Sydney Growth Centres Strategic Assessment

Commitment 7

Cumberland Plain Woodland HMV and PCLs review

Outcomes Report

March 2014

EXECUTIVE SUMMARY

In December 2011, the Federal Government endorsed the Sydney Growth Centres Strategic Assessment Program Report (Program Report) and, in February 2012, approved the classes of actions in the Growth Centres that if undertaken in accordance with the approved program do not require separate approval under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Program Report includes a range of commitments for matters of national environmental significance protected under the EPBC Act. The commitments are drawn from the analysis in the Supplementary Assessment Report and Draft Strategic Assessment Report (Part B), and build upon the Relevant Biodiversity Measures for the Growth Centres Biodiversity Certification.

This report has been prepared to address Commitment 7 of the Program Report for which the Office of Environment and Heritage (OEH) has lead responsibility. Under this commitment, OEH was required to review the Commonwealth Cumberland Plain Woodland higher long-term management viability lands (HMV) identified under the Strategic Assessment for inclusion within the Cumberland Plain priority conservation lands (PCLs).

The report is based on up-to-date vegetation mapping and representation of threatened ecological communities across the areas of interest to ensure the outcomes of the review are well informed. The review analysed 2,400ha of vegetation across 3,900ha of land within 4 sectors, 8 study areas and 13 HMV polygons.

In summary, this review makes the following conclusions:

- No candidate areas were identified within the Windsor Downs and Scheyville sectors due to the highly disturbed, isolated and fragmented nature of remaining vegetation within these sectors.
- Three candidate areas, Noorumba Reserve, Beulah Biobank site and Leppington candidate area; meet the criteria for inclusion within the Priority Conservation Lands.
- The Beulah Biobank site requires no further action to secure its long-term conservation as the site is already subject to an existing biobank agreement with the Historic Houses Trust.

OEH will work with private landholders and government agencies to ensure the biodiversity value of these candidate areas are enhanced and protected where possible. Noorumba Reserve and Leppington are also suitable for biobanking and external grant funding.

The outcomes of this review will be published in the Sydney Growth Centres Strategic Assessment Annual Report 2014.

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1 INTRODUCTION

In December 2011, the Federal Government endorsed the Sydney Growth Centres Strategic Assessment Program Report (Program Report) and, in February 2012, approved the classes of actions in the Growth Centres that if undertaken in accordance with the approved program do not require separate approval under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Program Report includes a range of commitments for matters of national environmental significance protected under the EPBC Act. The commitments are drawn from the analysis in the Supplementary Assessment Report and Draft Strategic Assessment Report (Part B), and build upon the Relevant Biodiversity Measures for the Growth Centres Biodiversity Certification.

This review is based on up-to-date vegetation mapping and representation of threatened ecological communities across the areas of interest to ensure the outcomes are well informed.

1.1 Terms of references

This report has been prepared to address Commitment 7 of the Program Report for which the Office of Environment and Heritage (OEH) has been identified as the lead agency as outlined below.

> "7. Review of the Priority Conservation Lands to consider inclusion of all HMV CPW remnants.
> a) Review to be undertaken in accordance with a methodology to be agreed with SEWPAC. At a minimum, the following areas of HMV CPW will be reviewed for inclusion in the Priority Conservation Lands:
> - Areas of HMV CPW greater than 10ha and that are contiguous with HMV CPW occurring within the Priority Conservation Lands.
> - Areas of contiguous HMV CPW greater than 20ha that are outside the Priority Conservation Lands."

In accordance with the Strategic Assessment commitment, OEH was required to have the methods for this review agreed to by SEWPAC (now Department of Environment). This agreement was received by OEH in July 2013. A copy of the agreed methods is provided in Appendix A.

For completeness and to ensure all potential areas of value were considered, OEH broadened the scope of the review to include additional polygons and study areas where they represent:

1. HMV of 10ha or greater within intact vegetation with total patch size greater than 20ha but not contiguous with PLCs and/or
2. HMV of 5ha or greater within close proximity (100m) to other HMV under consideration and connected by intact other vegetation (with reference to Biobanking Assessment Methodology (BBAM) <100m and not separated by a dual carriageway or wider road).

2 BACKGROUND

2.1 Cumberland Plain Woodland

This review focuses on the Commonwealth Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest which are listed as critically endangered under *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). These communities correspond with two threatened ecological communities listed under the New South Wales *Threatened Species Conservation Act 1995* (TSC Act) namely the critically endangered Cumberland Plain Woodland of the Sydney Basin Bioregion and endangered Shale-Gravel Transition Forest of the Sydney Basin Bioregion.

In addition, the strategic assessment included two other Commonwealth EPBC Act listed

communities the Shale Sandstone Transition Forest (SSTF) and the Turpentine-Ironbark Forest in the Sydney Basin Bioregion (TIF). These communities also correspond with NSW TSC Act listed communities, namely Shale Sandstone Transition Forest in the Sydney Basin Bioregion, Sydney Turpentine Ironbark Forest and the Blue Mountains Shale Cap Forest. Only the Shale Sandstone Transition Forest occurs in the study areas, including Noorumba Reserve and Beulah Biobank site.

2.2 Difference between HMV and PCLs

For this review it is important to note the differences between the objectives and processes for identifying the Cumberland Plain priority conservation lands (PCLs) and the Sydney Growth Centres "Biodiversity value – higher long-term management viability lands (HMV)".

The PCLs are formally identified in the Cumberland Plain Recovery Plan (DECCW 2010) and were originally identified in the Cumberland Plain Protected Areas Plan in 2007. The Recovery Plan identifies priorities and opportunities that may lead to protection of up to 40% of the remaining threatened ecological communities in western Sydney. The Plan identifies these lands as the Priority Conservation Lands (PCLs) (Figure 1). The PCLs include the largest and most intact patches of 20 different threatened ecological communities, populations and species on the Cumberland Plain. They therefore represent the best remaining opportunities in the region to maximise long term biodiversity benefits for the lowest possible cost, including the least likelihood of restricting land supply. OEH considers these lands, which cover approximately 26,000 ha, to be the highest priority for future recovery efforts for the threatened biodiversity of the Cumberland Plain.

The HMV lands were established under the Sydney Growth Centres Strategic Assessment and were based on the Biodiversity Certification Conservation Plan (Growth Centres Commission 2007). This Conservation Plan included an assessment of the biodiversity value and viability of native vegetation within the Growth Centres to determine the best patches to be conserved and protected. A method, consistent with the *DEC Working Draft Guidelines for Biodiversity Certification*, was developed to identify areas of "Biodiversity Value – Higher Long Term Management Viability" (HMV). For the purposes of the strategic assessment, this method was adapted to further describe the occurrence of the three EPBC listed communities (CPW, SSTF & TIF) within the Growth Centres. This enabled a more detailed understanding of the condition and viability of the communities, the degree of potential impacts and the adequacy of measures to avoid, mitigate and offset these impacts.

It is the differences in the outcomes of these two assessment and prioritisation processes that is the focus of this project. However, it is important to note that this project does not review the PCLs, rather reviews the HMV lands where they occur outside the PCLs and assesses their suitability for future consideration under the Cumberland Plain Recovery Plan review.

3 Methods

This review is primarily a detailed desktop analysis incorporating the latest standards for vegetation mapping to update the vegetation extent across the study areas and then re-run the HMV criteria analysis to identify candidate areas for inclusion in the Priority Conservation Lands. This section is to be read in conjunction with the agreed methods and Table 1 included in Appendix A.

3.1 Polygons under review

Figure 1 provides the context for this review, noting the Cumberland Plain boundary, areas of HMV lands, the NW and SW Growth Centres and the PCLs. This figure also highlights the fact that the majority of the HMV lands are already incorporated within the PCLs and the outliers are primarily covered by this review.

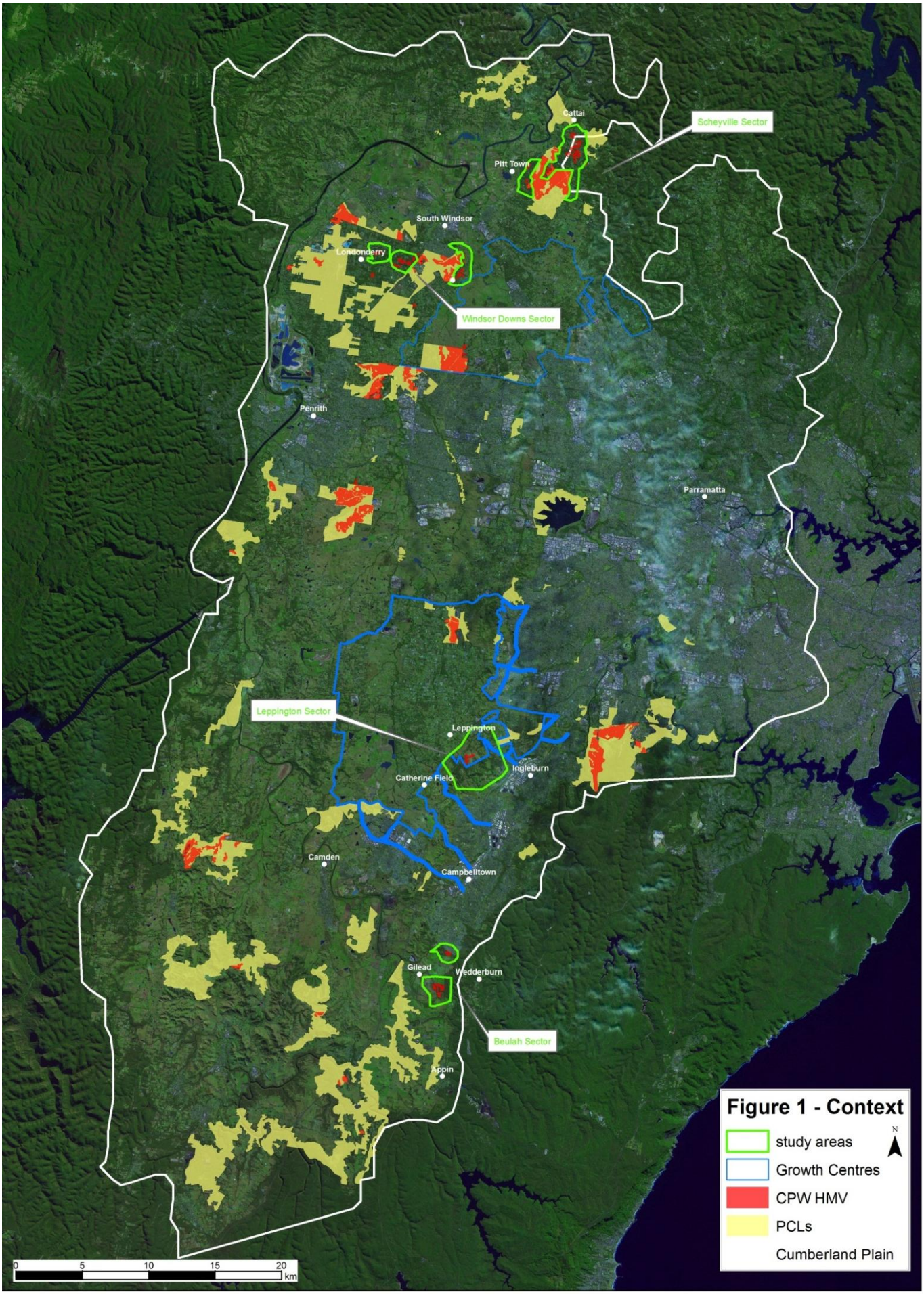

Figure 1 - Context

For completeness and to ensure all potential areas of value were considered, OEH broadened the scope of the review to include all HMV polygons outside of Priority Conservation Lands (PCLs) where they represent:

