4.4 Specific Survey Requirements

As detailed in the Director General's Requirements the following specific survey techniques were considered necessary. In each case, methodologies employed to satisfy these requirements are outlined and the results of the field surveys are provided. Assessments of the likely impacts to each of these species / communities are outlined in Sections 5 and 6 of this report. Note that assessments for threatened species / communities not included in the original DGR's have also been carried out in Sections 5 and 6 of this report (as no 'Specific Survey Requirements' were outlined for these parameters in the DGR's).

Grevillea parviflora* ssp. *parviflora

"Surveys for this species on adjoining land at the HEZ indicate that it is a common understorey species in two main vegetation communities, Kurri Sand Swamp Woodland and Lower Hunter Spotted Gum-Ironbark Woodland (Harper Somers 2002). Both of these communities occur on the proposed link road site. Consequently, targeted surveys for G. parviflora ssp. parviflora are required to determine the distribution/abundance of this species across the site and within the broader study area. These surveys should be undertaken during the main flowering period for the species (between July to December and April to May) when it is most conspicuous and should incorporate areas which represent potential habitat for the species, as described in the draft Threatened Species Information and EIA Guidelines for Grevillea parviflora ssp. parviflora. Survey methods should be rigorous and the results should be mapped and included in the SIS. These results should also be discussed in the light of investigations into the rhizomatous nature of this species, which were proposed for plants to be destroyed during the construction of the stage 1 road infrastructure at the HEZ."

Callistemon linearifolius

"C. linearifolius is patchily distributed across the adjacent HEZ study area, as well as within Werakata National Park. In places, it occurs as a common understorey species within Lower Hunter Spotted Gum Ironbark Forest (Harper Somers 2002). Consequently, targeted surveys should be undertaken for this species in suitable habitat at the link road site to determine its distribution and abundance both along the proposed road route, as well as more generally across the site. The results should be mapped and discussed in relation to the results from the ecological constraints mapping at the HEZ study area."

Kurri Sand Swamp Woodland and *Eucalyptus parramattensis* ssp. *decadens*

"The site for the proposed link road supports the largest remaining intact remnant of Kurri Sand Swamp Woodland. This remnant also retains links with other smaller remnants to the east and north of Kurri Kurri. Preliminary ground truthing of this remnant (Biosis 2001) indicated that the community was in good condition. Further surveys/assessments should be conducted to refine this existing mapping and determine the extent and condition of the community across the site. Ecotonal areas should also be identified and the results mapped and included in the SIS. The distribution and abundance of E. parramattensis ssp. decadens within this EEC should also be surveyed and the information incorporated into the above mapping."

Woodland birds (Brown Treecreeper, Black-chinned Honeyeater, Grey-crowned Babbler, Diamond Firetail and Speckled Warbler)

"The adjacent HEZ study area provides important foraging and breeding habitat for various species of woodland bird such as the Brown Treecreeper, Grey-crowned Babbler and Black-chinned Honeyeater (Harper Somers 2002, Ecotone Ecological Consultants 2003). Consequently, targeted surveys should be undertaken at the proposed link road site by an appropriately qualified person/s in suitable habitat, under appropriate conditions and during periods of high bird activity to determine whether any of these species are present and, if so, how the site is being used by these species. Surveys should be undertaken using formal census methods such as sample plot counts described in the CRA vertebrate fauna surveys (NPWS 1997), as well as opportunistic observations. These surveys should incorporate behavioural observations (foraging, breeding, roosting etc.) to obtain information about how these species are using habitat at the site and should be undertaken over 2 seasons. The results of previous survey work can be used, as well as any other recent historical records compiled by local ornithological groups. Sampling times should reflect the nature of the vegetation (the denser the vegetation the longer the sampling times) and the results should be mapped and included in the SIS."

Swift Parrot and Regent Honeyeater

"Both of these species are seasonal migrants that move through the area and are known to use similar habitat to that which is present at the link road site. Visual and auditory surveys should be conducted between April and October targeting areas at the site which support winter-flowering eucalypts. Survey techniques should match those discussed above for the woodland birds in relation to sampling times and conditions. Sample plot counts should use the standard 20 minute search per 1 hectare area with the distribution of plots reflecting the nature of the habitat being sampled. These species forage over a large area each day and it may take several visits to the site to record their presence. Individuals within the site, flying overhead and in adjacent areas should be recorded and the abundance of birds present should be reported. The results of any earlier surveys of the site by local ornithological groups and other recent historical records can be used to augment this assessment. Using all of the above information, specific trees that represent important foraging resources for these birds should be identified and the results mapped and included in the SIS."

