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Goodman International Limited

Oakdale Concept Plan

Riparian Areas Assessment

May 2008

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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1. Introduction

1.1 Overview

GHD Pty Ltd (GHD) has been engaged by Goodman International Limited to undertake a riparian areas assessment of Ropes Creek, its tributaries and other watercourses associated with the proposed Oakdale development site (herein referred to as the site) at Kemps Creek and Horsley Park. The report includes assessment of all drainage lines in accordance with the *Water Management Act 2000.* Information contained in the report will form the basis of further negotiations with Department of Water and Energy (DWE) to set an agreed riparian corridor network.

The site is accessed from Old Wallgrove Road and encompasses Lots 1 and 2 in DP 120673, Lots 82 and 87 in DP 752041 and Lot 1 DP 843901. Lot 1 DP 120673 and Lots 82 and 87 DP 752041 are within the Penrith local government area (LGA), while Lot 2 DP 120673 and Lot 1 DP 843901 are within the Fairfield LGA.

1.2 Assessment Objectives

The objectives of the riparian areas assessment were to:

- Confirm the application of legislation and current policy relating to management of Ropes Creek, its tributaries and other watercourses;
- Identify those watercourses on the site that fit the definition of *protected waters* for the purposes of the *Water Management Act 2000;*
- For those watercourses defined as *protected waters*, identify appropriate stream category and corresponding management objectives; and
- Identify appropriate riparian zone widths to achieve the management objectives.

1.3 Assessment Method

In order to meet the objectives of this study, the following were undertaken:

1. A desktop review which included examination of site plans, topographic maps, aerial photography and references listed in the final section of this report;
2. A site inspection to classify watercourses according the procedures set out by Landcom (2004) in *Managing Urban Stormwater: Soils and Construction*; and
3. Consultation with the DWE to confirm the application of legislation and current policy relating to management of Ropes Creek, its tributaries and other watercourses on site.

2. Authority Requirements

2.1 Department of Water and Energy

The Department of Water and Energy (DWE) is currently responsible for administration of the WMA.

Under the WMA, a permit is required for activities on *protected land*[1] and / or in *protected waters*[2].

For the watercourses on the site to be considered *protected waters*, they must fit the definition of a *river*, stated in Part 1, clause 2 of the WMA:

*"**River** includes any stream of water, whether **perennial** or **intermittent**, flowing in a natural channel, or in a natural channel artificially improved, or in an artificial channel which has changed the course of the stream of water and any affluent, confluent, branch, or other stream into or from which the river flows …"*

Importantly, this definition does not extend to ***ephemeral*** streams. Ephemeral streams differ from intermittent streams in that they have a very small catchment, generally only flow in response to local runoff and do not have defined continuous geomorphic features (that is, defined thoughweg, bed and bank).

Although development assessed under Part 3A of the EPAA does not require a permit under Part 3A of the WMA, consultation with DWE in relation to riparian management is a requirement of the assessment phase.

2.2 Department of Planning

The Department of Planning's (DOP) Metropolitan Strategy identifies the Western Sydney Employment Hub spanning Fairfield, Penrith, Blacktown and Holroyd LGAs. The proposed Oakdale development site is located within the Western Sydney Employment Hub.

The Strategy goes on to outline a number of environmental targets to ensure the sustainable growth of the Sydney metropolitan area. The first of those objectives is to "*improve the health of waterways, coasts and estuaries*" through meeting "*community objectives for ecosystem health and recreational amenity*". The Strategy references the NSW Environmental Objectives for Water Quality and River Flow (1999) as the measure of community expectations in this regard.

The Strategy lists five actions that will contribute to improvement in the health of waterways:

- Include stormwater and catchment objectives and targets in local planning instruments;
- Undertake stream mapping to identify regionally significant riparian corridors and include in local planning instruments;
- Promote water sensitive urban design (WSUD) and ensure development is consistent with strategic stormwater management plans;
- Implement environmental flows as outlined in the *Metropolitan Water Plan* (2006); and
- Work with Catchment Management Authorities to link water initiatives to urban renewal.

