150109_Rev C.doc Revision C 15 January 2009 Page C-2

2018 intersection layout (without development)



South Dural Urban Release Area K:\60044833_South_Dural\6. Draft docs\6.1. Reports\South Dural TIA_150109_Rev C.doc Revision C 15 January 2009 Page C-3

Appendix D 2018 (without development) SIDRA Results



Glenhaven Road / Old Northern Road

2018 AM peak

Signalised - Fixed time

Cycle Time = 80 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	en Rd (s	outh)								
1	L	130	5.4	0.129	14.8	LOS B	22	0.43	0.73	42.8
2	Т	693	10.7	0.608	25.6	LOS B	101	0.90	0.77	35.2
Approach		823	9.8	0.608	23.9	LOS B	101	0.83	0.77	36.2
Old North	ern Rd (I	north)								
8	Т	803	6.4	0.350	8.2	LOS A	69	0.53	0.46	49.0
9	R	241	12.9	0.630	40.0	LOS C	81	0.96	0.84	28.7
Approach		1044	7.9	0.630	15.5	LOS B	81	0.63	0.55	42.1
Glenhaver	ר Rd									
10	L	453	5.3	0.365	8.4	LOS A	20	0.21	0.65	48.6
12	R	189	3.2	0.595	42.2	LOS C	63	0.97	0.81	27.8
Approach		642	4.7	0.595	18.3	LOS B	63	0.44	0.70	39.9
All Vehicle	es	2509	7.7	0.630	19.0	LOS B	101	0.64	0.66	39.5

Pedestrian Movements

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	53	32.4		0	0.90	0.90
P5	53	32.4	LOS D	0	0.90	0.90
P7	53	23.3	LOS C	0	0.76	0.76
All Peds	159	29.4	LOS C	0	0.85	0.85

Symbols which may appear in this table:

Following Degree of Saturation # x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS



Glenhaven Road / Old Northern Road

2018 PM peak

Signalised - Fixed time

Cycle Time = 90 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	en Rd (s	outh)								
1	L	419	1.0	0.497	24.5	LOS B	96	0.71	0.81	35.8
2	Т	735	3.0	0.823	41.2	LOS C	130	1.00	0.98	28.2
Approach		1154	2.3	0.823	35.1	LOS C	130	0.89	0.92	30.5
Old North	ern Rd (north)								
8	Т	546	3.5	0.211	5.8	LOS A	43	0.40	0.34	51.8
9	R	485	0.4	0.836	41.1	LOS C	151	0.90	0.98	28.1
Approach		1031	2.0	0.836	22.4	LOS B	151	0.64	0.64	37.1
Glenhaver	n Rd									
10	L	267	1.9	0.210	8.1	LOS A	10	0.17	0.64	48.9
12	R	74	1.4	0.302	47.5	LOS D	30	0.94	0.76	26.0
Approach		341	1.8	0.302	16.7	LOS B	30	0.33	0.67	41.1
All Vehicle	es	2526	2.1	0.836	27.4	LOS B	151	0.71	0.77	34.2

Pedestrian Movements

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	53	30.2		0	0.03	0.03
P5	53	39.2	LOS D	0	0.93	0.93
P7	53	31.2	LOS D	0	0.83	0.83
All Peds	159	36.5	LOS C	0	0.90	0.90

Symbols which may appear in this table:

Following Degree of Saturation # x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS



Gilbert Road / Old Northern Road

2018 AM peak

Signalised - Fixed time

Cycle Time = 90 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	ern Road	d (south eas	st)							
21	L	257	2.7	0.331	16.7	LOS B	47	0.48	0.76	41.2
22	Т	485	13.8	0.717	39.6	LOS C	95	0.99	0.88	28.7
Approach		742	10.0	0.717	31.6	LOS C	95	0.82	0.84	32.1
Old North	ern Road	d (north we	st)							
28	Т	680	6.0	0.354	14.0	LOS A	77	0.64	0.55	43.3
29	R	324	2.8	0.696	42.3	LOS C	105	0.96	0.87	27.7
Approach		1004	5.0	0.696	23.2	LOS B	105	0.74	0.65	36.7
Gilbert Ro	ad									
30	L	237	5.5	0.698	33.1	LOS C	124	0.90	0.91	31.4
32	R	698	1.3	0.699	34.4	LOS C	129	0.91	0.88	30.8
Approach		935	2.4	0.699	34.1	LOS C	129	0.91	0.89	31.0
All Vehicle	es	2681	5.4	0.717	29.3	LOS C	129	0.82	0.79	33.2

Pedestrian Movements

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P13	50	26.4	LOS C	0	0.77	0.77
P15	50	34.7	LOS D	0	0.88	0.88
All Peds	100	30.6	LOS C	Ο	0.82	0.82

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS



Gilbert Road / Old Northern Road

2018 PM peak

Signalised - Fixed time

Cycle Time = 90 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	ern Road	d (south eas	st)							
21	L	356	1.1	0.386	13.2	LOS A	50	0.38	0.74	44.1
22	Т	870	2.4	0.680	28.1	LOS B	126	0.92	0.80	33.9
Approach		1226	2.0	0.680	23.8	LOS B	126	0.77	0.79	36.3
Old Northe	ern Road	d (north we	st)							
28	Т	444	6.3	0.213	10.7	LOS A	47	0.54	0.45	46.3
29	R	199	1.0	0.694	49.6	LOS D	74	1.00	0.86	25.4
Approach		643	4.7	0.694	22.7	LOS B	74	0.68	0.58	36.9
Gilbert Ro	ad									
30	L	256	0.8	0.700	36.3	LOS C	111	0.92	0.95	30.0
32	R	587	0.9	0.700	37.6	LOS C	120	0.93	0.89	29.5
Approach		843	0.8	0.700	37.2	LOS C	120	0.93	0.91	29.7
All Vehicle	es	2712	2.3	0.700	27.7	LOS B	126	0.80	0.78	34.1

Pedestrian Movements

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P13	50	29.6	LOS C	0	0.81	0.81
P15	50	25.7	LOS C	0	0.76	0.76
All Peds	100	27.6	LOS B	0	0.78	0.78

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS



Hastings Road / Old Northern Road

2018 AM peak

Signalised - Fixed time

Cycle Time = 80 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	ern Rd (SE)								
22	Т	548	13.0	0.244	7.1	LOS A	48	0.47	0.40	50.2
23	R	243	2.5	0.633	35.4	LOS C	72	0.97	0.91	30.4
Approach		791	9.7	0.633	15.8	LOS B	72	0.62	0.56	41.9
Hastings I	Road									
24	L	543	0.7	0.692	28.5	LOS C	129	0.87	0.86	33.6
26	R	200	1.0	0.667	44.3	LOS D	67	0.99	0.85	27.0
Approach		743	0.8	0.692	32.8	LOS C	129	0.91	0.86	31.5
Old North	ern Rd (NW)								
27	L	430	0.9	0.701	31.8	LOS C	110	0.89	0.86	32.0
28	Т	941	4.9	0.586	19.1	LOS B	112	0.82	0.72	39.4
Approach		1371	3.6	0.701	23.1	LOS B	112	0.84	0.76	36.7
All Vehicle	es	2905	4.6	0.701	23.6	LOS B	129	0.80	0.73	36.4

Pedestrian Movements

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
ÞQ	53	33.3		0	0.91	0.91
P11	53	16.9	LOS D	0	0.65	0.65
P13	53	33.3	LOS D	0	0.91	0.91
All Peds	159	27.8	LOS B	0	0.83	0.83

Symbols which may appear in this table:

Following Degree of Saturation # x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS



Hastings Road / Old Northern Road

2018 PM peak

Signalised - Fixed time

Cycle Time = 70 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	ern Rd (SE)								
22	Т	1031	1.7	0.456	8.8	LOS A	82	0.61	0.54	48.3
23	R	319	0.3	0.822	42.2	LOS C	86	1.00	1.07	27.7
Approach		1350	1.4	0.822	16.7	LOS B	86	0.70	0.66	41.1
Hastings F	Road									
24	L	464	0.2	0.531	22.3	LOS B	90	0.75	0.83	37.1
26	R	179	0.6	0.564	38.2	LOS C	53	0.97	0.81	29.2
Approach		643	0.3	0.564	26.7	LOS B	90	0.81	0.82	34.5
Old North	ern Rd (NW)								
27	L	449	0.2	0.848	41.3	LOS C	127	1.00	1.03	28.1
28	Т	522	1.7	0.379	18.2	LOS B	60	0.79	0.66	40.0
Approach		971	1.0	0.848	28.9	LOS C	127	0.89	0.83	33.4
All Vehicle	es	2964	1.0	0.848	22.9	LOS B	127	0.79	0.75	36.8

Pedestrian Movements

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
ÞQ	53	20.3		0	0.01	0.91
P11	53	18.6	LOS C	0	0.73	0.73
P13	53	29.3	LOS C	0	0.91	0.91
All Peds	159	25.7	LOS B	0	0.85	0.85

Symbols which may appear in this table:

Following Degree of Saturation # x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS



Old Northern Rd / New Line Rd

2018 AM peak

Roundabout

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
New Line	Road									
1	L	39	5.1	0.684	16.0	LOS B	60	0.96	1.12	41.8
2	Т	675	7.0	0.967	29.2	LOS C	248	0.98	1.51	33.5
3	R	451	3.3	0.968	54.0	LOS D	248	1.00	2.01	25.4
Approach		1165	5.5	0.967	38.3	LOS C	248	0.99	1.69	29.9
Industrial	Park									
4	L	35	11.4	0.162	11.0	LOS A	9	0.86	0.93	46.4
5	Т	57	10.5	0.162	9.9	LOS A	9	0.85	0.87	47.0
6	R	49	2.0	0.162	17.5	LOS B	8	0.83	0.95	41.7
Approach		141	7.8	0.162	12.8	LOS A	9	0.85	0.91	44.8
Old Northe	ern Rd N	1								
7	L	59	0.0	0.831	15.6	LOS B	106	1.00	1.18	42.0
8	Т	766	1.7	0.831	14.5	LOS A	106	1.00	1.18	43.1
9	R	667	3.1	0.831	22.9	LOS B	101	1.00	1.23	38.1
Approach		1492	2.3	0.830	18.3	LOS B	106	1.00	1.20	40.6
Old Northe	ern Road	d W								
10	L	771	4.4	0.876	20.4	LOS B	113	1.00	1.36	38.5
11	Т	25	20.0	0.044	8.5	LOS A	2	0.77	0.73	47.7
12	R	125	8.8	0.188	15.0	LOS B	11	0.81	0.91	43.3
Approach		921	5.4	0.876	19.4	LOS B	113	0.97	1.28	39.4
All Vehicle	es	3719	4.3	0.968	24.6	LOS B	248	0.98	1.36	36.3

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue # - Density for continuous movement



Old Northern Rd / New Line Rd

2018 PM peak

Roundabout

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
New Line	Road									
1	L	57	8.8	0.500	9.7	LOS A	30	0.72	0.86	47.3
2	Т	614	1.5	0.703	8.8	LOS A	62	0.76	0.84	47.8
3	R	492	1.8	0.703	16.7	LOS B	62	0.83	0.98	42.3
Approach		1163	2.0	0.703	12.2	LOS A	62	0.79	0.90	45.2
Industrial	Park									
4	L	84	0.0	0.203	8.1	LOS A	10	0.71	0.71	47.4
5	Т	130	3.1	0.203	7.2	LOS A	10	0.71	0.65	48.2
6	R	87	2.3	0.203	14.6	LOS B	9	0.71	0.90	43.7
Approach		301	2.0	0.203	9.6	LOS A	10	0.71	0.74	46.5
Old Northe	ern Rd N	I								
7	L	47	4.3	0.522	9.6	LOS A	37	0.80	0.86	46.9
8	Т	516	1.7	0.521	8.4	LOS A	37	0.80	0.80	47.5
9	R	359	3.6	0.520	16.0	LOS B	36	0.80	0.94	42.8
Approach		922	2.6	0.520	11.4	LOS A	37	0.80	0.86	45.5
Old Northe	ern Road	d W								
10	L	405	0.5	0.419	9.1	LOS A	27	0.86	0.80	46.4
11	Т	23	17.4	0.035	8.1	LOS A	2	0.74	0.70	48.0
12	R	125	1.6	0.171	14.5	LOS B	9	0.77	0.88	43.5
Approach		553	1.4	0.419	10.3	LOS A	27	0.84	0.82	45.7
All Vehicle	es	2939	2.1	0.703	11.3	LOS A	62	0.79	0.86	45.5