Green-thighed Frog

"The species has been recorded along ephemeral creek lines in the eastern portion of the HEZ study area (Harper Somers 2002). These records are very significant, however no specific habitat surveys for Green-thighed Frog were subsequently undertaken across the HEZ study area for the stage 1 road infrastructure SIS, so it is unclear how much suitable habitat exists at the HEZ or what proportion of this habitat is protected in Werakata National Park or the 7(b) habitat protection zone. An assessment of the likely extent of Green-thighed Frog habitat across the link road site should be undertaken based on habitat where the species has been recorded at the HEZ, to assess the potential direct and indirect impacts of the proposal on this species. This assessment should also consider the extent of the likely Green-thighed Frog habitat in the broader study area and should refer to the results of ecological constraints mapping at the HEZ study area. A catchment map depicting the spatial extent of the known and likely habitat of the Green-thighed Frog in relation to the proposed link road should be prepared and included in the SIS."

4.4.1 Grevillea parviflora ssp*. parviflora*

To assist in the assessment of *G. p. parviflora* within the Pelaw Main By-pass study area, the results of a detailed survey and assessment report previously undertaken for this species within the HEZ study area have been considered (Harper Somers O'Sullivan 2002c). This report primarily attempted to gain further knowledge of the habitat requirements, distribution and abundance of the species within the locality. At this stage, investigations into the rhizomatous nature of this species have not advanced to a level where testable scientific data can be forwarded. Notwithstanding, initial observations have recorded individual plant stems growing from the same rhizome up to one metre in length under the ground. A site inspection with Bob Makinson (a recognised expert in the *Grevillea* genus) to some extent confirmed the results of this report, although it was revealed that closely adjacent flowering stems did not always connote that rhizomes connected these stems, and that they were separate plants. Notwithstanding, it is apparent that in the majority of cases, clumping flowering stems were connected via subterranean rhizomes.

4.4.1.1 Methods

Targeted surveys as part of the abovementioned assessment report involved a combination of methods including desktop assessment (including literature review, database searches), targeted field based surveys, randomised quadrat sampling and statistical analyses. Specific surveys as part of these investigations were conducted along the HEZ Stage 1 road alignment, study area (HEZ lands) and in selected areas (publicly accessible lands) in the locality. The results and population estimates of these investigations have also been considered within this assessment.

Targeted surveys during recent fieldwork area were undertaken in five phases, the first in September 2002, the second during March 2003, the third during June 2003, the fourth during October 2003 and the fifth during June 2005. These surveys focussed on the preliminary and current proposed road alignments, whilst considering the broader distribution of the species throughout the remainder of the study area. Flora quadrat and transect surveys recorded the presence of this species throughout the remainder of the study area. Note of the distribution and frequency of this species was also taken during other phases of diurnal fieldwork throughout the study area.

4.4.1.2 Results

Investigations as per Harper Somers O'Sullivan 2002c

The results show that *G. p. parviflora* is a relatively common to abundant understorey shrub species over large areas of the study area, the nearby HEZ and the Cessnock LGA. This species was found to occur in relative abundance over the majority of the study area, being absent only from cleared / disturbed areas and limited parts of the forested areas. This species appears to achieve the highest frequencies within KSSW and ecotonal areas with LHSGIF. Within the LHSGIF community the species maintains a more sporadic occurrence, being absent from an understorey containing dense thickets of *Melaleuca nodosa* and regenerating / juvenile Broad-leaved Ironbarks. The results obtained from these surveys are summarised below in Table 4-2.