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[1] *Protected land* is the bank, bed, shore or land within 40 metres of the top of the bank of the of *protected waters*.

[2] *Protected waters* means a river, or lake into or from which a river flows, coastal lake or lagoon (including any permanent or temporary channel between a coastal lake or lagoon and the sea).

Achievement of these actions has been considered in development of the riparian management objectives. The performance of the Oakdale development project against these actions will be assessed by DOP in its assessment of the proposal.

2.3 Other Authorities

Consultation with the DWE, Department of Primary Industries (Fisheries), Sydney Water and the Hawkesbury Nepean CMA will be important in progressing the management strategies outlined in this riparian assessment. Such consultation is outside the scope of GHD's commission.

3. Relevant Background

3.1 Catchment Characteristics

Ropes Creek is a tributary of South Creek, which flows into the Hawkesbury River at Windsor. The South Creek catchment encompasses most of the Cumberland Plain of Western Sydney. Hydrological and sediment regimes have been drastically altered throughout the catchment due to vegetation clearing and increasing urbanisation, however, there are some very important remnants of endangered vegetation along the riparian zones (Hawkesbury Nepean CMA).

3.2 Riparian Vegetation

The ecological assessment determined the presence of Swamp Oak Floodplain Forest (SOFF) throughout the riparian zones, particularly Ropes Creek. SOFF is a listed endangered ecological community (EEC) under the *Threatened Species Conservation Act 1995* (TSCA) and consideration of this legislation will be required during assessment and rehabilitation of the corridors.

Penrith City Council (1995) undertook a remnant native vegetation survey along the section of Ropes Creek between the M4 Motorway and Sydney Water supply pipeline, downstream of the study site. This study found that the Ropes Creek community is made up of primarily *Casuarina glauca*, restricted to the immediate stream corridor. Other native vegetation identified included *Acacia parramattensis* on the fringes and *Lomandra longifolia*, *Glycine clandestina* and *Clamatis aristate* within the canopy of the *C. glauca*. *Eucalyptus amplifolia*, *E. tereticornis*, *Angophora floribunda* and *Bursaria spinosa* were also noted in smaller numbers. The survey noted that the vegetation was in good condition and has a role in stabilising the creek banks.

The ecological study for the site is being prepared by Cumberland Ecology Pty Limited. This study will assess the riparian vegetation of the site in detail, including the need for rehabilitation and vegetation management.

3.3 Flooding

A flood study of Ropes Creek and its tributaries is currently being undertaken. Delineation of flood extents is important for riparian zone selection and management. Consistency between the riparian objectives and flood risk implications must be ensured. Recommendations made in this report have been based on the indicative levels only. The riparian objectives must be integrated into the setting of flood planning levels.

3.4 Soils

Bannerman and Hazelton (1990) describe three soil landscapes across the development site. In selecting species for the restoration of riparian areas, it will be important to consider these constraints:

- ***South Creek Landscape*** – this covers most of the riparian area of Ropes Creek and its major tributary. This area is constrained by frequent flooding and erosion;
- ***Blacktown Landscape*** – this covers most of the site, the gentle slopes between the ridge lines and the riparian areas. This soil group is constrained by moderately reactive highly plastic subsoils, low soil fertility and poor soil drainage; and

» ***Luddenham Landscape*** – this landscape occurs at the extents of the site, generally along the ridge tops. Its limitations include high soil erosion hazard, localised impermeable and moderately reactive, highly plastic subsoil.

Constraints mapping undertaken for the Western Sydney Employment Lands shows that a large portion of the eastern side of the site contains areas of extensive salinity hazard. Vegetation under stress from salinity was observed on the Ropes Creek floodplain and lower slopes during the site inspection.

4. Stream Categories and Riparian Zones

4.1 Categorisation Method

GHD undertook an assessment of the site to determine *protected waters* for the purposes of the RFIA, categorise each stream according to the method set out by Landcom (2004) and determine appropriate riparian zones, in accordance with DWE policy (see Appendix A). The following characteristics were considered for each defined channel during the assessment:

- Stream geomorphology;
- Definition and size of channel;
- Riparian and in-stream vegetation;
- Flood conveyance; and
- Connectivity with the surrounding landscape.