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements

Following Queue # - Density for continuous movement



Kenthurst Rd / Old Northern Rd

2018 AM peak

Signalised - Fixed time

Cycle Time = 80 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	ern Rd e	ast								
5	Т	595	6.1	0.249	6.6	LOS A	48	0.46	0.40	50.7
6	R	449	6.0	0.807	40.6	LOS C	139	0.98	0.97	28.4
Approach		1044	6.0	0.807	21.3	LOS B	139	0.68	0.64	37.9
Kenthurst	Rd									
7	L	593	6.1	0.568	13.6	LOS A	81	0.65	0.79	44.0
9	R	243	6.2	0.643	40.7	LOS C	79	0.97	0.84	28.4
Approach		836	6.1	0.643	21.5	LOS B	81	0.74	0.80	38.0
Old North	ern Rd v	vest								
10	L	276	6.2	0.315	19.3	LOS B	55	0.58	0.78	39.3
11	Т	757	5.9	0.806	35.4	LOS C	122	1.00	0.97	30.4
Approach		1033	6.0	0.806	31.1	LOS C	122	0.89	0.92	32.4
All Vehicle	es	2913	6.0	0.807	24.8	LOS B	139	0.77	0.79	35.8

Pedestrian Movements

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P3	50	34.2	LOS D	0	0.93	0.93
P5	50	24.8	LOS C	0	0.79	0.79
All Peds	100	29.5	LOS C	0	0.86	0.86

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS



Kenthurst Rd / Old Northern Rd

2018 PM peak

Signalised - Fixed time

Cycle Time = 90 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	ern Rd e	ast								
5	Т	692	6.1	0.307	9.4	LOS A	67	0.52	0.46	47.7
6	R	618	6.0	0.892	48.0	LOS D	227	1.00	1.07	25.9
Approach		1310	6.0	0.892	27.6	LOS B	227	0.75	0.75	34.2
Kenthurst	Rd									
7	L	247	6.1	0.198	10.4	LOS A	24	0.37	0.69	47.0
9	R	432	6.0	0.910	60.1	LOS E	177	1.00	1.15	22.6
Approach		679	6.0	0.910	42.0	LOS C	177	0.77	0.99	28.0
Old North	ern Rd v	vest								
10	L	263	6.1	0.341	23.8	LOS B	64	0.65	0.79	36.3
11	Т	462	6.1	0.852	48.9	LOS D	95	1.00	1.01	25.6
Approach		725	6.1	0.852	39.8	LOS C	95	0.87	0.93	28.7
All Vehicle	es	2714	6.0	0.910	34.5	LOS C	227	0.79	0.86	30.9

Pedestrian Movements

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P3	50	32.9	LOS D	0	0.86	0.86
P5	50	35.6	LOS D	0	0.89	0.89
All Peds	100	34.2	LOS C	0	0.87	0.87

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS



Hastings Road / New Line Road

2018 AM peak

Signalised - Fixed time

Cycle Time = 80 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
New Line	Rd (sout	:h)								
1	L	439	0.5	0.374	12.0	LOS A	52	0.37	0.75	45.1
2	Т	939	5.8	0.740	26.9	LOS B	132	0.94	0.86	34.5
Approach		1378	4.1	0.740	22.2	LOS B	132	0.76	0.82	37.3
New Line	Rd (nort	h)								
8	Т	971	6.1	0.518	0.1	LOS D#	17#	0.00	0.00	59.8
9	R	309	0.3	0.741	49.5	LOS D	57	1.00	0.89	25.4
Approach		1280	4.7	0.741	12.0	LOS A	57	0.24	0.21	45.1
Hastings F	Rd									
10	L	224	0.9	0.237	19.8	LOS B	45	0.59	0.77	38.8
12	R	449	1.3	0.751	36.3	LOS C	125	0.95	0.91	30.0
Approach		673	1.2	0.751	30.8	LOS C	125	0.83	0.86	32.5
All Vehicle	es	3331	3.7	0.751	20.0	LOS B	132	0.58	0.60	38.7

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS # - Based on density for continuous movements

Following Queue # - Density for continuous movement

SIDRA SOLUTIONS

Site: 2018 AM 2 lanes NLR K:\60044833_South_Dural\4. Tech work area\4.3. Engineering\Traffic\SIDRA\with dev traffic\Hastings Rd_New Line Rd_v2_with dev.aap Processed Aug 26, 2008 12:41:57PM

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Hastings Road / New Line Road

2018 PM peak

Signalised - Fixed time

Cycle Time = 90 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
New Line	Rd (sout	ih)								
1	L	329	0.6	0.280	11.4	LOS A	38	0.30	0.73	45.7
2	Т	1105	3.9	0.817	32.9	LOS C	177	0.97	0.95	31.5
Approach		1434	3.1	0.817	28.0	LOS B	177	0.82	0.90	33.9
New Line	Rd (nort	h)								
8	Т	887	2.3	0.461	0.1	LOS C#	15#	0.00	0.00	59.9
9	R	310	0.3	0.836	58.7	LOS E	65	1.00	0.97	22.9
Approach		1197	1.8	0.837	15.3	LOS B	65	0.26	0.25	42.2
Hastings F	Rd									
10	L	271	1.5	0.288	21.7	LOS B	60	0.61	0.78	37.6
12	R	521	0.8	0.819	42.1	LOS C	166	0.98	0.97	27.8
Approach		792	1.0	0.819	35.1	LOS C	166	0.85	0.90	30.5
All Vehicle	es	3423	2.2	0.836	25.2	LOS B	177	0.63	0.67	35.4

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS # - Based on density for continuous movements

Following Queue # - Density for continuous movement

SIDRA SOLUTIONS

Site: 2018 PM 2 lanes NLR K:\60044833_South_Dural\4. Tech work area\4.3. Engineering\Traffic\SIDRA\with dev traffic\Hastings Rd_New Line Rd_v2_with dev.aap Processed Aug 26, 2008 12:42:41PM

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Appendix E 2018 (with development) Traffic Flows and Intersection Layouts

2018 AM Peak (with development) Turning Flows



South Dural Urban Release Area K:\60044833_South_Dural\6. Draft docs\6.1. Reports\South Dural TIA_150109_Rev C.doc Revision C 15 January 2009 Page E-1



South Dural Urban Release Area K:\60044833_South_Dural\6. Draft docs\6.1. Reports\South Dural TIA_150109_Rev C.doc Revision C 15 January 2009 Page E-2

2018 PM Peak (with development) Turning Flows



South Dural Urban Release Area K:\60044833_South_Dural\6. Draft docs\6.1. Reports\South Dural TIA_150109_Rev C.doc Revision C 15 January 2009 Page E-3



South Dural Urban Release Area K:\60044833_South_Dural\6. Draft docs\6.1. Reports\South Dural TIA_150109_Rev C.doc Revision C 15 January 2009 Page E-4
DRAFT

2018 intersection layout (with development)



South Dural Urban Release Area K:\60044833_South_Dural\6. Draft docs\6.1. Reports\South Dural TIA_150109_Rev C.doc Revision C 15 January 2009 Page E-5



South Dural Urban Release Area K:\60044833_South_Dural\6. Draft docs\6.1. Reports\South Dural TIA_150109_Rev C.doc Revision C 15 January 2009 Page E-6 DRAFT

Appendix F 2018 (with development) SIDRA Results



Glenhaven Road / Old Northern Road

2018 AM peak with development

Signalised - Fixed time Cycle Time = 110 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	en Rd (s	outh)								
1	L	167	4.2	0.249	21.4	LOS B	33	0.73	0.78	37.8
2	Т	718	10.3	0.772	43.9	LOS D	150	0.99	0.91	27.2
Approach		885	9.2	0.772	39.7	LOS C	150	0.94	0.88	28.7
Access Ro	ad									
4	L	11	0.0	0.054	56.3	LOS D	6	0.92	0.68	23.5
5	Т	49	0.0	0.302	45.3	LOS D	41	0.93	0.73	26.7
6	R	40	0.0	0.302	53.4	LOS D	41	0.93	0.77	24.3
Approach		100	0.0	0.302	49.8	LOS D	41	0.93	0.74	25.3
Old North	ern Rd (north)								
7	L	10	0.0	0.573	43.6	LOS D	272	0.74	0.85	27.2
8	Т	1132	4.5	0.582	27.4	LOS B	272	0.74	0.67	34.2
9	R	274	11.3	0.763	56.2	LOS D	122	1.00	0.91	23.6
Approach		1416	5.8	0.763	33.1	LOS C	272	0.79	0.72	31.5
Glenhaver	า Rd									
10	L	461	5.2	0.773	17.1	LOS B	86	0.45	0.76	41.1
11	Т	12	0.0	0.673	48.4	LOS D	87	0.99	0.84	25.7
12	R	189	3.2	0.673	56.6	LOS E	87	0.99	0.84	23.5
Approach		662	4.5	0.773	29.0	LOS C	87	0.62	0.79	33.6
All Vehicle	es	3063	6.3	0.773	34.6	LOS C	272	0.80	0.78	30.8

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	50	49.2	LOS E	0	0.95	0.95
P3	50	35.2	LOS D	0	0.80	0.80
P5	50	48.2	LOS E	0	0.94	0.94
P7	50	35.2	LOS D	0	0.80	0.80



Glenhaven Road / Old Northern Road

2018 PM peak with development

Signalised - Fixed time Cycle Time = 130 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	en Rd (s	outh)								
1	L	428	0.9	0.670	29.1	LOS C	110	0.91	0.85	33.3
2	Т	838	2.6	0.861	58.1	LOS E	202	1.00	1.00	23.1
Approach		1266	2.1	0.861	48.3	LOS D	202	0.97	0.95	25.8
Access Ro	ad									
4	L	3	0.0	0.018	66.4	LOS E	2	0.93	0.64	21.2
5	Т	12	0.0	0.088	53.9	LOS D	13	0.91	0.66	24.2
6	R	10	0.0	0.088	62.1	LOS E	13	0.91	0.71	22.1
Approach		25	0.0	0.088	58.7	LOS E	13	0.91	0.68	22.9
Old North	ern Rd (I	north)								
7	L	40	0.0	0.291	24.5	LOS B	81	0.52	0.79	35.8
8	Т	628	3.0	0.291	14.7	LOS B	84	0.52	0.46	42.8
9	R	493	0.4	0.887	67.0	LOS E	240	1.00	1.04	21.1
Approach		1161	1.8	0.887	37.2	LOS C	240	0.72	0.72	29.6
Glenhaver	ר Rd									
10	L	300	1.7	0.553	13.2	LOS A	52	0.39	0.70	44.2
11	Т	49	0.0	0.500	57.9	LOS E	64	0.98	0.78	23.2
12	R	74	1.4	0.500	66.0	LOS E	64	0.98	0.79	21.3
Approach		423	1.4	0.552	27.6	LOS B	64	0.56	0.73	34.2
All Vehicle	es	2875	1.8	0.887	40.9	LOS C	240	0.81	0.82	28.3