1. HMV of 10ha or greater within intact vegetation with total patch size greater than 20ha but not contiguous with PLCs and/or
2. HMV of 5ha or greater within close proximity (100m) to other HMV under consideration and connected by intact other vegetation (with reference to Biobanking Assessment Methodology (BBAM) <100m and not separated by a dual carriageway or wider road)

This approach identified 14 polygons for review, where polygons 1A through to 8A were identified using the criteria from Commitment 7, polygons 9B through to 14B where identified using the additional criteria. Of the 14 polygons, all but one has been used in defining the individual study areas. Polygon 3A in St Marys is located over the old St Marys Australian Defence Industries lands which have been subject to separate planning and assessment, including the provision of protection zones for areas of Cumberland Plain vegetation under the Draft Sydney Regional Environmental Plan No.30 St Marys - Zoning Plan (Amendment No.2). Therefore this polygon and surrounding areas have been excluded from further assessment. It is also noted that one polygon (2A) occurs within the SW Growth Centre however it is adjacent to other CPW outside of the SW Growth Centre so this vegetation has been included for consideration and assessment.

Tenure and zoning information was also considered to review polygon suitability against reserve design principles. Areas identified for future urban growth (e.g. SW & NW Growth Centres), and properties zoned for residential development or industrial land uses were flagged for potential exclusion at the end of the review. In addition, consideration was also given to the number of lots or potential number of owners across each remnant as this would impact on the likelihood of obtaining agreement across multiple landowners to collectively manage a remnant for conservation purposes. Polygons which have a high number of lots to area ratio (e.g. 7 or more lots per 10ha) are likely to have a low suitability. Table 1 in Appendix A provides summary tenure, zoning and initial suitability assessment.

3.2 Defining the study areas

Individual study areas were established around the 13 polygons identified from the site selection process noted above and buffering approximately 500m around these polygons while excluding existing priority conservation lands. Sectors were established aggregating study areas around a locality. The review incorporates eight study areas outlined in green within four sectors as displayed in Figure 1. At this stage of the assessment it was established that the review would be undertaken across 3,900 ha of land within 4 sectors, 8 study areas and 13 HMV polygons.

3.3 Updating the vegetation mapping

The review included an update to the existing vegetation map (Tozer 2003, Simpson update, 2007) to ensure accurate representation of the vegetation across the study areas. To do this, the new standard vegetation mapping practices as developed for the Sydney Metro vegetation mapping (OEH 2013) were adapted for this project, incorporating digital aerial photographic interpretation using stereo analysis, rapid site assessment and polygon validation. This component updated approximately 2400ha of vegetation of which 842ha is intact CPW (Cwth) in remnants greater than or equal to 4ha. Figures 2.1-2.4 in Appendix B outline the vegetation extent across the four sectors. The baseline vegetation map that underpins this analysis is accessible at http://mapdata.environment.nsw.gov.au and searching on VIS Map Catalogue Number 3817.

3.3.1 API review

Across the study areas, vegetation extent was updated comparing existing intact vegetation extent against the more recent Sydney Conurbanation 2011 digital imagery and up-to-date ortho-rectified stereo ADS 40 digital imagery (Penrith 100k mapsheet 2010, Wollongong 100k mapsheet, 2010). Under this process existing polygons where edited to reflect an increase or decrease in vegetation extent. Where vegetation disturbance remained consistent, attribution was transposed while where disturbance had obviously changed attribution was updated consistent with Roberts (1999). Additional vegetation was also digitised in accordance with the new standard API pathway which maps patches greater than 0.01 ha at 1:2,000 scale. These new polygons were attributes using API and interpreter confidences (as per Roberts 1999) and with a simplified disturbance code, including African Olive dominated with canopy gaps (V) and canopy gaps within agricultural/semi-rural matrix (W). In addition and given time constraints, the level of disturbance at isolated polygons less than 2ha in size were not assessed. Vegetation classification codes for new polygons were also simplified for Cumberland Plain Woodland (500) by amalgamating Shale Plains Woodland and Shale Hills Woodland. Similarly, Shale Sandstone Transition Forest (600) amalgamated the low and high sandstone influence vegetation types.

To attribute vegetation classification to the new polygons, API attribution codes were compared with data collected during the rapid data point site assessment with reference to surrounding vegetation and physical attributes such as soil, geology, condition and landform position. Within the given timeframe it was not possible to review in detail existing polygons or fully attribute new polygons as this would require specialist API expertise, substantial additional fieldwork including quadrat surveys and rapid data point collection to assign this data.

3.3.2 Rapid site assessment and polygon validation

Targeted fieldwork was undertaken to validate polygon attribution across the study areas. Rapid data points were collected during the API review and polygon validation stage. The data points were chosen as a representative sample of the individual API patterns that were observed. This assessment focused on relating patterns identified during the API review and matching that with what is on the ground. It also collected data on understorey and disturbance. To do this rapid data points were collected noting:

- Dominant and sub-dominate canopy species
- Presence/absence of understorey and dominant composition
- Presence/absence of weed species/level of disturbance
- Soil, underlying geology and transition points
- Landform position
- Likely vegetation classification and transition points

It is noted that this rapid assessment is qualitative, similar to the original assessment but incorporates more recent API assessment using up-to-date imagery.

3.3.3 Updated vegetation mapping across the study areas

Figures 3.1-3.4 in Appendix C show the updated vegetation extent and classification across the study areas which cover approximately 2,400ha of land, of which approximately 970ha is intact CPW (Cwth). Of this CPW, only 373ha is outside the PCLs and within remnants greater than 4ha. It was noted that the majority of new polygons mapped were disturbed in nature, either occurring on the edge of existing patches, in areas of high intensity semi-rural landuse or as regrowth. Furthermore, editing of existing intact polygons at such a fine scale often picked up changes at the edge or even internally which further fragmented polygons and/or increased the perimeter - area ratios for these patches. This was particularly noticeable in the Windsor Downs and Scheyville Sectors where large lot residential and small lot rural zonings predominate. Vegetation type has not greatly changed across the study areas apart from at the Beulah Biobank site which

has incorporated detailed vegetation mapping undertaken for the biobanking agreement. As a result, CPW across the Beulah site is less extensive than previously mapped due to the influence of the nearby sandstone plateau. This sandstone influence is also noticed at the northern edge of the Scheyville sector, reducing the extent of CPW here as well. Conversely, the western Windsor Downs study areas have picked up an increased area of Shale Gravel Transition Forest, albeit occurring in fragmented and elongated patches.

3.4 Candidate area assessment

Using the updated and validated mapping across the study areas, further desktop assessment was undertaken to determine a short list of candidate areas recommended for addition to the Priority Conservation Lands (PCLs). Criteria for identifying candidate areas include the HMV criteria from the Draft Assessment Report (DECCW & DoP 2010), with additional updates combined with a consideration of threats as outlined below:

1. Condition – good quality vegetation based on revised and updated existing mapping. Previously this has been identified as vegetation that has greater than 10% canopy cover however with the improved methods of assessment using ADS 40 imagery it is possible to identify and define good condition vegetation in terms of: native species dominant in the overstorey (including some veg with <10% cover but still with a native canopy) and low levels of disturbance (i.e. existing edited intact polygons and new polygons without X, V or W disturbance attribution).
2. Size – vegetation remnants that are equal to or greater than 4 ha. With reference to Commitment 7, this criteria has been amended to include polygons:
    a. 10ha or greater, or
    b. 5ha or greater within 100m of polygons identified in part a.

    It is noted that for this assessment all CPW and SGTF polygons were amalgamated to form CPW (Cwth) patches for this and following criteria.
3. Threat (high edge to area ratio) - identifying all remnants with high edge to area ratios (long thin strips of vegetation) as having lower management viability and therefore should be excluded. This was determined if the perimeter:area ratio of a remnant was greater than the perimeter:area ratio of a 100 m wide polygon equivalent.
4. Threat (buffer to future development) – Applying a 50m disturbance buffer within the edge of remnant patches where they bordered future development areas. If the buffering reduced the overall size of the patch below the 4ha threshold it was then excluded. It is noted that this criteria was not required in this assessment.
5. Landscape context (connectivity) – based on an analysis of the proportion of vegetation cover at the regional and local scale using the Biometric methodology (Gibbons *et al.* 2005) and updated in the Biobanking Assessment Methodology (DECC 2008). A remnant was considered to have good connectivity if there was 30% or greater vegetation cover within both a 0.55km and 1.75km radius of the patch. The 30% threshold was chosen given the fragmented nature of Cumberland Plain vegetation and the available evidence that suggests significant declines in biodiversity values once 70% of the landscape has been cleared (Freudenberger *et al.* 1997).

(Source DECCW & DoP 2010)

Detailed review of the outcomes from this candidate area assessment is outlined in the following section.