The Landcom stream categorisation method (2004) identifies three stream categories, each with minimum objectives for riparian zones and differing management objectives. The following is a description of each category:

- ***Category 1 – Environmental Corridor*** – minimum core riparian zone (CRZ) of 40 m from the top of each bank, with a further 10m outer riparian zone (ORZ) to counter edge effects. The entire riparian zone is to consist of local provenance native vegetation, with utility services, bushfire asset protection, recreational activities and stormwater treatment facilities located outside the CRZ;
- ***Category 2 – Terrestrial and Aquatic Habitat*** – minimum CRZ of 20 m from the top of each bank, with a further 10m ORZ to counter edge effects. Again, the entire riparian zone is to consist of local provenance native vegetation, with utility services, recreational activities and stormwater treatment facilities located outside the CRZ; and
- ***Category 3 – Bank Stability and Water Quality*** – Riparian zone minimum width of 10m from top of each bank and generally no vegetated buffer is required. Vegetation used in restoration will be of local provenance.

4.2 Category Management Objectives

Each category of stream presents opportunities and constraints to the proposed development. In determining the final stream category, GHD considered the interaction of the stream to achieve the development's desired objectives. The management objectives that have been adopted for each stream category are listed below.

- ***Category 1***:
  - Conservation and enhancement of existing biodiversity;
  - Connectivity with surrounding vegetation and drainage lines;
  - Flood management;
  - Water quality management; and
  - Watercourse crossings allowing for continuity of habitat.

» ***Category 2***:

  – Linking category 1 steams with pockets of existing vegetation;
  – Improve the connectivity of vegetation and drainage lines throughout the site;
  – Flood management;
  – Stormwater and water quality management; and
  – Watercourse crossings allowing for continuity of habitat.

» ***Category 3***:

  – Stormwater and water quality management; and
  – Bed and bank stability.

4.3 Riparian Zones

All identified protected waters, with the corresponding stream category are shown in the figure in Appendix A. The analysis of available information and negotiations with DWE has led to preliminary agreement on the proposed stream categories.

The main channel of Ropes Creek is delineated as a Category 1 stream, with a CRZ of 40 m from the top of each bank and an ORZ of 10 m. Once the flooding constraints are delineated, this zone may be extended to match the 100 year average recurrence interval boundary. However, a riparian zone of this width will allow for connectivity with downstream habitat restoration works carried out as part of the Fitzpatrick Lands development.

Four major tributaries of Ropes Creek are classified as Category 2 streams, with a CRZ of 20 m from the top of each bank and an ORZ of 10 m. Minor tributaries and watercourses, indicated as category 3 streams, are also shown with stormwater runoff from these catchment areas being managed to mitigate any impacts from changes to the hydrological regime or stormwater quality to the downstream Category 1 and 2 streams.

A meeting to discuss the stream categorisation methods and preliminary recommendations was held with a DWE representative (Greg Brady) and Goodman representatives (David Colpo and Phil Jones) on 21 March 2007. The advice received from DWE was that the rationale behind the preliminary stream categorisation was sound and the recommended stream categories reasonable. This preliminary advice was confirmed following a joint site inspection held with DWE (Greg Brady) and Goodman (Phil Jones) on 12 April 2007. It was agreed at the site meeting that further negotiations should occur to gain agreement on a preferred riparian corridor network once site masterplanning had progressed and other specialist studies such as flooding and ecological assessments had been completed.

Three further points for consideration were offered by DWE at the meeting held on the 21 March 2007:

» All creek road and pedestrian crossings should be in accordance with DWE 's crossing guidelines;
» At creek crossings, all services, as much as possible, are to be within the easement of road or pedestrian crossing; and
» Stormwater treatment system should, as far as possible, maintain the natural hydrologic regime.

Reedy Creek, on the far eastern side of the site, has not been surveyed in detail, however examination of aerial photography suggests that it is likely to be a Category 1 stream, and would therefore have the same management objectives as Ropes Creek.