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	10	59.1	LOS E	0	0.95	0.95
P3	10	40.8	LOS E	0	0.79	0.79
P5	10	59.1	LOS E	0	0.95	0.95
P7	10	40.8	LOS E	0	0.79	0.79



Gilbert Road / Old Northern Road

2018 AM peak with development

Signalised - Fixed time Cycle Time = 110 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	ern Road	d (SE)								
21	L	261	2.7	0.481	29.3	LOS C	76	0.69	0.79	33.2
22	Т	509	13.2	0.866	58.5	LOS E	128	1.00	1.03	23.0
23	R	46	0.0	0.639	71.0	LOS F	27	1.00	0.76	20.3
Approach		816	9.1	0.866	49.9	LOS D	128	0.90	0.94	25.3
Access Ro	ad									
24	L	172	0.0	0.800	62.9	LOS E	79	1.00	0.93	21.9
25	Т	111	0.0	0.211	41.7	LOS C	33	0.89	0.69	28.0
26	R	37	0.0	0.211	49.8	LOS D	33	0.89	0.76	25.3
Approach		320	0.0	0.800	54.0	LOS D	79	0.95	0.83	24.1
Old North	ern Road	d (NW)								
27	L	1	0.0	0.809	34.4	LOS C	165	0.85	0.86	30.8
28	Т	1063	3.9	0.655	26.5	LOS B	166	0.85	0.76	34.7
29	R	331	2.7	0.869	63.8	LOS E	147	1.00	1.03	21.8
Approach		1395	3.6	0.869	35.4	LOS C	166	0.89	0.82	30.4
Gilbert Ro	ad									
30	L	239	5.4	0.547	27.7	LOS B	70	0.89	0.82	34.1
31	Т	37	0.0	0.548	19.3	LOS B	70	0.89	0.75	39.2
32	R	700	1.3	0.837	58.6	LOS E	146	1.00	0.98	23.0
Approach		976	2.3	0.837	49.6	LOS D	146	0.97	0.93	25.4
All Vehicle	es	3507	4.2	0.869	44.4	LOS D	166	0.92	0.88	27.0

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
Р9	50	49.2	LOS E	0	0.95	0.95
P11	50	48.2	LOS E	0	0.94	0.94
P13	50	41.9	LOS E	0	0.87	0.87



Gilbert Road / Old Northern Road

2018 PM peak with development

Signalised - Fixed time Cycle Time = 130 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old Northe	ern Road	1 (SE)								
21	L	357	1.1	0.451	19.5	LOS B	64	0.67	0.80	39.0
22	Т	965	2.2	0.815	48.2	LOS D	211	0.99	0.93	25.8
23	R	184	0.0	0.758	70.8	LOS F	94	1.00	0.89	20.4
Approach		1506	1.7	0.816	44.2	LOS D	211	0.92	0.89	27.1
New NE le	g									
24	L	43	0.0	0.128	29.5	LOS C	13	0.80	0.73	33.1
25	Т	28	0.0	0.062	50.6	LOS D	11	0.88	0.63	25.1
26	R	9	0.0	0.062	58.7	LOS E	11	0.88	0.71	23.0
Approach		80	0.0	0.128	40.2	LOS C	13	0.84	0.69	28.5
Old Northe	ern Road	l (NW)								
27	L	1	0.0	0.426	46.3	LOS D	107	0.85	0.82	26.3
28	Т	527	5.3	0.455	38.5	LOS C	108	0.85	0.73	29.2
29	R	201	1.0	0.834	75.0	LOS F	106	1.00	0.96	19.6
Approach		729	4.1	0.834	48.6	LOS D	108	0.89	0.79	25.7
Gilbert Ro	ad									
30	L	263	0.8	0.829	61.9	LOS E	146	0.96	0.96	22.2
31	Т	148	0.0	0.828	56.2	LOS D	162	0.98	0.95	23.6
32	R	596	0.8	0.828	65.8	LOS E	162	1.00	0.96	21.4
Approach		1007	0.7	0.829	63.3	LOS E	162	0.99	0.96	21.9
All Vehicle	es	3322	1.9	0.834	50.8	LOS D	211	0.93	0.88	25.0

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P9	50	59.1	LOS E	0	0.95	0.95
P11	50	39.2	LOS D	0	0.78	0.78
P13	50	48.2	LOS E	0	0.86	0.86



Hastings Road / Old Northern Road

2018 AM peak with development

Signalised - Fixed time Cycle Time = 100 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	ern Rd (SE)								
22	Т	605	11.7	0.242	6.1	LOS A	54	0.40	0.35	51.4
23	R	317	1.9	0.824	55.2	LOS D	124	1.00	0.97	23.8
Approach		922	8.4	0.824	23.0	LOS B	124	0.61	0.56	36.8
Hastings F	Road									
24	L	695	0.6	0.916	56.9	LOS E	289	1.00	1.14	23.4
26	R	217	0.9	0.840	61.1	LOS E	93	1.00	0.98	22.4
Approach		912	0.7	0.917	57.9	LOS E	289	1.00	1.11	23.1
Old North	ern Rd (NW)								
27	L	494	0.8	0.926	44.4	LOS D	166	0.92	0.94	27.0
28	Т	1385	3.3	0.864	36.2	LOS C	251	0.98	1.00	30.1
Approach		1879	2.7	0.926	38.4	LOS C	251	0.97	0.99	29.2
All Vehicle	es	3713	3.6	0.926	39.3	LOS C	289	0.88	0.91	28.8

Pedestrian Movements

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
PQ	53	12.3	LOS F	0	0.92	0.92
P11	53	20.5	LOS C	0	0.72	0.64
P13	53	42.3	LOS E	0	0.92	0.92
All Peds	159	35.0	LOS C	0	0.83	0.83

Symbols which may appear in this table:

Following Degree of Saturation # x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity



Hastings Road / Old Northern Road

2018 PM peak with development

Signalised - Fixed time Cycle Time = 100 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	ern Rd (SE)								
22	Т	1258	1.4	0.465	7.1	LOS A	105	0.48	0.43	50.2
23	R	611	0.2	0.998	51.9	LOS D	227	1.00	0.96	24.7
Approach		1869	1.0	0.998	21.7	LOS B	227	0.65	0.61	37.6
Hastings F	Road									
24	L	502	0.2	0.475	21.7	LOS B	109	0.63	0.81	37.5
26	R	232	0.4	0.964	87.5	LOS F	119	1.00	1.28	17.6
Approach		734	0.3	0.964	42.5	LOS C	119	0.75	0.96	27.6
Old North	ern Rd (NW)								
27	L	473	0.2	0.981	48.5	LOS D	166	1.00	0.87	25.7
28	Т	633	1.4	0.528	30.8	LOS C	101	0.88	0.75	32.5
Approach		1106	0.9	0.981	38.3	LOS C	166	0.93	0.80	29.2
All Vehicle	es	3709	0.8	0.998	30.8	LOS C	227	0.75	0.74	32.5

Pedestrian Movements

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P9	53	43.2	LOS E	0	0.93	0.93
P11	53	28.1	LOS C	0	0.75	0.75
P13	53	43.2	LOS E	0	0.93	0.93
All Peds	159	38.2	LOS C	0	0.87	0.87

Symbols which may appear in this table:

Following Degree of Saturation # x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity



Old Northern Rd / New Line Rd

2018 AM peak with development

Signalised - Fixed time Cycle Time = 100 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
New Line	Road									
1	L	112	1.8	0.184	25.1	LOS B	30	0.76	0.76	35.5
2	Т	737	6.4	0.905	56.5	LOS D	163	1.00	1.12	23.5
3	R	411	3.4	0.576	34.7	LOS C	122	0.85	0.84	30.8
Approach		1260	5.0	0.905	46.6	LOS D	163	0.93	0.99	26.3
Industrial	Park									
4	L	35	11.4	0.553	37.5	LOS C	28	1.00	0.76	29.7
5	Т	57	10.5	0.552	35.2	LOS C	32	1.00	0.76	30.5
6	R	48	2.1	0.552	61.0	LOS E	32	1.00	0.76	22.5
Approach		140	7.9	0.552	44.6	LOS D	32	1.00	0.76	27.0
Old Northe	ern Rd N									
7	L	59	0.0	0.113	32.9	LOS C	20	0.72	0.74	31.5
8	Т	782	1.7	0.932	62.9	LOS E	175	1.00	1.19	22.0
9	R	670	3.1	0.937	45.5	LOS D	242	1.00	0.96	26.8
Approach		1511	2.3	0.937	54.0	LOS D	242	0.99	1.07	24.2
Old Northe	ern Road	W k								
10	L	859	4.0	0.950	18.5	LOS B	166	0.65	0.83	40.0
11	Т	25	20.0	0.127	44.7	LOS D	14	0.93	0.67	26.9
12	R	192	5.7	0.945	78.9	LOS F	100	1.00	1.20	19.1
Approach		1076	4.6	0.950	29.9	LOS C	166	0.72	0.89	33.2
All Vehicle	es	3987	4.0	0.950	44.8	LOS D	242	0.90	0.99	27.0

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements



Old Northern Rd / New Line Rd

2018 AM peak with development

Roundabout

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
New Line	Road									
1	L	112	1.8	0.789	20.2	LOS B	81	1.00	1.23	38.6
2	Т	737	6.4	1.105	124.3	LOS F	905	1.00	3.44	13.7
3	R	451	3.3	1.105	226.5	LOS F	905	1.00	5.46	8.9
Approach		1300	4.9	1.105	150.8	LOS F	905	1.00	3.95	12.0
Industrial	Park									
4	L	35	11.4	0.174	11.7	LOS A	10	0.88	0.94	45.7
5	Т	57	10.5	0.174	10.6	LOS A	10	0.87	0.92	46.8
6	R	49	2.0	0.174	18.3	LOS B	8	0.85	0.96	41.1
Approach		141	7.8	0.174	13.5	LOS A	10	0.87	0.94	44.3
Old North	ern Rd N	l								
7	L	59	0.0	0.843	16.9	LOS B	114	1.00	1.23	41.0
8	Т	782	1.7	0.848	15.7	LOS B	114	1.00	1.23	42.1
9	R	689	3.0	0.849	24.3	LOS B	109	1.00	1.28	37.2
Approach		1530	2.2	0.849	19.6	LOS B	114	1.00	1.25	39.6
Old North	ern Road	d W								
10	L	859	4.0	0.983	51.5	LOS D	261	1.00	2.24	24.9
11	Т	25	20.0	0.044	8.6	LOS A	2	0.78	0.74	47.7
12	R	193	5.7	0.282	15.0	LOS B	16	0.85	0.92	43.2
Approach		1077	4.6	0.983	43.9	LOS D	261	0.97	1.97	27.4
All Vehicle	es	4048	3.9	1.105	68.0	LOS E	905	0.99	2.30	21.4