4 OUTCOMES FROM CANDIDATE AREA ASESSMENT

4.1 Potential candidate areas

Within the Beulah and Leppington sectors there are two polygons that passed the first three HMV criteria within the Noorumba and Leppington study areas. A brief discussion is provided below on their suitability as potential candidate areas for inclusion into the PCLs. In addition, a brief consideration is also provided with respect to opportunities for

conservation investment and the implications of the revised vegetation mapping on the Beulah study area.

4.1.1 Noorumba Reserve

Noorumba Reserve is a 40ha Council reserve zoned regional open space, owned and managed by Campbelltown City Council. This reserve is located at the southern boundary of Rosemeadow Estate on the western side of Appin Road. Within the reserve, one polygon of 10.43ha has met the first three HMV review criteria. Although the polygon is below the 20ha criteria stipulated by Commitment 7, under OEH's broader criteria the polygon is included as it is part of a larger remnant which is made up of both CPW (Cwth) and EPBC and TSC listed Shale Sandstone Transition Forest to form a patch within the reserve that is approximately 40ha. Furthermore, in consideration of the polygon's connectivity within the landscape (criterion 5) the assessment at both the 100ha and 1000ha circle is over the 30% target at 35% and 40% respectively. Therefore this polygon and the surrounding vegetation within reserve meets the criteria as a potential candidate area. Figure 4.1 in Appendix D provides a draft boundary to this candidate area.

Noorumba Reserve also provides various opportunities for conservation investment as it has reasonable long-term site security as it is zoned 6a regional open space and owned and managed by Campbelltown City Council. It also has opportunities for investment for conservation purposes as there are portions within the reserve that could benefit from active management, particularly on the western boundary where disturbance has been mapped due to the presence of African Olive and previous clearing. The reserve also includes a large patch of EPBC & TSC listed Shale Sandstone Transition Forest and supports the TSC listed Cumberland Land snail. Furthermore the reserve is also part of a regional corridor that links the site to the Beulah biobank site via the Georges River corridor to the east.

The Reserve has an active management program operating under the Noorumba Reserve Plan of Management prepared by Council in 2004. It also has an active community volunteer group the Bushcare Noorumba Reserve, Rosemeadow that meets fortnightly during the year. It is recommended that the candidate area include the majority of the vegetation across the reserve but exclude the parkland area to the north and the inner asset protection zone to Rosemeadow Estate on the northern edge of the reserve which corresponds with the Department of Planning and Infrastructure corridor between the reserve and housing estate as shown in Figure 4.1 (Appendix D).

4.1.2 Leppington

The Leppington study area occurs within both the Camden and Campbelltown LGAs between Camden Valley Way and the Hume Highway in the suburb of Leppington. The East Leppington precinct of the SW Growth Centre also forms part of this study area. Land within Camden LGA is zoned as rural while the land in Campbelltown LGA is zoned Environment Protection. The candidate polygon crosses the LGA boundary and is located off Camden Valley Way via St Andrews Road and occurs between a transmission line easement and the water canal. See Figure 4.3 in Appendix D for further detail.

The candidate polygon is approximately 21ha of CPW (Cwth) and is well connected with surrounding vegetation within a 0.55km radius of the site with approximately 60% vegetation cover. However, as the polygon is bounded by the East Leppington precinct of the SW Growth Centre and the proposed Emerald Hills residential subdivision within a predominately agricultural landscape, the vegetation cover within a 1.75km radius from the site drops to 14% when this future development is incorporated. Notwithstanding this, the polygon covers a portion of the proposed 20ha conservation zone within the Emerald Hills development which extends further into the north-west of the polygon. Furthermore, to the south and south-east of the polygon, additional patches of vegetation of varying

disturbance and African Olive infestation occur. This includes between 20-50ha of CPW (Cwth) depending on the inclusion of intact versus disturbed vegetation.

Figure 4.2 (Appendix D) includes a draft boundary for the potential candidate area, including the identified polygon, the proposed Emerald Hills conservation area and the more intact CPW (Cwth) remnants to the south and south east and covers approximately 85ha. This area has a fair to reasonable potential conservation investment value as it includes larger remnant patches which would benefit from active management, particularly of olive, but with potentially moderate to high resilience and long-term management viability. These lands also cover a small number of lots within an existing large lot rural landscape which could simplify landholder negotiations.

4.1.3 Beulah

Just 2km south of Noorumba Reserve along Appin Road is the Beulah Biobank site which is located on land owned by the NSW Historic Houses Trust. This biobank site is approximately 60ha and is within Campbelltown LGA. As part of biobank assessment and revised mapping the extent of CPW (Cwth) over the site has been re-estimated to cover approximately 15ha over three areas with the remaining 50ha as EPBC and TSC listed Shale Sandstone Transition Forest. The biobank assessment also identified the site has having good connectivity within the surrounding landscape as the vegetation cover is greater than 30% within a 0.55 km and 1.75 km radius of the site (62% and 44% respectively).

When completing the review of the Beulah study area using the HMV criteria, none of the CPW (Cwth) polygons where successful however one polygon of approximately 6.2ha met the original 2010 HMV criteria where the size threshold was 4ha. This polygon is within 100m of another 6.6ha of intact CPW (Cwth). As this CPW (Cwth) vegetation is also part of 65ha intact viable remnant which has good connectivity within the landscape, it is recommended that the whole biobank site meets the HMV criteria and is included as a potential candidate area.

These values and its suitability for conservation investment have already been recognised as the site was targeted under the Growth Centres Offset Program and a biobank agreement was entered into with the Historic Houses Trust in May 2011. Under the agreement, the vegetation on site will be managed in perpetuity for the conservation of its biodiversity values, particularly the presence of NSW and Commonwealth listed threatened ecological communities. A map of the biobank boundary is provided in Figure 4.3 in Appendix D.

4.2 Windsor Downs and Scheyville Sectors

As mentioned above in section 3.3.3, the vegetation across the five different study areas within the Windsor Downs and Scheyville Sectors is heavily influenced by the nature of land use in these areas. The suburbs of Cattai, Maraylya, Pitt Town and Oakville around Scheyville National Park within Hawkesbury LGA are predominately rural small holdings and remaining vegetation is disturbed, isolated and/or fragmented by permissible activities within this landuse. Similarly vegetation across the suburbs of South Windsor, Windsor Downs, and Londonderry around Windsor Downs Nature Reserve within both Hawkesbury and Penrith LGAs is predominately rural small holdings, large lot residential and primary production, is also in this state. As a result, none of the CPW (Cwth) vegetation passed all the first three HMV criteria and were not considered any further as potential candidate areas.

5 CONCLUSIONS

In conclusion, this review makes the following statements:

Noorumba Reserve

1. Noorumba Reserve as defined in Figure 4.1 meets the criteria for inclusion within the Priority Conservation Lands.
2. OEH will discuss with Campbelltown City Council opportunities to leverage funding of long-term management actions for Noorumba Reserve (e.g. Linking landscapes Local government Grants other rehabilitation and restoration grants, biobanking) to assist with their current management and conservation of the site.

Leppington

3. Leppington candidate area as defined in Figure 4.2 meets the criteria for inclusion within the Priority Conservation Lands.
4. OEH will identify the value of the Leppington candidate area to state and local government authorities as potential biobanking and offset sites for adjoining development, particularly within the proposed Emerald Hills sub-division or development within the SW Growth Centres.

Beulah

5. Beulah Biobank site as defined in Figure 4.3 meets the criteria for inclusion within the Priority Conservation Lands. No further action is required to secure the long-term conservation of these lands as they are already subject to an existing biobank agreement with the Historic Houses Trust.

6 REFERENCES

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APPENDIX A

Appendix A - Methods

Sydney Strategic Assessment Program – Commitment 7, Cumberland Plain Woodland HMV and PCLs review
Methods for review
May 2013

This review will include a detailed desktop review incorporating digital stereo aerial photograph interpretation (API) paired with rapid site assessment to validate the updated vegetation extent and condition mapping, followed by the more detailed assessment of resultant candidate areas. These different tasks are outlined below.

Site selection
Potential sites for review have been identified using the Cumberland Plain Woodland – Management viability (CPW-MV) spatial data layer derived from the Strategic Assessment. All High Management Viability (HMV) polygons outside of Priority Conservation Lands (PCLs) that meet the following criteria have been identified for the review:

a. Areas of HMV CPW greater than 10ha and that are contiguous with HMV CPW occurring within the Priority Conservation Lands **OR**
b. Areas of contiguous HMV CPW greater than 20ha that are outside the Priority Conservation Lands and not contiguous with them.

In addition to the minimum requirements of Commitment 7, further polygons have also been considered where they represent:

- HMV of 10ha or greater within intact vegetation with total patch size greater than 20ha but not contiguous with PLCs and/or
- HMV of 5ha or greater within close proximity (100m) to other HMV under consideration and connected by intact other vegetation (with reference to Biobanking Assessment Methodology (BBAM) <100m and not separated by a dual carriageway or wider road)

Initial suitability assessment
Tenure and zoning information will be considered to review polygon suitability against reserve design principles. Areas identified for future urban growth (e.g. SW & NW Growth Centres), and properties zoned for residential or industrial land uses are flagged for potential exclusion at the end of the review. In addition, consideration will also be given to the number of lots or potential number of owners across each remnant as this would impact on the likelihood of obtaining agreement across multiple landowners to collectively manage a remnant for conservation purposes. Polygons which have a high number of lots to area ratio (e.g. 7 or more lots to 10ha or more) are likely to have a low suitability. This issue is also likely to limit access to sites for detailed assessment. These criteria will be incorporated in the final recommendations for candidate areas and any exclusions will be outlined in detail.

At this stage no polygons have been excluded, although one polygon (2A) occurs within the SW Growth Centre adjacent to other CPW and other vegetation outside of the SW Growth Centre and zoned as environmental protection so is being included. There is also one residential zoned polygon (12B) included which is large lot residential with over 20+ lots over the polygon.

API review
All polygons that have been identified above will be compared against more recent digital imagery to review preliminary vegetation extent, condition and connectivity. Methods for assessment will be consistent with the standard now developed and used for the draft vegetation mapping for Sydney Metro CMA (DECCW 2009b). This includes the use of the most up-to-date ortho-rectified stereo ADS 40 digital imagery and interpreted using GIS at a 1:1000 to 1:2000 scale and will determine a standard set of attributes and mapping thresholds to derive a revised map of vegetation extent and condition for validation by rapid site assessments. The attributes codes used will include: interpreter confidence, understorey, disturbance, disturbance severity, canopy cover (from Walker and Hopkins 1990) and vegetation classification.