Table 4-2 Habitat and Species Profile of *Grevillea parviflora* ssp. *parviflora* within the Study Area and Cessnock LGA

Recorded Vegetation Types:	Kurri Sand Swamp Woodland (KSSW), Lower Hunter Spotted Gum Ironbark Forest (LHSGIF), ecotones between KSSW / LHSGIF and other vegetation communities[1] and disturbed areas including edges of roads, trails, quarries and powerline easements.
Absent Vegetation Types:	Appears to be absent from parts of LHSGIF due to dominance of blanketing species such as *Melaleuca nodosa* and *Bursaria spinosa* in the understorey; Kurri Sand Melaleuca Scrub Forest; areas of KSSW where understorey is well developed and over-crowding may occur, and riparian vegetation.
Geology:	Various – sand, clay, sandstone, granule and pebble conglomerates.
Landform:	Various – flats and gentle slopes, less common on mid to upper slopes and ridges (i.e. Tomalpin Hill). Absent from larger creeklines, although may be common along small ephemeral creeklines with overland flows and headwater areas.
Elevation (m):	37 – 203m AHD.
Area of Occupancy (ha):	8700ha (Harper Somers O'Sullivan 2002b; Harper Somers O'Sullivan 2002c NPWS Atlas Data)[2].
Number of Known Locations:	Several on Pelaw Main By-pass study area, comprising a significant population. 56 within HEZ study area. 52 outside of Hunter Economic Zone within Cessnock LGA (likely to increase).
Occurrence:	Clustered distribution both on a local scale (within several hundred metres over a kilometre based scale), and on a micro-scale (within several square metres).
Height (m):	Mainly 0.1 – 0.6m, although may occur up to 1.4m.
Fire Response:	Regeneration recorded to occur around 4 months after a moderate intensity fire event.
Flowering:	Early flower buds observed in July, indicating August – onwards flowering period.
Similar Species:	*Grevillea humilis* ssp. *humilis*, *G. linearifolia*, *G. montana*, *Maytenus silvestris*, juvenile *Persoonia linearis*. Recent evidence of cross-breeding with *G. montana* (Harper Somers O'Sullivan 2003). Several different leaf forms noted and probably requires revision (S. Bell pers. comm.).

Note 1: Also found within Grey Gum / Scribbly Gum Open Forest community delineated within this report. Also recently recorded within Coastal Plains Smooth-barked Apple Woodland (HSO ecologists pers. obs.).
2: Likely to be outdated due to numerous other populations found in the interim.

What must be taken into consideration within any assessment for *G. p. parviflora* is the current status of the identification of this species in the Cessnock LGA. As outlined above in Table 4-2, it is likely that the *G. parviflora* complex (and allied species) requires taxonomic revision (S. Bell; B. Makinson pers. comms.). Recent evidence suggests that the identification of *G. p. parviflora* in the locality may be problematic due to the possibility of the occurrence of an analogous *Grevillea,* being the *G. humilis* complex. However, a site inspection with Bob Makinson revealed that there is little evidence that *G. humilis* exists in the area, and that all specimens are indeed, *G. p. parviflora.* It is considered more likely that the morphological differences noted between *G. p. parviflora* individuals within the locality may be due to shortcomings in the description of the *parviflora* sub-species (particularly within juvenile specimens), as opposed to influences from other species.

G. p. parviflora Within the Pelaw Main By-pass Alignment and Study Area

G. p. *parviflora* was found to occur in abundance as an understorey shrub within large sections of the Link Road study area. This species was located within each of the three forested communities throughout virtually the entire study area. For this reason, the distribution of this species on the study area has not been mapped. A depiction of the distribution of this along the proposed road alignment is provided in Figure 4-7. It was found at the greatest density within KSSW and ecotonal areas with LHSGIF, although most consistently within KSSW where it often occurred as a co-dominant low shrub species. It appeared to exist at the greatest densities within ecotone areas between KSSW and LHSGIF. This may be due to the shallower soils therein, necessitating greater surface spread by the rhizomes. However, due to disturbances related to human activity in the KSSW proximate to the village of Pelaw Main, the density of this species within that part of the study area was found to be significantly lower than in KSSW elsewhere on site.

Based on these detailed population estimate investigations, a broad population estimate of 1,239,217 above-ground stems has been determined to exist within the Pelaw Main By-pass study area, as outlined in Table 4-3. Note that the rhizomatous nature of this species may have some influence on the validity of this figure, although for the purposes of proportional estimates and assessment, it is considered sufficient at the present time. Furthermore, field investigations have revealed that *G. p. parviflora* occurs locally at a greater density on the majority of the subject study area than on the HEZ lands and therefore this figure may actually be a proportional underestimate (HSO ecologists pers. obs.).