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements



Old Northern Rd / New Line Rd

2018 PM peak with development

Signalised - Fixed time Cycle Time = 70 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
New Line	Road									
1	L	125	4.0	0.180	24.4	LOS B	30	0.71	0.77	36.0
2	Т	629	1.4	0.846	36.8	LOS C	96	1.00	1.02	29.8
3	R	440	1.1	0.807	37.9	LOS C	119	0.99	0.97	29.4
Approach		1194	1.6	0.846	35.9	LOS C	119	0.97	0.98	30.2
Industrial	Park									
4	L	88	4.5	0.795	46.2	LOS D	59	1.00	0.94	26.4
5	Т	130	3.1	0.795	38.5	LOS C	59	1.00	0.93	29.2
6	R	86	2.3	0.795	47.4	LOS D	47	1.00	0.92	26.2
Approach		304	3.3	0.795	43.2	LOS D	59	1.00	0.93	27.5
Old Northe	ern Rd N									
7	L	47	4.3	0.093	19.7	LOS B	9	0.78	0.73	39.0
8	Т	577	1.6	0.777	33.2	LOS C	85	1.00	0.93	31.4
9	R	446	2.9	0.828	39.4	LOS C	126	1.00	1.00	28.9
Approach		1070	2.2	0.828	35.2	LOS C	126	0.99	0.95	30.5
Old Northe	ern Road	W k								
10	L	427	0.5	0.394	11.5	LOS A	47	0.49	0.73	45.6
11	Т	23	17.4	0.127	32.7	LOS C	9	0.94	0.67	31.6
12	R	141	1.4	0.740	45.1	LOS D	48	1.00	0.89	26.9
Approach		591	1.4	0.740	20.4	LOS B	48	0.63	0.76	38.6
All Vehicle	es	3159	1.9	0.846	33.5	LOS C	126	0.91	0.93	31.3

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements



Old Northern Rd / New Line Rd

2018 PM peak with development

Roundabout

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
New Line	Road									
1	L	125	4.0	0.584	11.3	LOS A	40	0.81	0.97	45.9
2	Т	629	1.4	0.819	11.9	LOS A	97	0.89	1.06	45.4
3	R	492	1.8	0.819	21.0	LOS B	97	0.97	1.18	39.3
Approach		1246	1.8	0.819	15.4	LOS B	97	0.91	1.10	42.7
Industrial	Park									
4	L	84	0.0	0.233	8.6	LOS A	12	0.78	0.76	47.0
5	Т	130	3.1	0.233	7.8	LOS A	12	0.77	0.70	47.7
6	R	87	2.3	0.233	15.3	LOS B	11	0.77	0.93	43.3
Approach		301	2.0	0.233	10.2	LOS A	12	0.77	0.78	46.1
Old North	ern Rd N	I								
7	L	47	4.3	0.627	11.1	LOS A	53	0.88	0.96	46.1
8	Т	577	1.6	0.625	9.9	LOS A	53	0.88	0.95	47.0
9	R	447	2.9	0.625	17.6	LOS B	50	0.87	1.03	41.5
Approach		1071	2.2	0.625	13.2	LOS A	53	0.87	0.98	44.4
Old North	ern Road	d W								
10	L	427	0.5	0.481	10.0	LOS A	34	0.92	0.91	46.0
11	Т	23	17.4	0.038	8.3	LOS A	2	0.77	0.72	47.7
12	R	142	1.4	0.213	14.9	LOS B	11	0.82	0.91	43.3
Approach		592	1.4	0.481	11.1	LOS A	34	0.89	0.90	45.4
All Vehicle	es	3210	1.9	0.819	13.4	LOS A	97	0.88	0.99	44.0

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements



Kenthurst Rd / Old Northern Rd

2018 AM peak with development

Signalised - Fixed time Cycle Time = 90 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	ern Rd e	ast								
5	Т	691	5.9	0.276	6.5	LOS A	57	0.44	0.38	50.9
6	R	449	6.0	0.840	47.5	LOS D	160	1.00	1.01	26.1
Approach		1140	6.0	0.841	22.6	LOS B	160	0.66	0.63	37.0
Kenthurst	Rd									
7	L	593	6.1	0.543	14.4	LOS A	98	0.59	0.77	43.1
9	R	288	5.9	0.808	51.1	LOS D	109	1.00	0.96	25.0
Approach		881	6.0	0.808	26.4	LOS B	109	0.72	0.83	34.9
Old North	ern Rd v	vest								
10	L	455	5.9	0.532	20.5	LOS B	96	0.62	0.80	38.5
11	Т	913	6.0	0.811	36.1	LOS C	155	0.99	0.96	30.1
Approach		1368	6.0	0.811	30.9	LOS C	155	0.87	0.90	32.4
All Vehicle	es	3389	6.0	0.840	27.0	LOS B	160	0.76	0.79	34.5

Pedestrian Movements

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P3	50	38.3	LOS D	0	0.92	0.92
P5	50	24.2	LOS C	0	0.73	0.73
All Peds	100	31.2	LOS C	0	0.83	0.83

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements



Kenthurst Rd / Old Northern Rd

2018 PM peak with development

Signalised - Fixed time Cycle Time = 150 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	ern Rd e	ast								
5	Т	849	5.3	0.453	19.9	LOS B	153	0.63	0.56	38.8
6	R	618	7.3	1.000#	53.4	LOS D	227	1.00	0.89	24.3
Approach		1467	6.0	1.000	31.6	LOS C	227	0.76	0.68	32.1
Kenthurst	Rd									
7	L	247	6.1	0.172	10.2	LOS A	34	0.25	0.66	47.0
9	R	611	6.1	0.971	106.1	LOS F	449	1.00	1.30	15.3
Approach		858	6.1	0.971	78.5	LOS F	449	0.78	1.11	19.1
Old North	ern Rd v	vest								
10	L	308	5.8	0.514	30.4	LOS C	104	0.62	0.79	32.7
11	Т	468	6.0	0.984	120.1	LOS F	178	1.00	1.29	14.0
Approach		776	5.9	0.984	84.5	LOS F	178	0.85	1.09	18.1
All Vehicle	es	3101	6.0	1.000	57.8	LOS E	449	0.79	0.90	23.2

Pedestrian Movements

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P3	50	38.9	LOS D	0	0.72	0.72
P5	50	59.9	LOS E	0	0.89	0.89
All Peds	100	49.4	LOS D	0	0.81	0.81

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements



Hastings Road / New Line Road

2018 AM peak with development

Signalised - Fixed time Cycle Time = 80 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
New Line	Rd (sout	th)								
1	L	448	0.4	0.402	13.3	LOS A	60	0.42	0.76	44.0
2	Т	1021	5.3	0.867	37.4	LOS C	169	1.00	1.06	29.6
Approach		1469	3.8	0.867	30.0	LOS C	169	0.82	0.97	32.9
New Line	Rd (nort	:h)								
8	Т	1255	4.7	0.663	0.2	LOS D#	22#	0.00	0.00	59.7
9	R	469	0.2	0.843	51.5	LOS D	84	1.00	1.00	24.8
Approach		1724	3.5	0.843	14.2	LOS A	84	0.27	0.27	43.2
Hastings F	Rd									
10	L	316	0.6	0.318	19.3	LOS B	60	0.60	0.78	39.2
12	R	494	1.2	0.859	44.7	LOS D	156	1.00	1.04	26.9
Approach		810	1.0	0.859	34.8	LOS C	156	0.84	0.94	30.7
All Vehicle	es	4003	3.1	0.867	24.2	LOS B	169	0.59	0.66	36.0

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS # - Based on density for continuous movements

Following Queue # - Density for continuous movement



Site: 2018 AM 2 lanes NLR + dev K:\60044833_South_Dural\4. Tech work area\4.3. Engineering\Traffic\SIDRA\with dev traffic\revised analysis 120109 \Hastings Rd_New Line Rd_v2_with dev.aap Processed Jan 13, 2009 11:27:30AM

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Hastings Road / New Line Road

2018 PM peak with development

Signalised - Fixed time Cycle Time = 120 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
New Line	Rd (sout	ih)								
1	L	364	0.5	0.330	11.6	LOS A	49	0.28	0.73	45.5
2	Т	1470	2.9	0.904	48.3	LOS D	338	1.00	1.07	25.8
Approach		1834	2.5	0.904	41.0	LOS C	338	0.86	1.00	28.2
New Line	Rd (nort	h)								
8	Т	958	2.1	0.498	0.1	LOS D#	16#	0.00	0.00	59.8
9	R	366	0.3	0.911	81.4	LOS F	99	1.00	1.08	18.5
Approach		1324	1.6	0.911	22.6	LOS B	99	0.28	0.30	37.0
Hastings F	Rd									
10	L	577	0.7	0.657	33.8	LOS C	181	0.82	0.86	31.0
12	R	532	0.8	0.910	67.4	LOS E	255	1.00	1.10	21.0
Approach		1109	0.7	0.909	49.9	LOS D	255	0.91	0.98	25.3
All Vehicle	es	4267	1.7	0.911	37.6	LOS C	338	0.69	0.78	29.5

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS # - Based on density for continuous movements

Following Queue # - Density for continuous movement



Site: 2018 PM 2 lanes NLR + dev K:\60044833_South_Dural\4. Tech work area\4.3. Engineering\Traffic\SIDRA\with dev traffic\revised analysis 120109 \Hastings Rd_New Line Rd_v2_with dev.aap Processed Jan 13, 2009 11:28:28AM

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Access 3

2018 AM peak with development

Signalised - Fixed time Cycle Time = 90 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	ern Road	d S								
2	Т	1285	7.6	0.527	8.7	LOS A	119	0.57	0.51	48.4
3	R	32	0.0	0.163	22.3	LOS B	9	0.57	0.75	37.1
Approach		1317	7.4	0.528	9.0	LOS A	119	0.57	0.52	48.1
Access Ro	ad (3)									
4	L	128	0.0	0.536	47.3	LOS D	57	0.97	0.80	26.0
6	R	27	0.0	0.536	47.4	LOS D	57	0.97	0.80	26.0
Approach		155	0.0	0.537	47.3	LOS D	57	0.97	0.80	26.0
Old North	ern Road	d N								
7	L	7	0.0	0.486	16.5	LOS B	105	0.54	0.79	41.3
8	Т	1164	7.0	0.479	8.3	LOS A	105	0.54	0.49	48.9
Approach		1171	7.0	0.479	8.3	LOS A	105	0.54	0.49	48.8
All Vehicle	es	2643	6.8	0.536	11.0	LOS A	119	0.58	0.52	46.1

Pedestrian Movements

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
D1	53	27 A		0	0.01	0.01
Г I D2	52	57.4		0	0.91	0.91
гJ	55	0.4	LUS A	0	0.38	0.38
P5	53	34.7	LOS D	0	0.88	0.88
All Peds	159	26.1	LOS B	0	0.72	0.72

Symbols which may appear in this table:

Following Degree of Saturation # x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity



Access 3

2018 PM peak with development

Signalised - Fixed time Cycle Time = 100 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	ern Road	d S								
2	Т	1047	2.6	0.384	6.1	LOS A	83	0.43	0.38	51.4
3	R	128	0.0	0.530	53.8	LOS D	54	0.98	0.79	24.1
Approach		1175	2.3	0.530	11.3	LOS A	83	0.49	0.43	45.8
Access Ro	ad (3)									
4	L	32	0.0	0.104	42.8	LOS D	16	0.84	0.74	27.5
6	R	7	0.0	0.105	42.9	LOS D	16	0.84	0.74	27.4
Approach		39	0.0	0.104	42.8	LOS D	16	0.84	0.74	27.5
Old North	ern Road	d N								
7	L	27	0.0	0.522	25.1	LOS B	125	0.71	0.83	35.5
8	Т	1017	2.1	0.524	16.9	LOS B	126	0.71	0.63	41.0
Approach		1044	2.0	0.524	17.1	LOS B	126	0.71	0.64	40.8
All Vehicle	es	2258	2.1	0.530	14.5	LOS B	126	0.60	0.53	42.9

Pedestrian Movements

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	53	44.2	LOS E	0	0.94	0.94
P3	53	13.0	LOS B	0	0.51	0.51
P5	53	41.4	LOS E	0	0.91	0.91
All Peds	159	32.9	LOS C	0	0.79	0.79

Symbols which may appear in this table:

Following Degree of Saturation # x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity



Old Northern Road / Access 4

2018 AM peak with development

Signalised - Fixed time Cycle Time = 80 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	ern Road	d S								
2	Т	1311	7.5	0.783	22.5	LOS B	176	0.91	0.87	37.1
3	R	2	0.0	0.014	36.2	LOS C	1	0.81	0.66	30.0
Approach		1313	7.5	0.783	22.5	LOS B	176	0.91	0.87	37.1
Access Ro	ad (4)									
4	L	234	0.0	0.801	38.3	LOS C	143	0.97	0.96	29.2
6	R	268	0.0	0.801	38.4	LOS C	143	0.97	0.96	29.1
Approach		502	0.0	0.801	38.3	LOS C	143	0.97	0.96	29.1
Old North	ern Road	d N								
7	L	124	0.0	0.656	27.4	LOS B	126	0.85	0.85	34.2
8	Т	937	8.8	0.656	18.9	LOS B	133	0.84	0.74	39.5
Approach		1061	7.7	0.656	19.9	LOS B	133	0.84	0.76	38.8
All Vehicle	es	2876	6.3	0.801	24.3	LOS B	176	0.90	0.84	36.0

Pedestrian Movements

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	53	21.8	LOS C	0	0.74	0.74
P3	53	13.8	LOS B	0	0.59	0.59
P5	53	19.6	LOS B	0	0.70	0.70
All Peds	159	18.4	LOS B	0	0.67	0.67

Symbols which may appear in this table:

Following Degree of Saturation # x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity



Old Northern Road / Access 4

2018 PM peak with development

Signalised - Fixed time Cycle Time = 120 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
Old North	ern Road	d S								
2	Т	1046	2.6	0.360	5.1	LOS A	83	0.36	0.32	52.7
3	R	7	0.0	0.075	69.7	LOS E	4	0.98	0.66	20.5
Approach		1053	2.6	0.360	5.5	LOS A	83	0.36	0.32	52.1
Access Ro	ad (4)									
4	L	58	0.0	0.591	64.3	LOS E	62	1.00	0.80	21.6
6	R	67	0.0	0.591	64.4	LOS E	62	1.00	0.80	21.6
Approach		125	0.0	0.591	64.3	LOS E	62	1.00	0.80	21.6
Old North	ern Road	d N								
7	L	268	0.0	0.597	21.4	LOS B	173	0.63	0.82	37.7
8	Т	1212	1.7	0.597	12.6	LOS A	176	0.62	0.57	44.6
Approach		1480	1.4	0.597	14.2	LOS A	176	0.62	0.61	43.2
All Vehicle	es	2658	1.8	0.597	13.1	LOS A	176	0.54	0.51	44.1

Pedestrian Movements

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
D1	52	F 4 - 1		0	0.05	0.05
PT	53	54. I	LOS E	0	0.95	0.95
P3	53	8.1	LOS A	0	0.37	0.37
P5	53	51.3	LOS E	0	0.93	0.93
All Peds	159	37.9	LOS C	0	0.75	0.75

Symbols which may appear in this table:

Following Degree of Saturation # x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity



New Line Road / Access 5

2018 AM peak with development

Roundabout

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
New Line	Road S									
1	L	34	0.0	0.540	6.6	LOS A	48	0.15	0.51	50.0
2	Т	1321	29.0	0.539	6.3	LOS A	48	0.16	0.44	51.2
3	R	28	28.6	0.538	12.1	LOS A	48	0.16	0.64	45.9
Approach		1383	28.3	0.539	6.4	LOS A	48	0.16	0.44	51.0
Industrial	Estate									
4	L	19	21.1	0.029	10.3	LOS A	1	0.62	0.74	47.4
5	Т	1	0.0	0.029	8.6	LOS A	1	0.62	0.68	48.1
6	R	11	9.1	0.018	15.1	LOS B	1	0.62	0.78	43.4
Approach		31	16.1	0.029	11.9	LOS A	1	0.62	0.75	45.9
New Line	Road N									
7	L	17	17.6	0.395	7.8	LOS A	22	0.40	0.59	48.5
8	Т	971	0.0	0.392	6.2	LOS A	22	0.41	0.53	49.4
9	R	4	0.0	0.400	12.0	LOS A	22	0.41	0.68	44.9
Approach		992	0.3	0.392	6.2	LOS A	22	0.41	0.53	49.4
Access Ro	ad (5)									
10	L	17	0.0	0.037	12.5	LOS A	1	0.67	0.83	44.6
11	Т	1	0.0	0.037	11.4	LOS A	1	0.67	0.80	45.7
12	R	137	0.0	0.178	15.4	LOS B	7	0.70	0.91	42.9
Approach		155	0.0	0.178	15.0	LOS B	7	0.69	0.90	43.1
All Vehicle	es	2561	15.6	0.540	6.9	LOS A	48	0.29	0.51	49.7

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements



New Line Road / Access 5

2018 PM peak with development

Roundabout

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
New Line	Road S									
1	L	364	0.0	0.757	7.0	LOS A	99	0.36	0.48	48.8
2	Т	1355	46.0	0.756	7.3	LOS A	99	0.40	0.45	49.5
3	R	19	21.1	0.760	12.5	LOS A	110	0.42	0.58	44.8
Approach		1738	36.1	0.756	7.3	LOS A	110	0.39	0.46	49.3
Industrial	Estate									
4	L	28	28.6	0.039	10.1	LOS A	2	0.52	0.71	47.9
5	Т	1	0.0	0.040	8.0	LOS A	2	0.52	0.64	48.7
6	R	17	17.6	0.026	14.6	LOS B	1	0.53	0.77	43.9
Approach		46	23.9	0.039	11.7	LOS A	2	0.53	0.73	46.3
New Line	Road N									
7	L	11	9.1	0.275	7.0	LOS A	14	0.19	0.52	49.8
8	Т	764	0.0	0.275	5.6	LOS A	14	0.20	0.46	50.9
9	R	17	0.0	0.274	11.4	LOS A	14	0.20	0.65	45.7
Approach		792	0.1	0.275	5.7	LOS A	14	0.20	0.46	50.7
Access Ro	ad (5)									
10	L	4	0.0	0.013	14.0	LOS A	0	0.76	0.79	43.3
11	Т	1	0.0	0.013	13.0	LOS A	0	0.76	0.77	44.3
12	R	34	0.0	0.059	16.7	LOS B	3	0.79	0.88	41.9
Approach		39	0.0	0.059	16.3	LOS B	3	0.78	0.87	42.0
All Vehicle	es	2615	24.4	0.760	7.0	LOS A	110	0.34	0.47	49.5

Symbols which may appear in this table:

Following Degree of Saturation

x = 1.00 for Short Lane with resulting Excess Flow

* x = 1.00 due to minimum capacity

Following LOS

- Based on density for continuous movements



New Line Road / Access 6

2018 AM peak with development

Signalised - Fixed time Cycle Time = 60 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
New Line	Road S									
1	L	59	0.0	0.734	22.1	LOS B	127	0.85	0.89	37.3
2	Т	1316	4.3	0.735	13.9	LOS A	130	0.85	0.79	43.4
3	R	29	0.0	0.147	26.1	LOS B	7	0.76	0.74	34.9
Approach		1404	4.1	0.735	14.5	LOS A	130	0.85	0.79	42.9
Sebastian	Drive									
4	L	116	0.0	0.290	29.3	LOS C	29	0.86	0.78	33.2
5	Т	1	0.0	0.303	21.1	LOS B	29	0.86	0.69	37.9
6	R	68	0.0	0.160	29.3	LOS C	17	0.85	0.75	33.2
Approach		185	0.0	0.290	29.3	LOS C	29	0.86	0.77	33.2
New Line	Road N									
7	L	17	0.0	0.583	19.7	LOS B	93	0.76	0.83	38.9
8	Т	1103	1.7	0.584	11.5	LOS A	94	0.76	0.67	45.6
9	R	7	0.0	0.044	29.7	LOS C	2	0.82	0.69	33.0
Approach		1127	1.7	0.584	11.8	LOS A	94	0.76	0.67	45.3
Access Ro	ad (6)									
10	L	28	0.0	0.072	28.0	LOS B	7	0.81	0.72	33.9
11	Т	1	0.0	0.071	19.8	LOS B	7	0.81	0.59	38.9
12	R	235	0.0	0.692	35.3	LOS C	61	0.99	0.88	30.4
Approach		264	0.0	0.692	34.5	LOS C	61	0.97	0.86	30.8
All Vehicle	es	2980	2.6	0.735	16.2	LOS B	130	0.82	0.75	41.5

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	50	23.4	LOS C	0	0.88	0.88
P3	50	10.8	LOS B	0	0.60	0.60
P5	50	23.4	LOS C	0	0.88	0.88



New Line Road / Access 6

2018 PM peak with development

Signalised - Fixed time Cycle Time = 90 seconds

Vehicle Movements

Mov I D	Turn	Dem Flow (veh/h)	% HV	Deg of Satn (v/c)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate	Aver Speed (km/h)
New Line	Road S									
1	L	235	0.0	0.776	19.2	LOS B	207	0.75	0.86	39.2
2	Т	1741	2.6	0.775	10.7	LOS A	212	0.74	0.69	46.3
3	R	116	0.0	0.395	19.5	LOS B	28	0.56	0.77	39.0
Approach		2092	2.2	0.775	12.2	LOS A	212	0.73	0.71	45.0
Sebastian	Drive									
4	L	29	0.0	0.120	45.3	LOS D	12	0.90	0.73	26.7
5	Т	1	0.0	0.120	37.1	LOS C	12	0.90	0.66	29.7
6	R	17	0.0	0.064	45.5	LOS D	7	0.90	0.70	26.6
Approach		47	0.0	0.120	45.2	LOS D	12	0.90	0.71	26.7
New Line	Road N									
7	L	68	0.0	0.320	14.9	LOS B	65	0.45	0.76	42.5
8	Т	741	5.3	0.321	6.5	LOS A	65	0.45	0.39	50.9
9	R	28	0.0	0.287	36.4	LOS C	11	0.79	0.77	30.0
Approach		837	4.7	0.321	8.2	LOS A	66	0.46	0.44	49.0
Access Ro	ad (6)									
10	L	7	0.0	0.031	44.3	LOS D	3	0.88	0.67	27.0
11	Т	1	0.0	0.031	36.1	LOS C	3	0.88	0.60	30.1
12	R	59	0.0	0.230	46.9	LOS D	24	0.93	0.75	26.2
Approach		67	0.0	0.230	46.5	LOS D	24	0.93	0.74	26.3
All Vehicle	es	3043	2.8	0.776	12.3	LOS A	212	0.67	0.64	44.8

Mov I D	Dem Flow (ped/h)	Aver Delay (sec)	Level of Service	95% Back of Queue (m)	Prop. Queued	Eff. Stop Rate
P1	50	39.2	LOS D	0	0.93	0.93
P3	50	6.8	LOS A	0	0.39	0.39
P5	50	39.2	LOS D	0	0.93	0.93

Appendix I Retail and Commercial Potential



planning consultants

Incorporating Hirst Consulting Services

South Dural Urban Investigation Area Retail and Commercial Potential



Prepared for: The South Dural Residents Group Project No: 7015A Date: December 2008



South Dural Urban Investigation Retail and Commercial Potential

Printed: File Name: Project Manager: Client: Project Number: 23 December 2008 P:\PROJECTS\7015A South Dural Urban Investigation\Reports\7015A.1.doc Ellen Robertshaw Pascoe Planning Solutions on behalf of the South Dural Residential Group 7015A

Document history and status

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1 Location of surrounding centres

Appendices

A List of outlets within surrounding centres

1 Introduction

This assessment has been prepared by Don Fox Planning incorporating Hirst Consulting Services on behalf of the South Dural Residents Group in order to assist with a planning assessment of the urban potential of the South Dural Investigation Area.

The South Dural Investigation Area is that area bounded generally by Old Northern Road, Hastings Road and New Line Road. The bulk of this area is currently zoned Rural BA (Small Holdings – Agricultural Landscape) under the provisions of Hornsby Local Environmental Plan 1994.