Rapid site assessment and polygon validation
Depending on the ability to access sites, a method will be devised to validate polygon attribution for consideration against the management viability criteria. This assessment will focus on validating:

- Dominant canopy species

APPENDIX A

- Presence/absence of understorey and dominant composition
- Presence/absence of weed species
- Estimate of extent against API re-assessment

It is noted that this rapid assessment will be qualitative, similar to the original assessment but will incorporate more recent API assessment using up-to-date imagery. As an outcome from this section, a validated revised map of vegetation extent and condition will be produced for all polygons that are the subject of the current review.

Candidate area assessment

Using the updated and validated mapping of the selected sites, further desktop assessment will be undertaken to determine a short list of candidate areas for addition to the Priority Conservation Lands (PCLs). At this stage a more detailed site assessment, in accordance with that undertaken for the PCLs, will be undertaken. Criteria for identifying candidate areas will expand on the initial suitability assessment above and also consider the threat assessment criteria used in the Draft Assessment Report below.

> "Threats – the influence of future surrounding land use was taken into consideration in two ways:
> - Identifying all remnants with high edge to area ratios (long thin strips of vegetation) as having lower management viability and therefore should be excluded. This was determined if the perimeter:area ratio of a remnant was greater than the perimeter:area ratio of a 100 m wide polygon equivalent;
> - Applying a 50 m disturbance buffer within the edge of remnant patches where they bordered future development areas. If the buffering reduced the overall size of the patch below the 4ha threshold it was then excluded."
>
> (Source DECCW & DoP 2010)

Mapping of candidate areas will collate the API and site assessment data incorporating vegetation community, canopy density and understorey condition information for each polygon. Field data will verify the accuracy of the mapped boundaries and polygon attribution information. Resultant polygons will then be compared against the remaining HMV criteria from the Draft Assessment Report (DECCW & DoP 2010), and some additional updates, as listed below:

- Condition – good quality vegetation based on revised and updated existing mapping. Previously this has been identified as vegetation that has greater that 10% canopy cover however with the improved methods of assessment using ADS 40 imagery we will be able to identify and define good condition vegetation in terms of: native species dominant in the overstorey (including some veg with <10% cover but still with a native canopy), low levels of disturbance such as bare ground visible from the imagery, and low levels of the woody weeds that are visible on the imagery.
- Size – vegetation remnants that are equal to or greater than 4 ha. All polygons should already be greater than 10ha, given the initial criteria for this review. The 4ha threshold was chosen after taking into account the fragmented nature of the remaining vegetation on the Cumberland Plain, the relative biodiversity values of larger patches compared to smaller patches in Western Sydney, and the likely pressures on small remnants within the Growth Centres once they are surrounded by intensive urban development.
- Landscape context (connectivity) – based on an analysis of the proportion of vegetation cover at the regional and local scale using the Biometric methodology (Gibbons *et al.* 2005) and updated in the Biobanking Assessment Methodology (DECC 2008). A remnant was considered to have good connectivity if there was 30% or greater vegetation cover within both a 0.55km and 1.75km radius of the patch. The 30% threshold was chosen given the fragmented nature of Cumberland Plain vegetation and the available evidence that suggests significant declines in biodiversity values once 70% of the landscape has been cleared (Freudenberger *et al.* 1997).

Outcome Report

A final report will be prepared outlining the review methods for all polygons, including justification for any excluded polygons and their final ranking after the suitability assessment. It will also provide recommendations on any resultant candidate areas for inclusion within the PCLs. These recommendations will then be considered within the Cumberland Plain Recovery Plan review to be undertaken in 2014 for formal inclusion with the PCLs. Notwithstanding this process it is anticipated that candidate areas will be made available to the Sydney Growth Centres Biodiversity Offset Program for its consideration for offset opportunities. It will also be made available to Department of

APPENDIX A

Planning and Infrastructure and relevant local government bodies while also being published as part of the Strategic Assessment Annual Report.

Another outcome from this review will be the provision of updated vegetation mapping of areas covered by this assessment.

Note
The question has been raised on how this review differs from the original PCLs and MV assessments and their methods, this is because:

1. The methods for developing the PCLs and MV lands were based on different criteria to meet different objectives over two years apart, with the PCL assessment preceding the HMV assessment. The PCLs incorporates 20 different NSW threatened entities while the MV assessment focused on Commonwealth listed CPW. Therefore HMV lands have been identified outside of the existing PCLs and are the subject of consideration. The current review will incorporate only relevant criteria from both assessments to form a new method of assessment with different objectives.
2. The current assessment incorporates more recent air-photo interpretation and updates vegetation mapping for areas under review, providing more accurate and up-to-date mapping for the areas under consideration.
3. A CPW target won't be considered, and CPW will be considered as a single entity (not tied to other threatened entities and their targets as per the PCLs).

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APPENDIX A

Appendix A - Table 1

TABLE 1: Polygons for review, zoning, access and tenure									
ID	**Ha**	**Location**	**Sector**	**Tenure**	**Zoning**	**LEP**	**Review**	**Notes**	**Suitability**
1A	20.77	Beulah, Appin Rd, Gilead	Beulah	F'hold	1 Non-Urban	Campbelltown	B	Beulah Biobank	med
2A	20.82	St Andrews Rd East Leppington	Leppington	F'hold	7(d1) Env Protect (100ha min)	Campbelltown	B	CPW adj not mapped HMV, partial SW Growth Centre	med
3A	15.1	Former ADI site	N/A	F'hold	Central Precinct of St Marys	SREP 30 St Marys	N/A	Former ADI, Subject to separate planning instrument	N/A
4A	21.32	Carrington Rd, Londonderry	Windsor Downs	F'hold	Ru4 Rural small holdings	Penrith	A	multi-part adj Windsor Downs NR	Low
5A	12.36	Fairey Rd, South Windsor	Windsor Downs	F'hold	Ru1 Primary Production/R2 LD residential	Hawkesbury	A	multi-part adj Windsor Downs NR	Low
6A	24.93	Pitt Town, Scheyville NP	Scheyville	F'hold	Ru4 Rural small holdings	Hawkesbury	A	multi-part adj Scheyville	Low
7A	36.11	Pebbly Hill Rd, Maraylya	Scheyville	F'hold	Ru4 Rural small holdings	Hawkesbury	B	semi rural, small lot	Low
8A	21.19	Reeby Rd, Cattai	Scheyville	F'hold	Ru4 Rural small holdings	Hawkesbury	B	semi rural, small lot	Low
9B	6.23	S Beulah, Appin Rd Gilead	Beulah	F'hold	1 Non-Urban	Campbelltown	P	Partially Beulah Biobank and south	med
10B	6.99	Beulah, Appin Rd, Gilead	Beulah	F'hold	1 Non-Urban	Campbelltown	P	South of Beulah Biobank	med
11B	10.33	Appin Rd, Noorumba Reserve, Gilead	Beulah	Council?	6a local open space	Campbelltown	P	Noorumba Reserve	med
12B	16.74	Sanctuary Drive, Windsor Downs Estate	Windsor Downs	F'hold	R5 Large Lot residential	Hawkesbury	P	Residential exclusion?	Low
13B	10.88	Macpherson Rd, Londonderry	Windsor Downs	F'hold	Ru4 Rural small holdings	Penrith	P	semi rural, small lot	Low
14B	10.25	Mitchell Park Rd, Cattai	Scheyville	F'hold	Ru4 Rural small holdings	Hawkesbury	P	semi rural, small lot	Low
	234.02								

Categories for review
A = category "a" under review criteria – Areas of HMV CPW >10ha and contiguous with HMV CPW within Priority Conservation Lands
B = category "b" under review criteria – Areas of contiguous HMV CPW > 20 ha that are outside of the Priority Conservation Lands and not contiguous with them
P = 2nd tier review – HMV of 10ha or greater within intact vegetation with total patch size > 20ha but not contiguous with Priority Conservation Lands and/or HMV of 5ha or greater within close proximity (100m) to other HMV under consideration and contacted by intact other vegetation
N/A = excluded under separate planning instrument *Draft Sydney Regional Environmental Plan No. 30 St Marys – Zoning Plan (Amendment 2)*

Suitability = outcomes from initial suitability assessment conducted during the development of project methods. Note this assessment has been provided as context only not used to in final recommendations.