The number of plants to be directly affected has been estimated to be 16,390 above-ground stems. This figure was generated via ground sampling and counting estimates of above-ground stems along the entire proposed road alignment. This number is lower than would be the figure calculated using population estimates applied to area of vegetation removal multiplied by the mean frequency, as outlined above. However, the generated number is considered valid due to the noted low density of *G. p. parviflora* in much of the KSSW community along the proposed alignment. 16,930 above-ground stems represent an approximation of 1.36% of the total population occurring within the study area.

Table 4-3 Vital Statistics for *Grevillea parviflora* ssp. *parviflora* Within the Pelaw Main By-pass Study Area

Total Population Estimate[1] (TPE):	1,239,217
Number along Road Alignment and Buffer:	16,390
% along alignment compared to TPE:	1.36%
Mean Density within Kurri Sand Swamp Woodland[2] (per ha):	2,936
Mean Density within Lower Hunter Spotted Gum Ironbark Forest and Grey Gum / Scribbly Gum Open Forest[3] (per ha):	668

Note[1]: Population estimates are counts of above-ground stems only. As the species is rhizomatous the number of 'individual' plants is likely to be substantially less.
Note[2]: Figures based on criteria for population estimates as outlined within Harper Somers O'Sullivan 2002c.
Note[3]: Density within LHSGIF applied to GGSGF due to noted comparable frequencies therein.