The release of this land for urban purposes was previously considered as part of the Hornsby Shire Rural Lands Study conducted in August 1995, and independently in 2001.

This report aims to provide fresh advice regarding the feasibility, in terms of demand, for the provision of retail and non-retail commercial and community floorspace within the South Dural Investigation Area. In this regard the report will address the following:

- The likely scale of demand for convenience retailing on the site and the appropriate style and composition of uses;
- The relationship of any proposed centre with existing and proposed retail centres in the locality; and
- The position such a centre might occupy within the ultimate retail network in the area.

In order to address these issues, the following aspects will be discussed:

- Existing proposed and planned for retail facilities in the area;
- A potential trade area for any retail facilities provided as part of the South Dural investigation area;
- The likely characteristics of the future South Dural population;
- Population projections for the South Dural investigation area;
- Retail expenditure characteristics and trends of the potential South Dural population; and
- The likely demand for and potential composition of any retail centre including non-retail floorspace to be provided as part of the South Dural area.

2 Existing Retail Facilities in the Area

2.1 Introduction

Within the area surrounding South Dural there is a variety of centres of different size and function. The location of these centres in relation to South Dural is shown on the plan at **Figure 1**.



Figure 1 – Location of surrounding centres

2.2 Regional Centre

South Dural is within the catchment of the Castle Hill Regional Centre. Retailing in this centre is dominated by the Castle Towers Shopping Centre which comprises over 108,000m² of floorspace. The Shopping Centres Directory 2007, produced by the Property Council, identifies Castle Towers as a Super Regional Centre. This Centre is anchored by major tenants including David Jones, Myer, K Mart, Target, Coles, and Bi Lo and has in excess of 300 specialty shops. There is also a cinema complex and restaurant precinct within the Centre.

Baulkham Hills Council is currently considering an application to expand the Castle Towers Shopping Centre by more than 60,000m². Should this expansion proceed, the total floorspace of the Centre will be almost 173,000m². As part of this expansion, it is proposed to provide almost 20,000m² in department store and discount department store floorspace, 8,400m² of additional supermarket floorspace, 17,000m² of other retail floorspace, an additional 6,300m² of restaurant and café floorspace, and 5,000m² of cinemas and other entertainment facilities.

Castle Mall is another major retail centre within the Castle Hill Regional Centre. This centre is located on Old Northern road and comprises over 9,750m² of floorspace, 1,915m² is occupied by a discount variety outlet and 1,820m² of which is occupied by a Franklins supermarket. There are also 57 speciality stores in this centre.

There are a variety of retail and non-retail outlets along Old Northern Road, together with some community facilities such as a branch library.

Potential residents of the South Dural Investigation Area could also patronise facilities at the new Rouse Hill Regional Centre on Windsor Road at Rouse Hill. The centre currently comprises some 55,000m² of retail floorspace incorporating over 200 speciality shops with focus on fresh food, restaurants and cafes, homewares, fashion and entertainment. (Extract from Shopping Centre News, volume 26, No. 2 2008).

2.3 Local District Centres

Retail facilities at Round Corner Dural represent the closest convenience retail facilities to the South Dural area. The retail centre at Round Corner Dural comprises three main shopping centres, together with a smaller centre and street-front outlets along Kenthurst Road and New Line Road. We estimate the total retail and non-retail floorspace in Round Corner Dural to be approximately 14,700m².

The Village Green shopping centre comprises 19 speciality outlets with no major anchor tenant. Details of tenants within this centre are provided in **Appendix A**, which is the result of a recent field survey undertaken by DFP.

The **Round Corner Plaza** shopping centre accommodates a variety of retail and non-retail tenants including banks, solicitor and real estate agents. Outlets within Round Corner Plaza are also detailed in **Appendix A**. There are some 17 tenancies in the centre accommodating a variety of retail and non-retail services.:

Dural Mall is anchored by an ALDI store. A Woolworths supermarket is adjacent to Dural Mall. There are also 22 speciality outlets within the Dural Mall shopping centre including Post Office, banks, food stores and personal service providers.

Another centre known as the **Mirabelle Centre** is located behind the street frontage outlets along Old Northern Road and Kenthurst Road. This centre accommodates 13 tenants including restaurant, personal service providers, and some non-retail local serving businesses including construction companies and medical practitioners.

Along Kenthurst Road and Old Northern Road are street frontage outlets, many of which house non-retail facilities.

A complete list of both retail and non-retail facilities within Round Corner appears at **Appendix A** to this report. The variety and range of retail and non-retail facilities at Round Corner Dural make this centre a comprehensive local district centre, capable of providing services to the surrounding urban and rural areas.

The **Cherrybrook Village Shopping Centre** on Shepherds Drive is approximately three kilometres south-east of the South Dural Investigation area. This centre comprises 9,500m² of floorspace, 3,830m² of which is occupied by a Woolworths Supermarket. The centre also accommodates over 50 speciality outlets including food stores, clothing stores, cafes and a range of local serving non-retail outlets including banks, optometrists and other medical practitioners. A list of occupants currently in this centre is included in **Appendix A**.

2.4 Local Centres

The **Appletree Drive** neighbourhood centre on the corner of Shepherds Drive and Appletree Drive, Cherrybrook is a local convenience centre providing for the day-to-day needs of the surrounding neighbourhood. This centre comprises eleven outlets including a general store, bakery, newsagency, pharmacy, medical centre, physiotherapist, take-away food outlet, dentist, pathologist, beauty salon and a pizza restaurant. This centre has an estimated floorspace of 1,100m².

The **Oakhill Village Shopping Centre** on David Road, Castle Hill provides a similar range of services to the Appletree Centre. This centre is anchored by a 500m² IGA supermarket and has 16 speciality outlets including newsagent, Chinese restaurant, butcher, pizza restaurant, patisserie, chicken shop, liquor shop, beautician, medical practice and dentist. This centre provides 1,560m² of retail and non-retail floorspace.

The **Knightsbridge Shopping Centre** on the corner of Ridgecroft Drive and Gilbert Road, Castle Hill is approximately 2.5 kilometres west of the South Dural area. We estimate this centre comprises some 2,200m² of floorspace. Tenants within this centre include an IGA supermarket, delicatessen, bakery, newsagent, chemist, liquor outlet, real estate agent, butcher, video hire and beautician. There is a total of 15 retail and non-retail outlets in this local centre which provides services to its local neighbourhood.

This collection of centres is supported by two smaller village centres at Glenhaven and Dural. The **Dural Village Shopping Centre** on Old Northern Road near Galston Road comprises eight tenancies. Outlets in this centre include an IGA Supermarket, Liquorland, newsagent, take away food outlet, chemist and Chinese restaurant. At the time of the recent survey there was one vacant outlet in this centre. The **Glenhaven Shopping Centre** on Glenhaven Road near Hyde Avenue is a small local centre accommodating six outlets including a small supermarket/general store which incorporates video hire, newspapers and fruit and vegetable sales, a medical clinic, pharmacy, pizza restaurant, beautician and Chinese takeaway food outlet.

This network of centres is complemented by the Dural Service Centre which is located on the eastern side of New Line Road between Sebastian Drive and Quarry Road. The Dural Service Centre supports a variety of light industrial uses and bulky goods retail outlets, including fast food restaurants and major hardware chains. A complete list of uses within the Dural Service Centre also appears in **Appendix A** to this report.

The development of the South Dural area for residential purposes could well increase the level of support for these surrounding centres and there may also be the opportunity for complementary convenience retail facilities to be provided as part of the redevelopment of the South Dural area.

In addition, the preliminary concept plan for South Dural recognises the existence of a number of non-residential commercial uses fronting major roads around the site by proposing to incorporate such uses in appropriate zones in order to encourage future residential use in addition to the current uses.

3 Population

3.1 Introduction

The current (rural) population of the South Dural area is unlikely to be representative of the future community should the area be developed for residential purposes.

We would expect the ultimate population of the South Dural area to display similar characteristics to the surrounding residential areas of Dural and Glenhaven, although there is likely to be a much higher proportion of medium density housing within South Dural. In this regard, a collection of Census Collectors Districts based on the residential areas north of Pyes Creek and east of New Line Road, between Hastings Road and David Road, and the residential areas bounded generally by Gilbert Road, Old Northern Road, Glenhaven Road and Evans Road, have been used to generate an indication of the broad characteristics of the future population of the South Dural Area. These characteristics have been based on data available from the 2006 Census.

3.2 **Population Characteristics**

A summary profile of the population characteristics of the potential South Dural population compared to the Sydney metropolitan area as a whole is presented in Table 1.

TABLE 1: Extract from 2006 Basic Community Profile						
	South Dural					
	Surrogate Area	Sydney Metro				
Born in Australia	65.6%	60.4%				
Born Overseas	30.6%	31.7%				
AGE of PERSONS						
0-14	22.9%	19.5%				
15-24	17.4%	13.8%				
25-44	23.7%	30.6%				
45-64	30.2%	23.8%				
65 or more	5.8%	12.3%				
	0.070	12.070				
On Census Night, persons counted:						
At home	97.4%	96.7%				
Elsewhere in Australia	2.6%	3.3%				
Household Composition						
Couple with Children	65.7%	49.3%				
Couple without Children	24.2%	33.2%				
Single Parent	9.5%	15.6%				
Other Families	0.7%	1.9%				
Lone Person Households	6.4%	23.1%				
Group Households	1%	4%				
Dwolling Structure						
Separate House	01 /%	63.6%				
Anartments	91.4%	23.0%				
Other Medium Density	8.6%	11.8%				
Other (including not stated)	0.0%	0.7%				
other (molading not stated)	0.070	0.7 /0				
Persons per Dwelling	3.3	2.7				
Tenure						
Owned	36.7%	31.9%				
Being Purchased	53.8%	33.1%				
Rented	8.3%	31.3%				
Other	1.2%	3.7%				
Medians						
Weekly Rent	\$418	\$250				
Monthly Mortgage	\$2 270	Ψ200 \$1.833				
Annual Household Income	\$111 800	\$60.010				
	φιι,	ψου,στο				
Weekly Household Income						
\$0 - \$649	9.8%	25.1%				
\$650 - \$1999	31.0%	40.6%				
\$2000 +	46.1%	23.0%				
Other, including not stated	13.2%	11.3%				
Average Vehicles per Household	2.2	1.5				
Households with no vehicle	1%	13%				

Based on the analysis of the surrogate area, the population of South Dural could display the following characteristics:

- A younger population compared to that of the Sydney metropolitan area. The proportion of 0 to 14 and 15 to 24 year olds is likely to be higher than that of the Sydney metropolitan area.
- The dominant household is likely to comprise a couple with children. The next most represented household is likely to be a couple without children. Lone person households are expected to make up only a small proportion of households within the South Dural area.
- The dominant dwellings are likely to comprise a separate dwelling on its own allotment of land, although a significant proportion of integrated housing and other forms of medium density housing is also likely.
- The average occupancy is likely to be higher than that of the average Sydney household. In 2006, the average occupancy rate of households of the surrogate area was 3.3 persons per dwelling.
- It is likely that most residents will be owner/occupiers, although the majority of these will be paying off a mortgage. Only a small proportion of dwellings are likely to be rented.
- Those households paying a mortgage will have significant financial commitments in terms of meeting monthly payments. However, given the median annual income of households is likely to be significantly greater than that of the average Sydney household, this commitment is unlikely to result in these households having restricted spending capacity.
- Members of these households are likely to be relatively mobile, with an average of more than two vehicles per household, and very few households having no vehicle.
- The majority of households are likely to be on a high weekly income, particularly when compared to the Sydney metropolitan population.