APPENDIX B

Appendix B: Study Areas

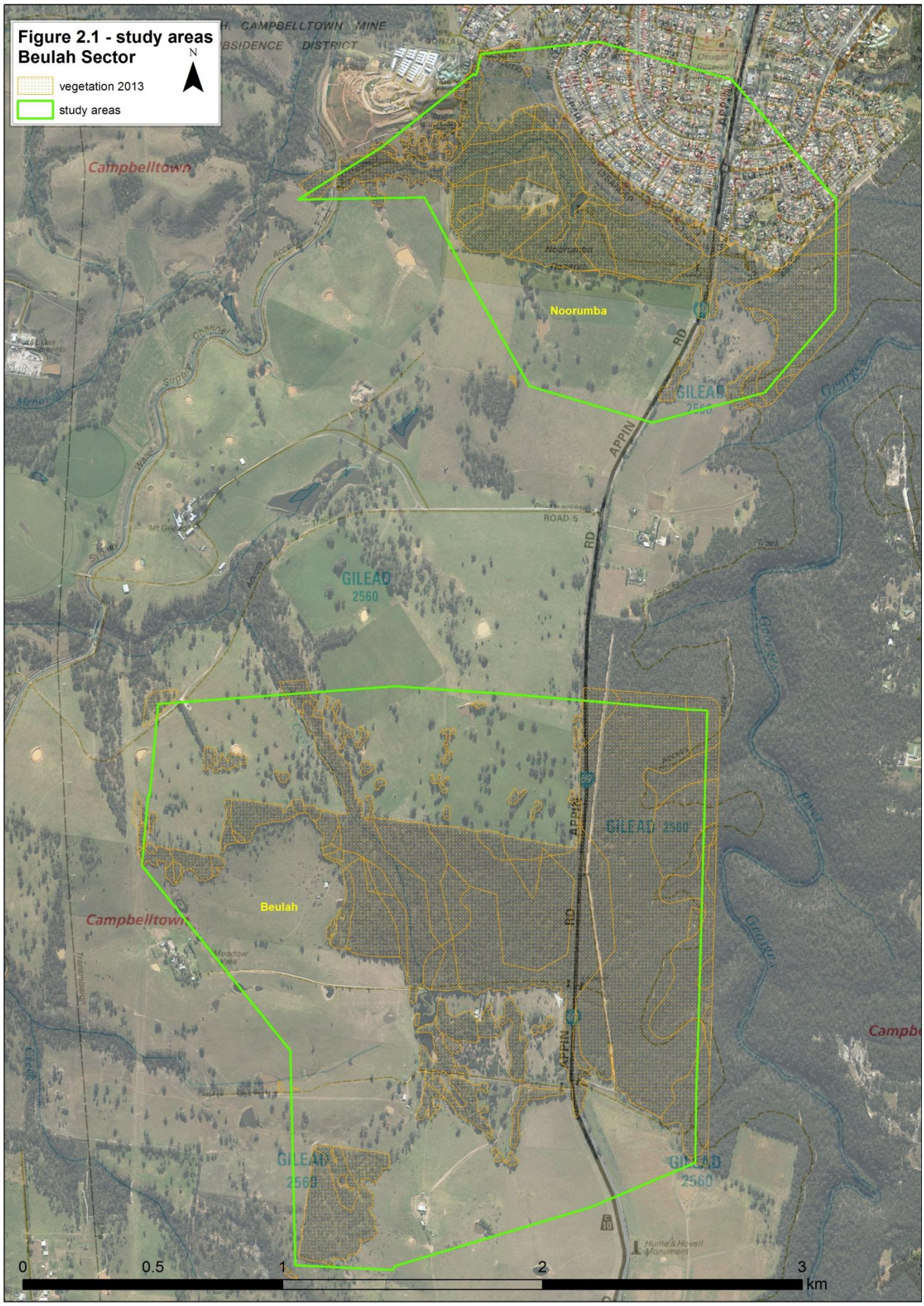

Figure 2.1 - Beulah Sector

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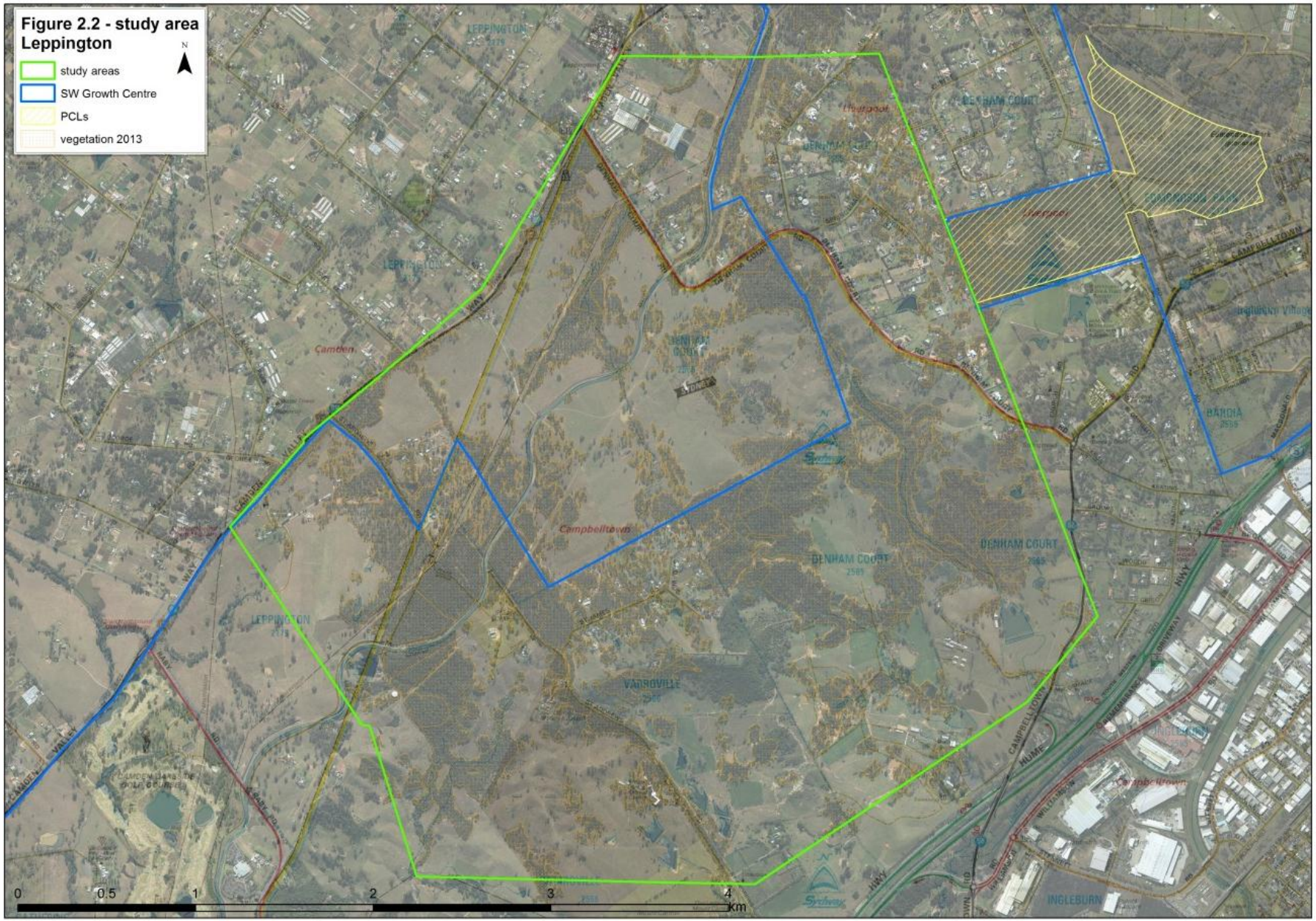