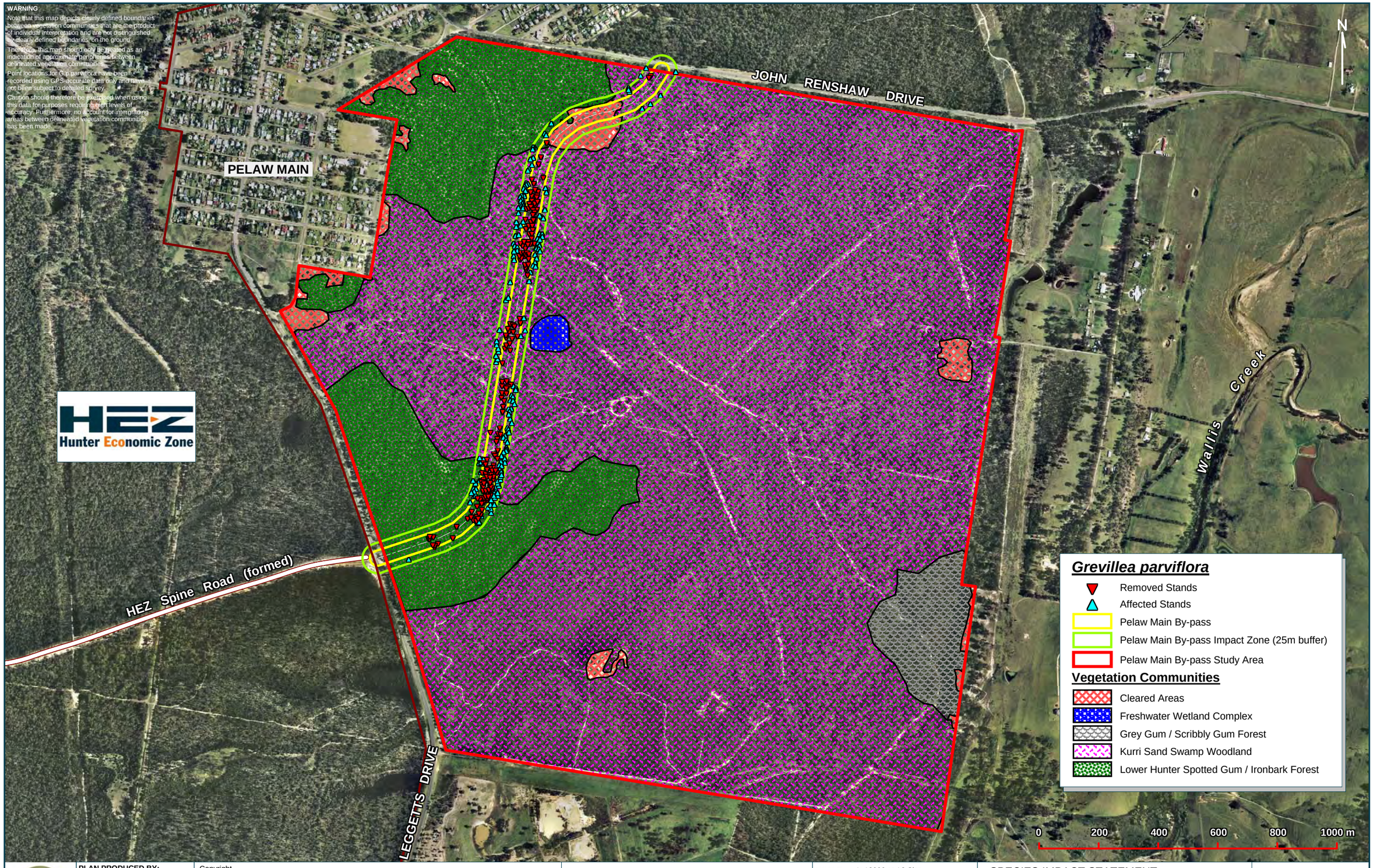
WARNING

Note that this map depicts clearly defined boundaries between vegetation communities that are the product of individual interpretation and are not distinguished by clearly defined boundaries on the ground.

Therefore, this map should only be treated as an indication of approximate peripheries between delineated vegetation communities.

Point locations for *G. parviflora* have been recorded using GPS-accurate data only and have not been subject to detailed survey.

Caution should therefore be exercised when using this data for purposes requiring high levels of accuracy. Furthermore, no account for intergrading areas between delineated vegetation communities has been made.



Grevillea parviflora

- Removed Stands
- Affected Stands
- Pelaw Main By-pass
- Pelaw Main By-pass Impact Zone (25m buffer)
- Pelaw Main By-pass Study Area

Vegetation Communities

- Cleared Areas
- Freshwater Wetland Complex
- Grey Gum / Scribbly Gum Forest
- Kurri Sand Swamp Woodland
- Lower Hunter Spotted Gum / Ironbark Forest

HARPER SOMERS O'SULLIVAN

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NOTES:

Hunter Economic Zone

SCALE: 1: 12000 at A3 Size
DATE: 11/11/2005
DRAWN: S. WATSON
PROJECTION: MGA Zone 56 (GDA 94)

SPECIES IMPACT STATEMENT
PELAW MAIN BY-PASS

FIGURE 4-7

DISTRIBUTION OF GREVILLEA PARVIFLORA ALONG THE ROAD ALIGNMENT

LAYOUT REF: H:\HEZ\MAPINFO\20675 LINK - ROAD\2005 SIS NEW ALIGNMENT DOCUMENT FIGURES\20675-FIG 4-7 GREVILLEA PARVIFLORA-A-A3.WOR

JOB REF: **20675**

4.4.2 Callistemon linearifolius

4.4.2.1 Methods

Targeted surveys were undertaken for *C. linearifolius* along the entire road alignment as well as within the broader study area. These surveys also extended to plot and transect methodologies undertaken throughout the study area and during those surveys undertaken for *G. p. parviflora.* Any specimens found to be unidentifiable in the field were collected and later analysed to determine the identification of the sample. Any specimens unable to be determined this way were then sent to the Royal Botanic Gardens identification service for confirmation or assistance.

4.4.2.2 Results

Despite careful cross-checking with the morphologically similar *C. rigidus,* no specimens of *C. linearifolius* were located anywhere within the study area. Specimens of *C. rigidus* were found to occur in various locations throughout the LHSGIF community within the study area. Some confusion exists between the identification of this species and *C. linearifolius*, although the specimens in question were differentiated by the raised oil-dots on the leaves, lack of pronounced venation, leaf shape and other characteristics that are typical of *C. rigidus*. The Royal Botanic Gardens Sydney has confirmed other similar specimens taken from within the HEZ study area as *C. rigidus* (Inquiry No: 7148) (Harper Somers O'Sullivan 2002b). Further confusion may also occur with the juvenile leaves of *C. linearis*, which may superficially resemble *C. linearifolius* (authors pers. obs.). *C. linearis* was also confirmed to exist within the study area.