3.3 **Population Projections**

For the purposes of assessing the development potential of the area, a development timeline has been considered based on a preliminary development concept prepared by others. Under this scenario 2,900 dwellings may be possible. Table 2 is an estimate of the maximum development potential of the South Dural area.

Table 2: Assumed Development Potential								
	2011	2016	2021	2025	2031	2036		
Assumed development scenario	200	600	1300	1900	2400	2900		
Source: DFP estimates								
Notes: Development relates to number of households								

Based on the staging as indicated in Table 2, maximum population projections for the South Dural area as shown in Table 3 could result.
Table 3: South Dural Population Projections 2008 - 2021								
	20	08	20	11	2016		2021	
Area	Persons	H'holds	Persons	H'holds	Persons	H'holds	Persons	H'holds
Assumed development								
scenario	0	0	670	200	1,920	600	4,095	1,300
		iald actimat	aa in Tahla C		anav ratao of	2.25		hold in

Source: DFP estimates based on yield estimates in Table 2 and occupancy rates of 3.35 persons per household in 2011, 3.2 persons per household in 2016 and 3.15 persons per household in 2021

This notional development scenario could see 600 households in South Dural by 2016 and 1,300 households by 2021. We assume that full development of the area may not occur before 2036 under this scenario.

3.4 Expenditure Potential

Accepting these broad characteristics of the possible future resident population of the South Dural area, it is possible to estimate the likely theoretical household expenditure across the range of retail commodity groups by evaluating the results for such a community from the 2006 Census, if the community had existed then, with information from the 2003/2004 Household Expenditure Survey, updated by applying the most recent Consumer Price Index. The results for the notional South Dural population, based on the above scenario are presented in Table 4 below. These results have been compared to the Sydney metropolitan area for comparison purposes.

Table 4: Estimated Retail Expenditure per South Dural Household and in Total, 2011 to 2021						
Retail Commodity Group	\$per Household	Total all households 2011 (\$mil)	Total all households 2016 (\$mil)	Total all households 2021 (\$mil)	Sydney Av. \$ per Household	
Food for Home	\$10,256.7	\$2.1	\$6.7	\$14.0	\$8,691.5	
Clothing	\$3,058.7	\$0.6	\$2.0	\$4.2	\$2,327.3	
Small Household Goods	\$5,468.1	\$1.1	\$3.5	\$7.5	\$4,501.8	
Large Household Goods	\$8,579.6	\$1.8	\$5.6	\$11.7	\$6,885.7	
Personal Services	\$3,364.4	\$0.7	\$2.2	\$4.6	\$2,647.2	
Food Restaurants	\$2,610.7	\$0.5	\$1.7	\$3.6	\$1,932.4	
Take Away Food	\$2,039.9	\$0.4	\$1.3	\$2.8	\$1,560.1	
TOTAL (\$)	\$35,378.1	\$7.3	\$23.0	\$48.2	\$28,546.0	
Supermarket Expenditure	\$10,720.7	\$2.2	\$7.0	\$14.6	\$9,128.0	
Source: ABS: Basic Community Profile, Household Income Data.						
ABS: Household Expenditure Survey, 2003/04						
Detailed Expenditure Items, Cat. No. 6535.0.55.001						
Base Data: ABS Consumer Price Index, March 2008						
Totals: Annual Growth Rate of 1.0% factored in						

The available expenditure from the average South Dural household is likely to be significantly higher per year than the average Sydney household. If South Dural had existed in 2008, we estimate each household could expend \$35,400 across the range of retail commodity groups. This is almost \$7,000 per year more than the average Sydney household.

Based on this development scenario, we estimate the following expenditure may be available from South Dural households:

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- In 2011 there could be \$7.3 million available;
- By 2016 we estimate there could be \$23 million available; and
- \$48.2 million in 2021.

3.5 Expenditure Distribution

The way in which retail expenditure is distributed throughout the retail network can vary significantly depending upon accessibility to different centres and the level of services provided by a centre.

As described in Section 2 of this report, the South Dural area is surrounded by a comprehensive network of local, large local/district and major regional centres. We would anticipate however that the potential population of the South Dural area could not only support some of the retail and non-retail facilities in these centres, there may also be the potential for facilities to be provided within the South Dural area to directly service these households.

Previous experience in urban areas would suggest that as much as 25% of household expenditure could be captured by local facilities and be spent within locally available convenience retail outlets. Even if we conservatively estimate that only 20% of such expenditure is retained, the following expenditure could be available to support outlets within a local retail centre:

Under the adopted scenario there could be:

- \$1.46 million dollars available in 2011;
- \$4.6 million available in 2016; and
- \$9.64 million available in 2021.

Beyond 2021 there is likely to be additional support for any local retail facilities as the population of the area increases. Without factoring in a growth in spending (ie – based on population growth only), and using 2008 dollar values, we estimate the total available ultimate expenditure from all South Dural households could be \$102.6 million.

If 20% of this available expenditure continues to be directed to locally provided retail outlets within South Dural, \$20.5 million expenditure could ultimately be available.

These estimates are considered particularly conservative as they are based on a 2008 dollar value and do not allow for any increase in spending capacity. Historically, the growth in spending has averaged around 1% per annum (although it has been as high as 3% per annum). If such a trend continued, the total amount of expenditure available to support local retail facilities within South Dural could be \$26.8 million.

3.6 Turnover Estimates

In order to establish how much retail floorspace may be able to be supported by a population, it is necessary to calculate the sales requirements of different retail facilities.

Depending on their size, location and the range of products available, supermarkets and speciality stores can experience significantly different turnovers. For example, from our experience a full range supermarket such as the Woolworths located within the Round Corner Dural Centre might attract a turnover of up to \$9,000 per square metre per annum in 2008, but speciality stores are likely to have a much lower average turnover. Estimates of the turnovers of various retail facilities for the years 2008-2021 are provided in Table 5 below:

Table 5: Estimated Turnovers of Various Retail Facilities				
	Estimated Turnover \$/m²/year			
Retail Facility	2008	2011	2016	2021
Full-line supermarket (Average size 3,600sqm)	\$9,000	\$9,270	\$9,734	\$10,220
Smaller supermarket (less than 2,000sqm)	\$8,000	\$8,240	\$8,652	\$9,085
Specialty shops (includes food and non-food and personal service providers)	\$5,200	\$5,356	\$5,624	\$5,905
Source: DFP estimates. 1% growth rate/annum factored in.				

3.7 Potential Retail and Non-Retail Provision

It is generally not economically viable to construct retail projects in a piecemeal fashion as additional expenditure becomes available. The market will dictate when such facilities might be supportable, however it is likely that some or all of the outlets may experience slightly reduced turnovers until such time as the support population has increased to a point where turnovers equivalent to those estimates provided in Table 5 may be able to be achieved.

Given that development within the South Dural area is likely to occur over an extended period of time, a staged development where additional retail floorspace is added in increments may be warranted.

Using 2016 as a benchmark for the initial development, we estimate that based on the adopted scenario, over 800m² of retail floor space may be supportable within South Dural in 2016. These estimates assume only speciality outlets will be provided by that time.

These estimates do not include any non-retail floorspace that may be provided. As can be seen from the lists included at **Appendix A** to this report, in order to ensure a neighbourhood centre provides a complete range of services and facilities, provision of some local servicing non-retail floorspace within a centre is essential. Such floorspace could be occupied by professionals such as doctors, dentists, physiotherapists, engineers, travel agents, accountants, solicitors and the like.

In our experience, such floorspace is generally provided at a rate of $0.75m^2$ per household. On this basis, in 2016 there could be a demand for $450m^2$ of such floorspace. If such floorspace was provided, total floorspace of $1,250m^2$ might be supportable by 2016.

Ultimately, we estimate the following retail floorspace could be supportable in South Dural:

Available expenditure = \$20.5 million

- 1,000m² of small supermarket (@ \$10,547/m² in 2036)
 - = \$10.55 million +
- 1,400m² of speciality retail floorspace (@ \$6,855/m² in 2036) +
- 600m² of non-retail/local serving office floorspace (20% of floorspace)

Total floorspace = $3,000m^2$

Table 6 below is a summary of the potential floorspace that may be supportable in 2016 and upon ultimate development of the South Dural area.

Table 6: Potential Floorspace Provision						
	2016	Ultimate				
Potential supportable floorspace	Assumed Yield Scenario	Assumed Yield Scenario				
Supermarket (assuming small supermarket)	0	1000				
Specialty Retail	800	1400				
Non-retail	500	600				
Total floorspace	1300	3000				
Notes:						
All floorspace estimates in m ²						
Estimated turnover of small supermarket in 2036 = \$10,547/m ²						
Estimated turnover of specialty shop floorspace in $2036 = (6.855)/m^2$						

Based on the accessibility of larger centres such as Round Corner Dural, Cherrybrook and Castle Hill, it is unlikely that a large, full-line supermarket would be supportable in any retail provision in South Dural. However, it is considered that a small supermarket/grocery store, similar to the IGA outlets at Knightsbridge and Oakhill, would serve as an appropriate 'anchor' for any small local centre in South Dural. However, such floorspace may not be supportable until the area is almost fully developed.

The quantum of non-retail floorspace has been increased only slightly above the 2016 floorspace provision which was calculated on the basis of 0.75m²/2016 household. Given the range of non-retail services available within both the Cherrybrook and Round Corner Dural centres, the demand for such floorspace within South Dural is likely to be limited to uses such as a real estate agent, medical practitioners and possibly an accountant (or similar) office. Ultimately this floorspace could comprise approximately 20% of the total floorspace, which is considered appropriate.

3.8 Retail Floorspace Provision

Notwithstanding the availability of retail services in other nearby centres, we suggest that there could be demand for local servicing retail floorspace within the South Dural area.

The method in which any retail facilities are delivered will be dictated to a certain extent by market forces.

In order for a centre to attract operators, that centre needs to be a reasonable size in terms of its capacity to accommodate a satisfactory number of outlets within a supportable floorspace provision.

There are pros and cons for providing any retail floorspace within South Dural in one centre or whether that is 'split' between two centres.

There are obvious benefits to surrounding residents by having a local centre in their immediate neighbourhood and this could have flow on effects in terms of increasing the value of land within these neighbourhoods.

The identification of sites for such centres could allow for more efficient strategic planning and infrastructure provision and consideration in regard to linking neighbourhoods could be dispensed with.

However, it must be remembered that the expenditure estimates provided in this assessment are based on the total development of South Dural.

Depending on the level of expenditure available, it may be that the surrounding population could only support a very small centre. In our experience, developers are generally loath to

commit to a development with less than 1,500m², unless the development is a 'one-man band' operation, such as a corner store/general store.

On the basis of the suggested floorspace breakdown in Table 6, in our opinion any retail provision within South Dural should preferably be provided in one location. We would also suggest that such a centre be provided as part of a community hub, adjacent to other uses such as playing fields, a primary school/child care facility, or other community facilities.

There could be the potential for a small (up to 150m²) general store/convenience store to be provided to service a secondary 'hub', but in our opinion the potential for two local centres to be supported (particularly given the existing network of centres surrounding the area) might only be confirmed as significant residential development proceeds.

It is appreciated that there are internal constraints that may separate some precincts within the South Dural area. Depending on the ultimate location of any retail provision within South Dural, some households may find facilities in Round Corner for example, more accessible than a retail centre in South Dural.

The expenditure estimates assume that 20% of expenditure from all South Dural households will be directed to locally provided retail facilities. If such a centre is more conveniently located to some households, it could potentially attract more than 20% of retail expenditure from these households. Similarly, some households may find it more convenient to patronise retail facilities 'outside' South Dural as their 'local' centre in which less than 20% of their expenditure may be expended at a local South Dural Centre.