Figure 2.2 - Leppington Sector

APPENDIX B

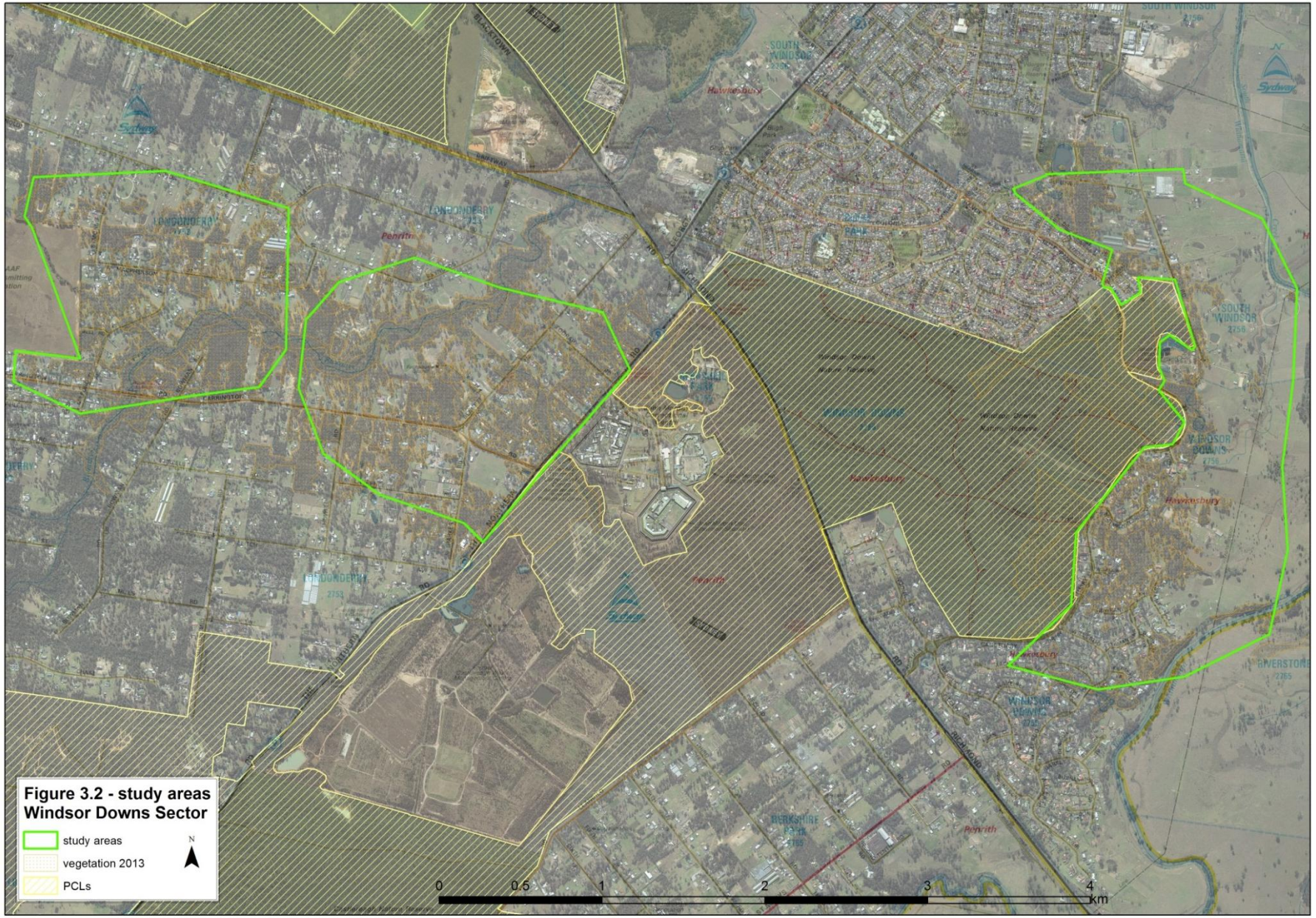

Figure 2.3 - Windsor Downs Sector

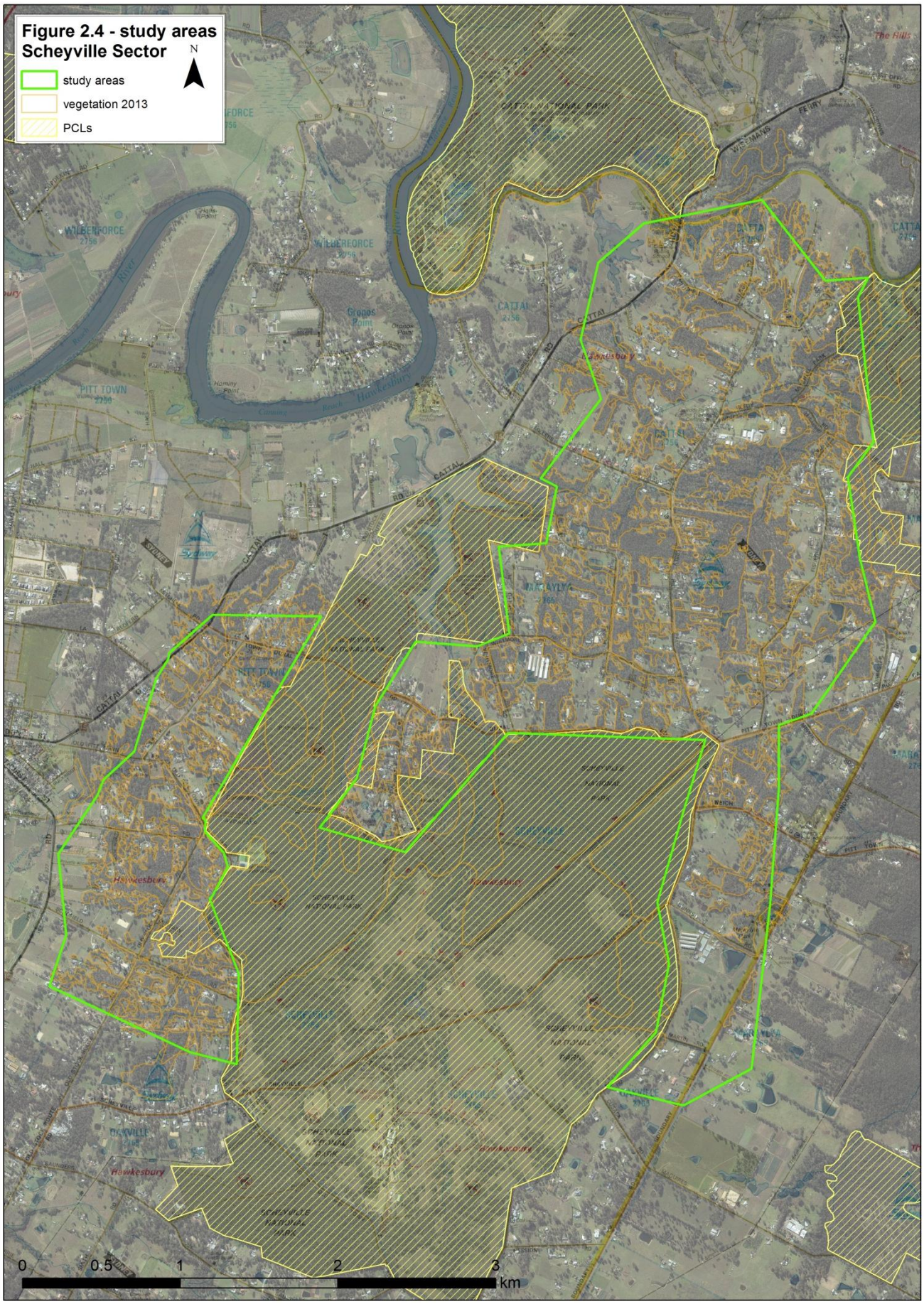

Figure 2.4 - Scheyville Sector

APPENDIX C

Appendix C: Vegetation

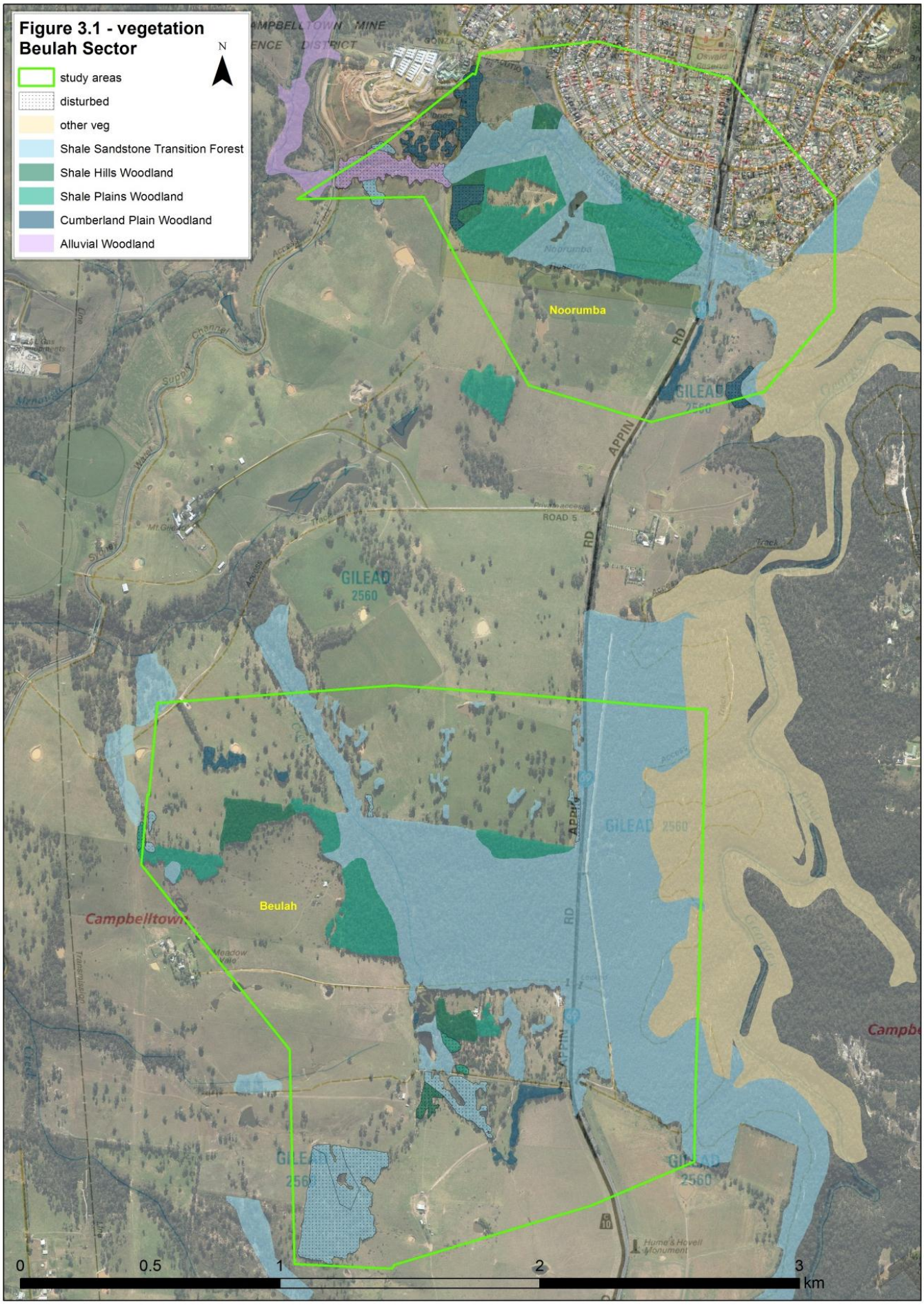