5. Preferred Concept Plan

The following information describes the preferred riparian corridor network associated with the concept plan, impacts on drainage lines, proposed 'offsetting' actions and justification. The concept plan delivers a balance between development opportunities and environmental outcomes in the urban fabric. The concept plan proposed also 'builds' on the existing open space network of Ropes Creek and the Erskine Park Release Area Biodiversity Corridors.

5.1 Impacts and Offset Actions Proposed

The following table describes the known impacts on the existing drainage line network to deliver the outcomes of the concept plan

Table: 1 Impacts and Offset Actions

Item No.	Description of Impact	Offset Actions Proposed
1.	Removal T3, T6, T8, T9 and T10 category 3 streams	» 'Best Practice' WSUD principles treating water quality and managing flow before entering riparian corridors; » WSUD system designed considering natural hydrology and sub-catchments; » Bio-swales and detention basins, located outside riparian corridors, to manage/control flow; » Plants used in WSUD system will be of local provenance; » Rehabilitation of endemic vegetation throughout riparian corridors 'linking' with the surrounding landscape;
2.	Removal of T1 category 3 stream	» Construct swale on southern boundary of the development site to convey stormwater runoff; » Swale to utilise 'soft' engineering principles; » Vegetation in the swale will be of local provenance and provide similar habitat opportunities;
3.	Removal 3 'online' farm dams	» Inclusion of similar habitat in several bio-swales/detention basins to compensate for habitat loss; » Inclusion of 'pools' mimicking natural geomorphology in creek rehabilitation program; » Inclusion of 'woody debris' reinstatement in creek rehabilitation program;
4.	Removal of vegetation	» Revegetation of large areas of the Ropes Ck floodplain outside the influence of the RFI Act; » Revegetation of degraded riparian systems throughout riparian corridors; » Inclusion of endemic native vegetation in Estate Park/Amenities embellishment.

5.2 Justification

The proposed riparian corridor network at Oakdale provides a sustainable balance between development opportunities and environmental outcomes in the urban fabric. The function of the corridor network will be supplemented by WSUD initiatives. The corridors are deliverable and can be justified as follows:

- Consider the surrounding landscape and 'build' on the biodiversity outcomes of the Erskine Park Release Area;
- 'Link' rehabilitated open space with existing public open space network;
- Provide a significant increase in vegetation cover and, through time, habitat values, across the site;
- Improve environmental function, including water quality, salinity and connectivity of current riparian corridors;
- Allow for suitable development outcomes to be realised; and
- Provide visual amenity for the development.

6. Summary

The Oakdale Development Site Riparian Areas Assessment has categorised streams (defined as *protected waters* under the RFIA) across the site as shown in the figure in Appendix A. Broadly, the management constraints of each category are:

Category 1 – CRZ of 40 m, consisting of local provenance native vegetation, with an additional riparian zone of 10 m;

Category 2 – CRZ of 20 m, consisting of local provenance native vegetation, with an additional riparian zone of 10 m; and

Category 3 – Riparian Zone minimum width of 10m from top of each bank and generally no vegetated buffer is required. All vegetation being restored will be of local provenance.

Integration of the findings of this assessment with other site assessments completed (especially flood, ecological and geotechnical studies) has helped determine the concept plan. Agreement, in principle, from DWE of the preferred riparian corridors, will be important to progress approval of the concept plan.