It should also be noted that *C. linearifolius* was recorded tentatively from two locations within the study area as part of the initial Ecological Constraints Study, undertaken in 2002 (Harper Somers O'Sullivan 2002a). With an increased knowledge of the morphology of these species since the production of that report, recent ground-truthing has revealed that those plants are in fact, *C. rigidus.*

4.4.3 Kurri Sand Swamp Woodland and Eucalyptus parramattensis **ssp***. decadens*

4.4.3.1 Methods

Further surveys and assessments to those undertaken by Harper Somers O'Sullivan (2002a) were conducted to refine the existing mapping of the boundaries for KSSW and *E. p*. *decadens,* particularly where both features existed along the road alignment. In these instances the edge of the community and/or the occurrence of *E. p*. *decadens* was defined using a Leica GS50 (Backpack) DGPS which was specified to maintain a three dimensional accuracy of 4 metres (i.e.. within 2 metres 'on the ground' – worst case scenario).

Defining the edge of KSSW is often a subjective and difficult task given the often extensive ecotonal intergrade areas that occur. A variety of criteria have been utilised to identify such edges along the route, including:

- Presence / absence of dominant canopy species of KSSW and adjacent vegetation communities (***** see below);

- Presence / absence of indicative understorey species from differing communities (such as those detailed in the final determination to list KSSW as an Endangered Ecological Community under the *Threatened Species Conservation Act 1995*); and

- General structural composition of the communities.

***** The extent of the occurrence of *Corymbia maculata* (Spotted Gum) was used as a key indicator for the bounds of KSSW. This approach was taken due to the following factors:

- Spotted Gum is definitive of the drier Open Forest communities on site and has not been listed in any of the descriptions of KSSW available (i.e. NPWS 2000a; Ecotone 1999; 2002; Biosis 2001; NSW Scientific Committee Final Determination).

- Field observation had inferred that Spotted Gum appeared to only occur within the Open Forest communities, and rarely occurred at the ecotonal point where the community could be classed as KSSW. All other tree types within the Open Forest communities occurred to varying extents and distances within areas that could be classed as KSSW. In essence, Spotted Gum appeared mutually excusive of KSSW virtually 100% of the time and was a good indicator of the point of intergrade where a significant percentage of KSSW attributes start to occur.

- Spotted Gums could be quickly identified and picked up in the field, particularly from a distance, which facilitated the GPS traversing undertaken.

- By defining the extent of Spotted Gums, it is asserted that a conservative approach has been afforded in defining the extent of KSSW in this area. Utilising this approach has probably inadvertently added buffer areas to the extent of the KSSW community.

4.4.3.2 Results

KSSW was found to vastly dominate the study area. Field investigations revealed that 399ha of KSSW exists on the study area, comprising 81.2% of the study area. This includes a small wetland area and creekline / wetland variants (dominated by *Melaleuca* spp.) in the north-western corner of the study area. This figure is slightly higher than the figure generated by Biosis (2001), which delineated 391.4ha of KSSW on the study area (as per LHCCREMS mapping). This is the largest remnant patch of this community known to exist (Biosis 2001).

The proposed Pelaw Main By-pass traverses KSSW predominantly in one large section in the western end of the study area, as well as one smaller section, near John Renshaw Drive. This will result in the loss of 6.7ha of KSSW and a further 6.6ha is considered likely to be affected by the proposed road via edge effects and other indirect impacts. As a result, 13.3ha of KSSW may be affected by the proposal, comprising 3.3% of the total KSSW on the study area. This represents 0.56% of the current total mapped distribution of KSSW. The distribution of *E. p. decadens* along the road alignment is provided in Figure 4-8 whereas a depiction of KSSW along the alignment is provided in Figure 6-1.

Parts of the KSSW along the road alignment have suffered degradation associated with a history of human disturbances. These areas were found to contain several discarded vehicles and illegally dumped rubbish. Many of the vehicles have been burnt out and evidence of unusually high fire frequency is apparent in this area (such as via the dominance of Blady Grass within the groundcover layer). Indeed, parts of the study area appear to have burnt more than once within the past 2 years. Some small cleared patches and tracks also exist. An assessment of the likely impacts upon KSSW is made within Section 6.0.