Figure 3.1 - Beulah

APPENDIX C

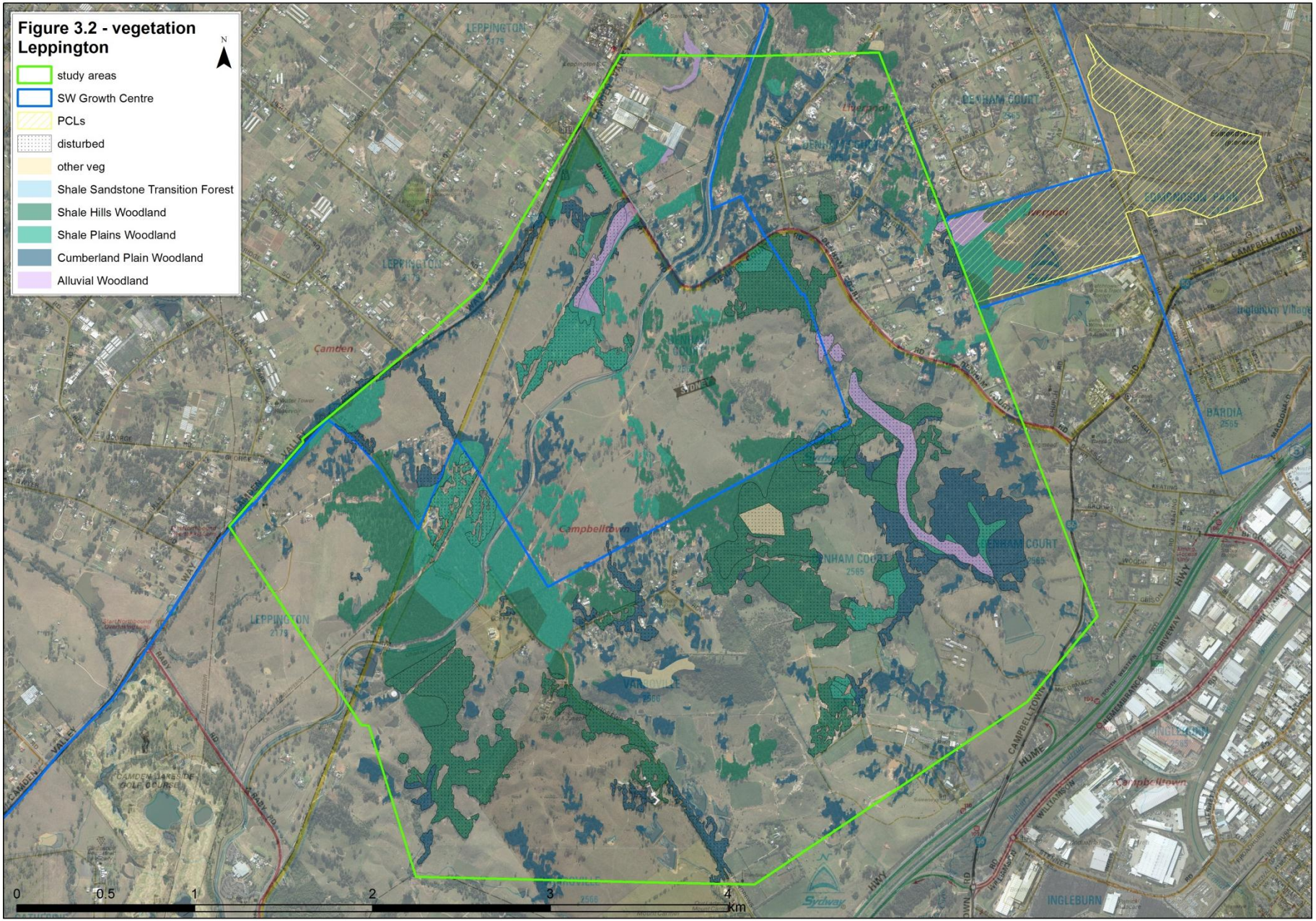

Figure 3.2 - Leppington

APPENDIX C

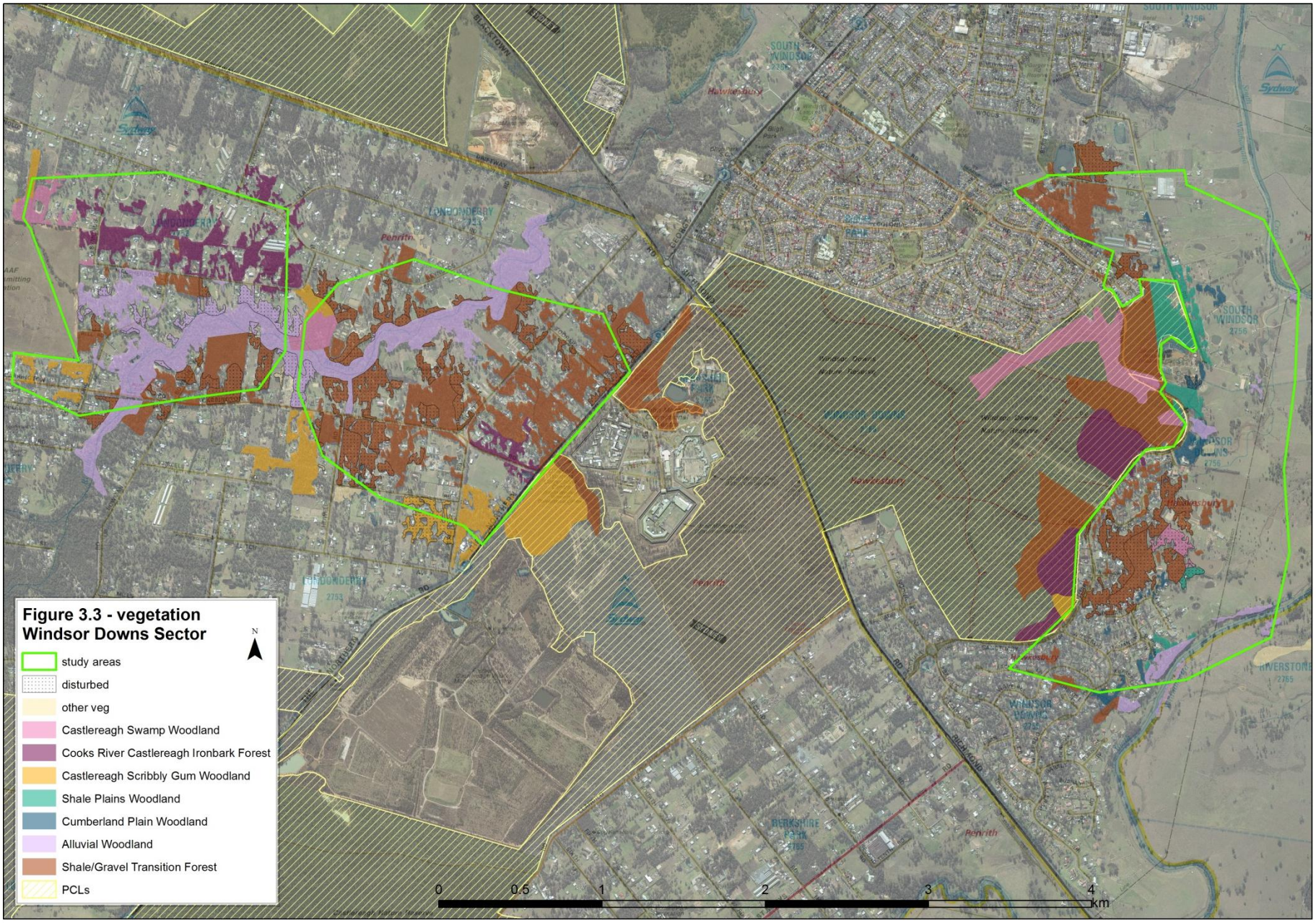

Figure 3.3 - Windsor Downs

APPENDIX C

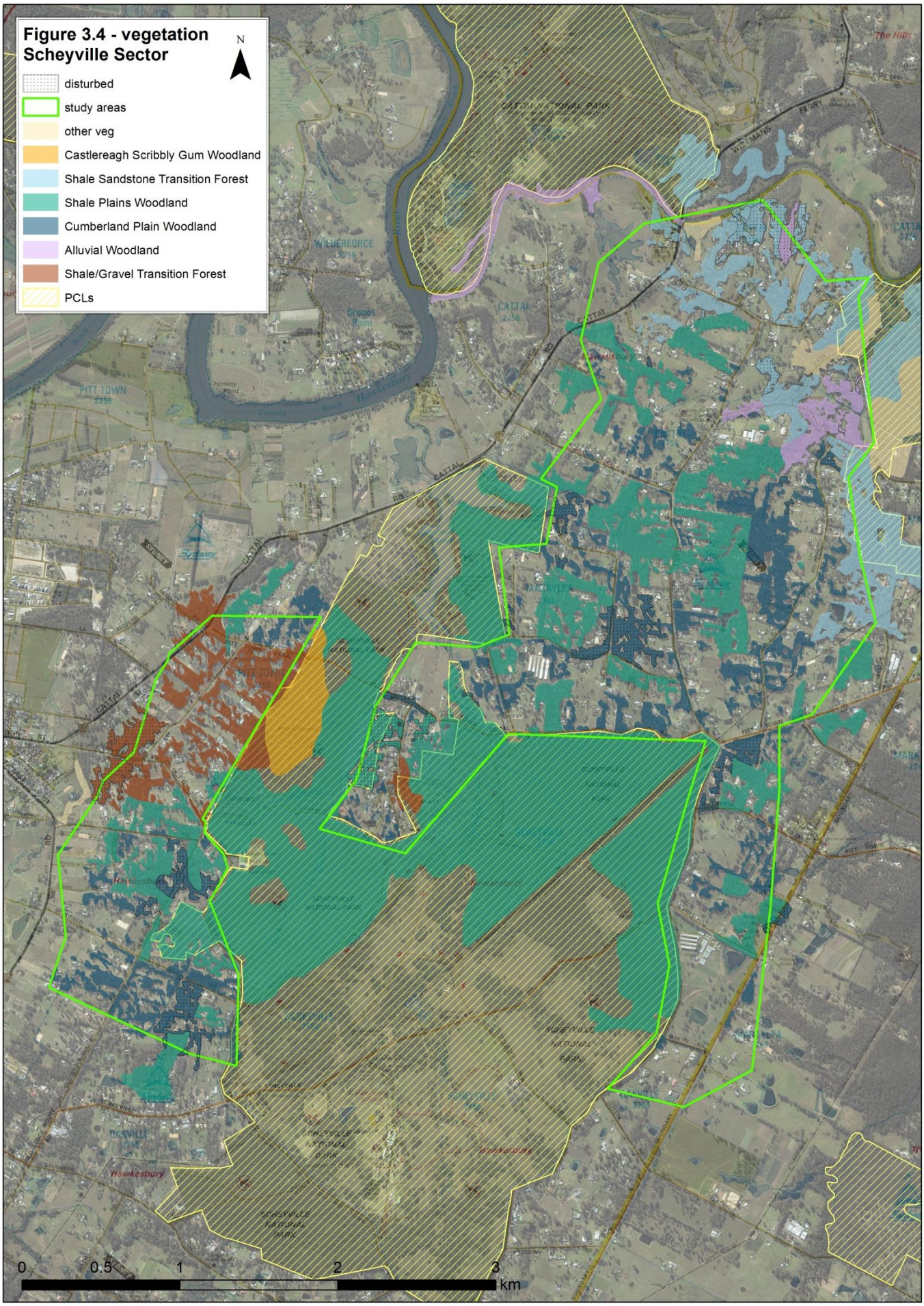

Figure 3.4 - Scheyville