7. References

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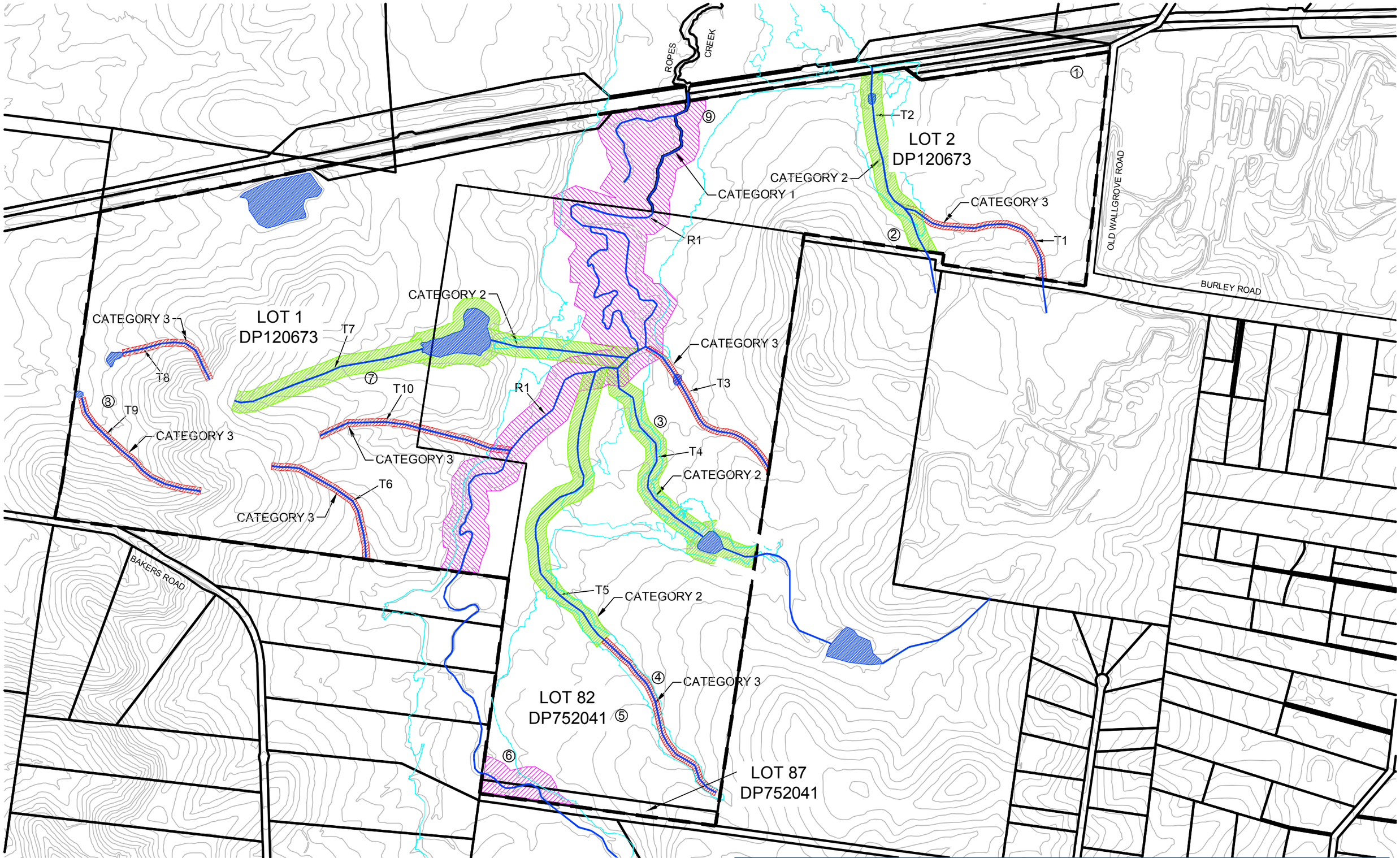
Appendix A

Stream Categories



LEGEND

- ROPES CREEK 100 YEAR FLOOD EXTENTS (APPROX)
- EXISTING DAMS
- LOT BOUNDRY
- SITE BOUNDRY
- CATEGORY 1 BUFFER
- CATEGORY 2 BUFFER
- CATEGORY 3 BUFFER
- ⑧ DNR SITE MEETING LOCATIONS
- T5 EXISTING WATERCOURSE & LABEL

N

0 100 200 300m
SCALE 1:10000 AT ORIGINAL SIZE

PRELIMINARY

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GOODMAN INTERNATIONAL LTD
OAKDALE CONCEPT PLAN
RIPARIAN BUFFERS
DRAFT ONLY

job no. | 21-15101
rev no. | E

Figure 1

scale | 1:10000 for A3 date | DECEMBER 2007

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