In any event, in our opinion the ability for any locally provided retail facilities to attract an average of 20% of retail expenditure from South Dural households represents a reasonable estimate of the expenditure likely to be attracted to a small local centre to be provided as part of the development of South Dural.

In our opinion, the composition of such a centre could possibly ultimately replicate that of the Knightsbridge shopping centre on Gilbert Road, Castle Hill. This centre comprises approximately 2,200m² of floorspace and includes an IGA supermarket and 15 other retail and non-retail tenancies. In addition to the variety of outlets provided in the Knightsbridge centre, we might expect a local centre in South Dural to include at least one restaurant.

4 Support for Existing Retail Network

The addition of up to 2,900 households within South Dural will also support retail facilities in other centres, particularly those higher order centres identified in Section 2 of this report.

If we assume an average 20% of expenditure from South Dural households is retained locally, the remaining 80% of that available expenditure could be distributed throughout the retail network in the following manner:

- 40% to regional centres such as Castle Hill and Rouse Hill;
- 25% to local district centres such as Round Corner Dural and Cherrybrook; and
- 15% to out-of-centre retail outlets such as the facilities located in the Dural Service Centre and other facilities located along New Line Road and Old Northern Road.

Based on the expenditure estimates in Table 4, and applying the rationale in terms of forecasting potential available expenditure as described in Section 3.5 of this report, development in South Dural could also ultimately contribute the following expenditure to support retail outlets outside South Dural:

- \$41 million to regional centres;
- \$25.6 million to district centres; and
- \$15.4 million to out-of-centre locations.

These estimates are based on 2008 \$ values and therefore only allow for an increase in population. As described in Section 3.5 of this report, if retail spending continues to absolutely increase at a rate of 1% per annum, there could be significantly more expenditure available to support retail facilities within South Dural and in the surrounding centres.

5 Community Facilities

In addition to retail and commercial floorspace as above, maximum of 2,900 new households could also generate the following demands for community facilities based on a preliminary review of available data:

Health

Whilst major health needs are catered for by the existing hospital and private medical facilities in the region, provision of floorspace for private medical (and other associated) services could be considered as part of any centre development, as could the possible need for a small consulting space for visiting public health providers, subject to future consultation.

Education

There are several existing public primary and secondary schools in suburbs close to the South Dural area, and there are a number of private schools in the general locality. Because of this availability, it's possible that only one new public primary school might be required within the South Dural area, but this possibility needs to be confirmed by detailed consultation in the plan making phase.

Childcare

Given the proximity of the area to existing suburbs, and the maximum 2,900 new households, it would probably be prudent to imagine a future need for one multi-purpose childcare facility at (or near) any new retail/commercial centre within South Dural. The absolute need for such a facility can be confirmed by reference to prevailing circumstances at the time of final plan making for the area.



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APPENDIX A

Survey of Shopping Centres South Dural:

1. Dural Village Shopping Centre

Old Northern Road Dural, opposite Galston Road

- Liquorland
- IGA Supermarket
- Newsagent
- Take-away food outlet
- Chemist
- Vacant (Formerly Butcher)
- Dentist (First Floor)
- Chinese Restaurant on the upper floor

2. Glenhaven Shopping Centre

Off Glenhaven Road, Corner Hyde Avenue, Glenhaven

- Chinese take-away food outlet
- Beautician/hairdresser
- Pizza Restaurant
- Supermarket/general store including video hire, newspapers, and fruit & vegetables
- Medical clinic
- Pharmacy
- 3. Knightsbridge Shopping Centre

Corner Ridegecroft Drive and Gilbert Road

In the Knightsbridge Estate of Castle Hill

- Liquor shop
- Chemist/ medical centre
- Newsagent
- Bakery

- Real Estate agent
- Take-away food outlet
- Delicatessen
- IGA supermarket
- Butcher
- Video Hire
- Doctor's surgery (1st floor)
- Beautician (1st floor)
- Music School (1st floor)
- Dentist (1st floor)
- Pizza takeaway
- 4. Oakhill Village Shopping Centre

David Road, Castle Hill

- IGA supermarket
- Newsagent
- Chinese Restaurant
- Butcher
- Pizza Restaurant
- Patisserie
- Chicken shop
- Liquor shop
- Lolly store
- Pharmacy
- Pool shop
- Medical Practice
- Dentist (1st floor)
- Physiotherapist (1st floor)

- Beautician/ Hair dresser (1st floor)
- 5. Cherrybrook Village Shopping Centre

Located off Shepherds Drive, Cherrybrook

Building 1:

• A long-day care centre

Outside Promenade:

- Commonwealth bank
- Post office
- Vacant (Real Estate Agent coming)
- Video Store
- Subway (Fast Food Outlet)
- Take away food restaurant
- Coffee shop
- Travel Agency
- Asian restaurant
- Tab
- Real Estate Agent
- Florist
- Women's clothing store
- ANZ bank
- Liquor store
- Dry Cleaners
- Travel Agent

Stores outside promenade separated from the main building:

- Patisserie
- Italian Restaurant
- Restaurant

- Gelato Bar
- Nuts and Chocolate store

Internal Mall:

- Pharmacy
- Hair dresser
- Newsagency
- Alfresco emporium
- Photo camera store
- Fruit market grocery
- Fish market
- Butcher
- Vitamin store
- Deli
- Bakery
- Diner
- Hair dresser
- Deli
- Beauty salon
- Optometrist
- Noodle bar
- Toy store
- Vacant store (previously clothing women's)
- Clothing store
- Book shop
- Women's clothing store
- St. George bank
- Women's clothing store

- Optometrist
- Ella Bache (beauty salon)
- Shoe store
- Jewellers
- Women's clothing store
- Child's clothing store
- Patisserie
- Supermarket
- Phone repairs store

6. Appletree Centre

Located on the Corner of Shepherds Drive and Appletree Drive, Cherrybrook

- General store
- Bakery
- Newsagency
- Pharmacy
- Medical centre
- Physiotherapist
- Take-away food outlet
- Dentist
- Pathologist
- Beauty salon
- Pizza restaurant

7. Round Corner, Dural

Located on the corner of Old Northern Road and Kenthurst Road, Round Corner

Village Green Shopping Centre:

- Hairdresser
- Chemist

- Travel agency
- Bakery
- Electrical repairs
- Clothing store
- Video store
- Giftware (Antiques gift)
- Take-away food (cheesecake shop)
- Home loans (mortgage broker)
- Physiotherapist
- Travel agency
- Clothing
- Child clothing store
- Computer store
- Pool shop
- Jewellery
- Liquor shop
- Thai Restaurant

Round Corner Plaza:

- Indian Restaurant
- Giftware
- Hairdresser
- Beautician
- Children's clothing
- National Australia bank
- Take-away food
- Real estate agent
- Real estate agent

- Solicitor
- Commonwealth bank
- Chicken shop
- Cake shop
- Natural Medicine Practice
- Development/Construction Company
- Osteopaths practice
- Women's clothing store

Dural Mall:

- Woolworths supermarket
- Patisserie
- Patisserie
- Delicatessen
- Drycleaner
- Medical centre
- Bank
- Optometrist
- Newsagent
- Health food shop
- Cafe
- Clothing shop
- Jewellery store
- Hairdresser
- Bakery
- Florist
- Gift shop
- Fruit shop

- Locksmith
- Gourmet meats
- Hairdresser
- Post office
- Optometrist

Strip shopping centre located on the western side of Kenthurst Road:

- Costume hire
- Jewellery store
- TAB
- Take-away food outlet
- Restaurant
- Saddler
- Beauty salon
- Clothes shop
- Hairdresser
- Westpac bank
- Real estate agent
- Real estate agent
- Accountant (upstairs)
- Hairdresser (upstairs)

(This was not on the Original checklist) Mirabelle Centre located behind the strip shopping centre:

- Malaysian restaurant
- Beauty therapies
- Hairdresser
- Clothing alterations
- Draftsmen

- Development/ construction company
- Clothing store
- Chiropractor
- Hairdresser
- Gift shop
- Cafe
- Beauty salon/ spa
- Gift store

Retail Area of Round Corner extends around the north-eastern corner of Old Northern Road and Kenthurst Road. Retailers in this section of Round Corner (beginning at the eastern end of the 3(a) area on Old Northern Road) include:

- Take-away food outlet
- Delicatessen
- Electrical store
- Real estate agent

Commercial building with tenants including:

- Dentist
- Real estate agent
- Office service
- Financial planner
- Service station
- Black smith
- Rural suppliers (horse)
- Auto spares/ smash repairs

Commercial development with tenants including:

- Solicitor
- Accountant

- Hairdresser
- Building consultant
- Hardware store
- 8. The Dural Employment Zone

The Dural Employment Zone is located on the eastern side of New Line Road between Quarry Road and Sebastian Drive

- Restaurant
- 827 Old Northern Road (uses listed separately)
- Dural Business Park (business listed separately)
- Rural supply/ farm equipment
- Bus Company
- Landscape supplies/ cafe
- Automotive repairs
- Pool Shop Irrigation supplies
- Golf driving range
- Australian Post Delivery sorting centre
- Building supplies
- Bunning Hardware Warehouse
- Southern Cross Laboratories
- Jarrett Implements
- Farm machinery/ mowers
- Welding
- Hardware
- Tiles
- Mitre 10 Hardware Warehouse
- Gazebo/ spa store

On the south-eastern corner of the intersection of Sebastian Drive and New Line

- Hungry Jack Fast food outlet
- Car wash centre

827 Old Northern Road:

- Equipment Hire
- Building suppliers
- Ultra tune (automotive repairs)
- Motorbike showroom
- Ceramic title
- Exhaust repairs
- Taxi repairs
- Gun/hunting store

Dural Business Park:

- Horseland (Horse supplies store)
- Restaurant
- Take-away food (McDonalds)
- Take-away food (Kentucky Fried Chicken)
- Medical Centre
- Video Hire
- Cafe/restaurant
- Country furniture
- Footwear sales
- Carpets
- Offices
- Wetsuits
- Party hire
- Pet accessories

- Pumps
- Swim school
- Plumbing suppliers
- Auto electrician
- Auto mechanic
- Plumbing supplies
- Mechanic
- Art suppliers
- Stationery suppliers
- Chef supplies
- Carpets
- Music teaching studio
- King Gee clothing store
- Women's only gym
- Child care centre
- Water tank shop/ pool supplies
- Cabinet making

New Line Business Centre 256:

- Gym
- Cafe
- Interior Outlet store
- Fishing supplies store

Business Park South of New Line Business Centre:

- Carpet store
- Auto store
- (3 vacant suites)
- Lighting store

- Carpet store
- Builders/ draftsmen office
- Auto store
- Dental supplies wholesaler
- Church centre
- Dance factory studio
- Outdoor furniture
- Taekwondo studio
- Diving supplies

List of Uses:

- 1. Medical Centre
- 2. Chiropractic/ alternative medicine centre
- 3. Art Gallery
- 4. Service Station- Auto, marine sales and repairs to the rear, tyre centre
- 5. Squash courts
- 6. Physiotherapy
- 7. Australia Post
- 8. Vacant
- 9. Medical Centre
- 10. Nursery
- 11. Real Estate Office
- 12. Restaurant/ Function Centre
- 13. Restaurant/ Function Centre
- 14. Nursery/ Cafe at rear
- 15. Service Station
- 16. Timber Supplies
- 17. Surgery
- 18. Real Estate
- 19. Charted Account & Tax agent
- 20. Service Station/ Mechanic
- 21. Smash Repairs
- 22. Farm Equipment
- 23. Bed & Breakfast Accommodation
- 24. Family Councillor Services
- 25. Veterinary Clinic
- 26. Solicitor & Attorneys
- 27. Nursery- Herbs
- 28. Podiatry Centre
- 29. Paving and Concrete services

Appendix J Indicative Concept plan