APPENDIX D

Appendix D: Candidate Areas

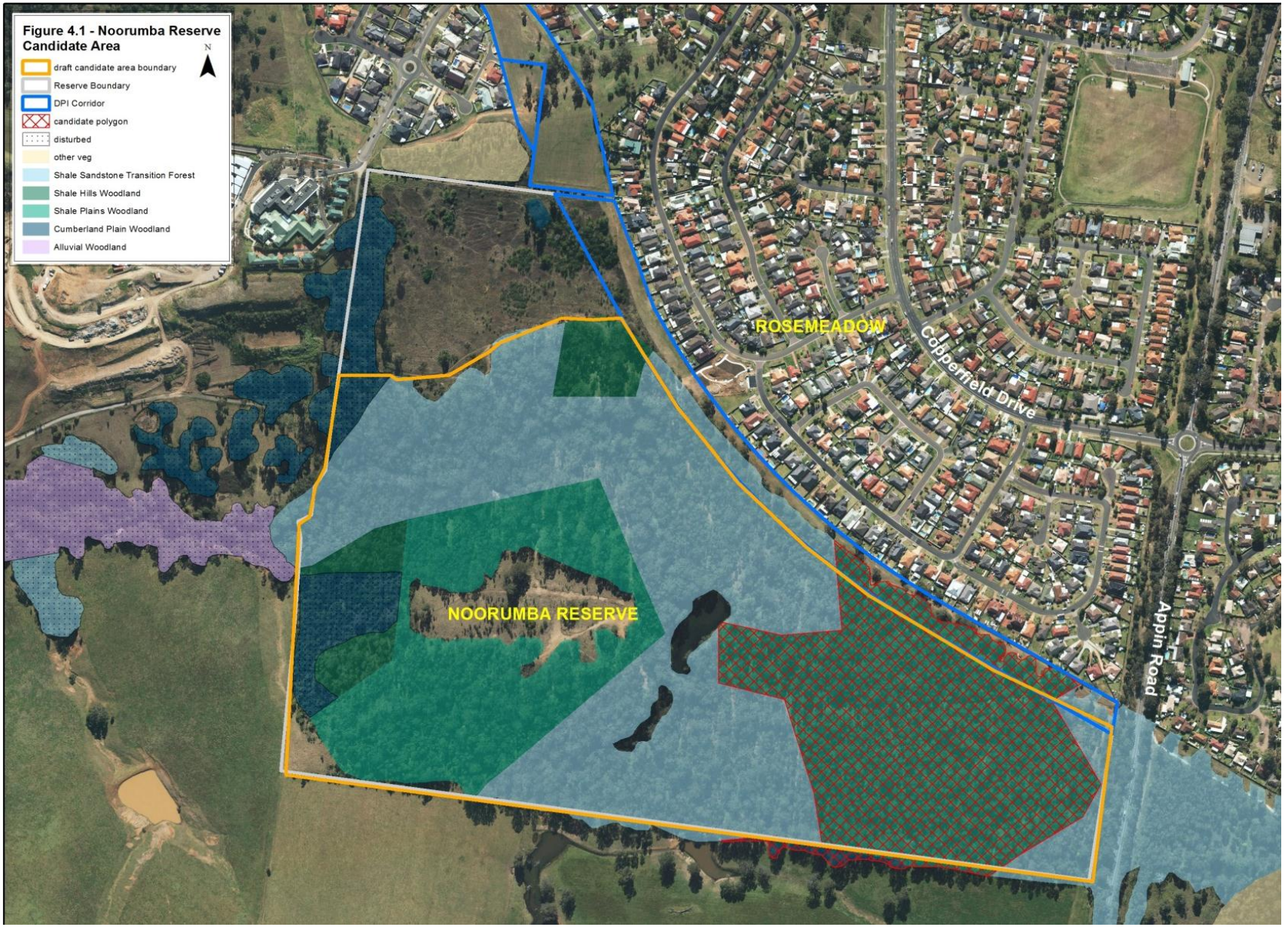

Figure 4.1 - Noorumba Reserve

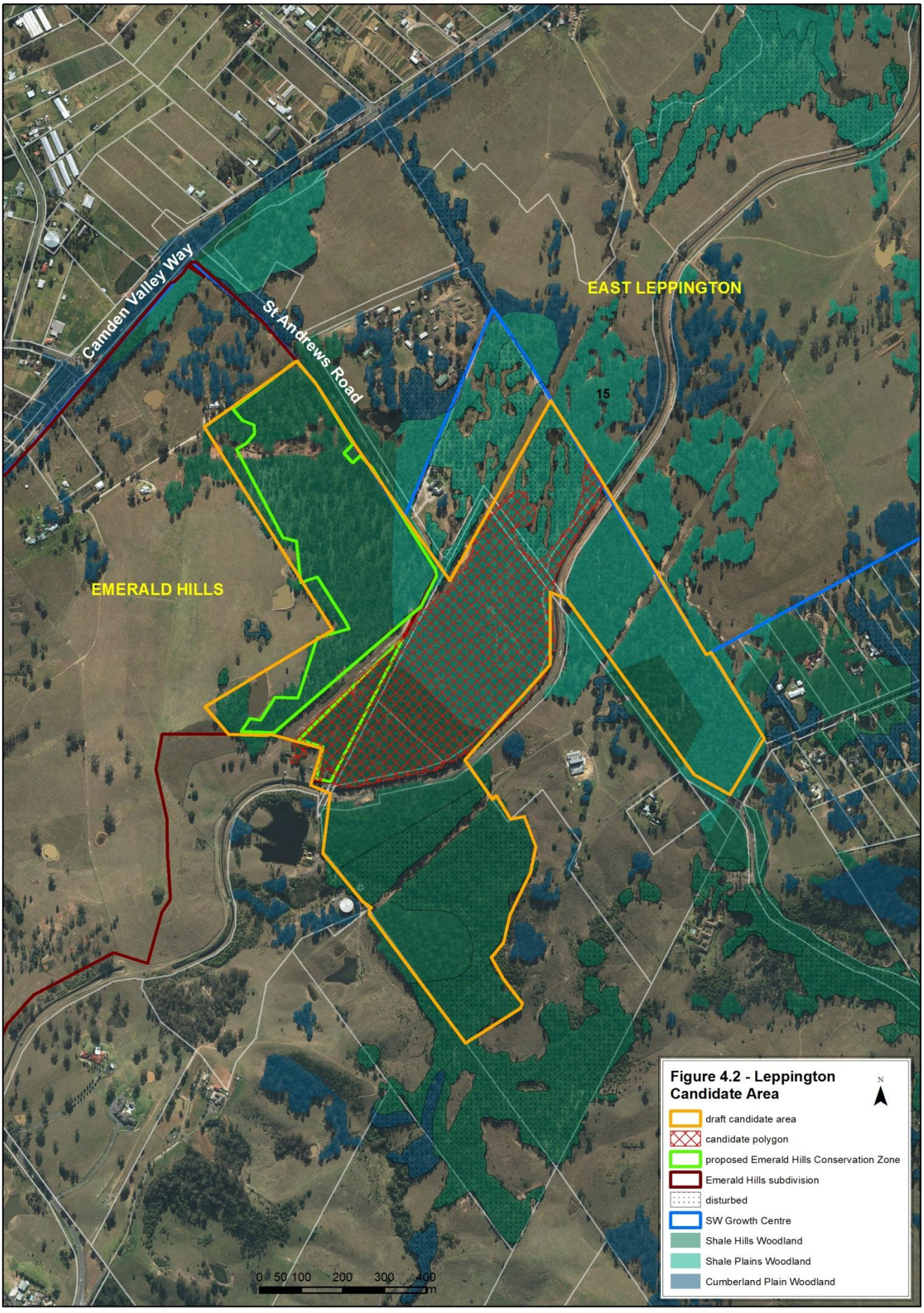

Figure 4.2 - Leppington

APPENDIX D

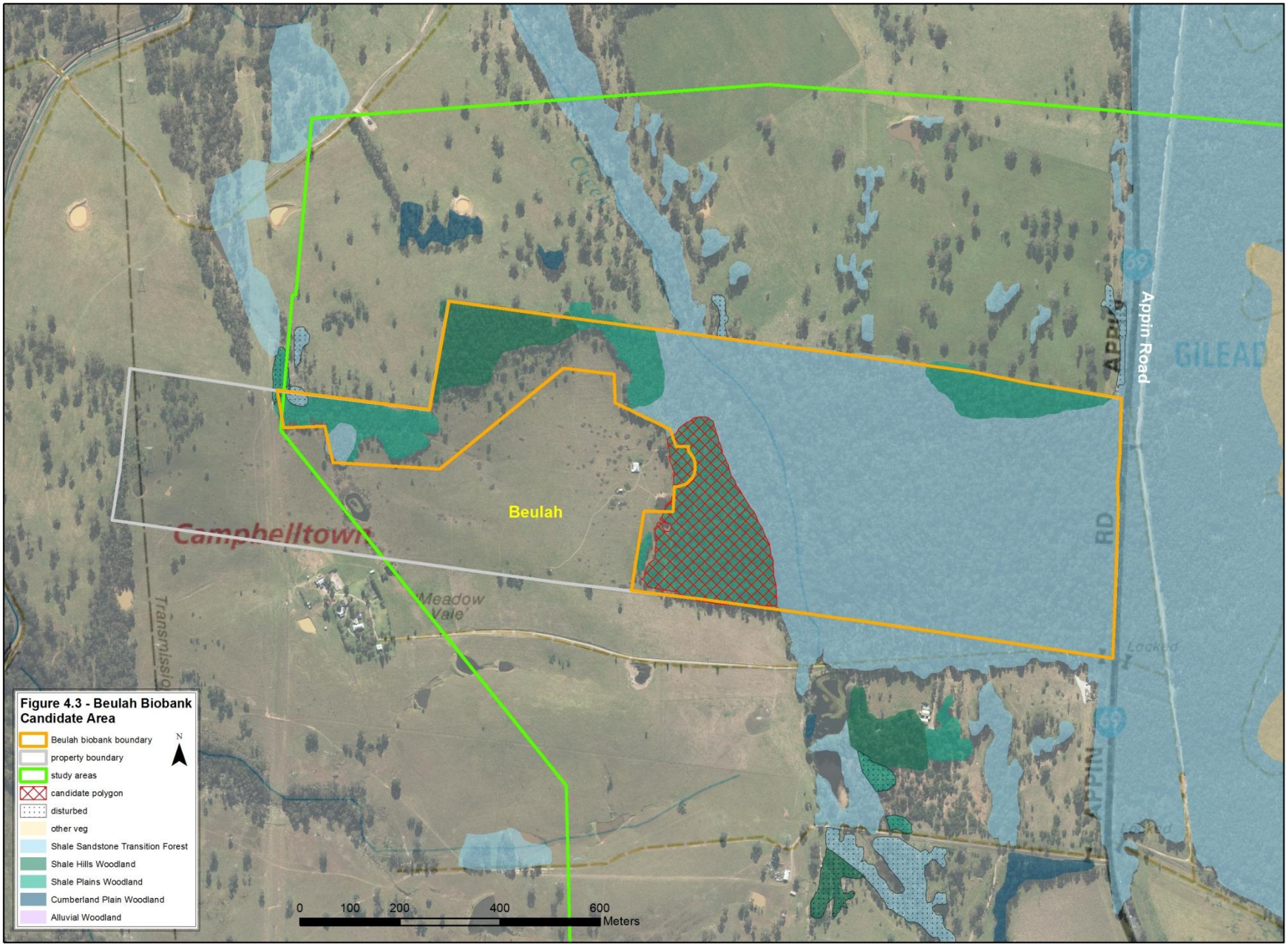

Figure 4.3 - Beulah