4.4.4 Woodland Birds (Brown Treecreeper, Black-chinned Honeyeater, Grey-crowned Babbler, Diamond Firetail and Speckled Warbler)

4.4.4.1 Methods

Targeted and opportunistic surveys were undertaken for these woodland birds in a variety of habitats and localities throughout the study area.

Targeted diurnal bird censuses followed the "sample plot counts" as described by NPWS (1997) and replicated by Murray *et al* (2002). Sample plot counts employed a standard 20-minute search within a 1ha area (eg. 100mx100m, 50mx200m). Counts were conducted during periods of high bird activity and detectability. All bird species and individuals seen or heard were recorded, being scored as on-site if detected within the plot, or off-site if recorded in adjacent vegetation types or flying overhead. All data from plot counts were recorded on the NPWS Survey Proforma Sheets, which are attached in Appendix G.

Much time has also been spent on opportunistic surveys and bird observation in general. These observations have been made during other facets of the fieldwork component such as significant tree surveys, vegetation community analysis and threatened flora surveys.

Targeted surveys were undertaken primarily during February / March and June 2003. Field studies conducted during 2005 also paid close attention to any potentially significant avifauna within the study area due to the noted occurrence of threatened avifauna throughout the greater Cessnock LGA during 2005. Previous work was also undertaken in September / October 2002 (Harper Somers O'Sullivan 2002a). Numerous field surveys in the interim have also noted avifauna during those periods. The results from other studies (eg. those undertaken within the HEZ study area) and NPWS Atlas of NSW Wildlife records (last accessed January 2006), when combined with recent results, provide a sufficient level of information (as far as practical) on the size and make-up of the family groups / populations present and how the study area and adjacent areas are being used by each of these species.

It is therefore considered that the requirement to conduct surveys over two seasons has been met (and exceeded).

4.4.4.2 Results

No additional records of any of the above target species were noted during recent surveys, despite ample time periods being spent in areas of suitable habitat. As such, only a single record exists for any these species within the study area, being of a *Chthonicola sagittata* (Speckled Warbler) observed in the north-western part of the study area (Harper Somers O'Sullivan 2002a). Despite targeted searches undertaken in that area following this record, no further signs of this species have been noted therein.

Studies undertaken within the HEZ study area have revealed several and ongoing records of *Pomatostomus temporalis* (Grey-crowned Babbler), *Climacteris picumnus* (Brown Treecreeper) and *Melithreptus gularis* (Black-chinned Honeyeater) in areas proximate to the Pelaw Main By-pass study area that contain similar habitat features (Harper Somers O'Sullivan 2002b; authors pers. obs.). Therefore it is considered likely that individuals of these species would utilise the study area from time to time. This would be particularly likely for *M. gularis* at appropriate times (i.e. during tree blossoming periods), which was recently recorded within proximate land in the HEZ during 2005. The reason for the apparent absence of *P. temporalis* and *C. picumnus* is difficult to ascertain, although the general dominance of the Pelaw Main By-pass study area by KSSW habitats may be a major contributing factor as

both of these species appear (at least locally) to prefer habitats structurally similar to those provided by the LHSGIF (authors pers. obs.).

4.4.5 Swift Parrot and Regent Honeyeater

4.4.5.1 Methods

Targeted surveys were undertaken for *Lathamus discolor* (Swift Parrot) and *Xanthomyza phrygia* (Regent Honeyeater) throughout the study area. Such surveys followed the "sample plot counts" as described previously for 'Woodland Birds' in Section 4.4.4.1. These were principally undertaken during June 2003, when these species are known to occur in the region. Much time has also been spent on opportunistic surveys and bird observation in general. These observations have been made during other facets of the fieldwork component such as significant tree surveys, vegetation community analysis and threatened flora surveys. This includes field studies undertaken during June to August 2005, when the species was known to be inhabiting the Lower Hunter (with records noted by field ecologists involved with the Pelaw Main By-pass project).

Similar investigations were also carried out within the HEZ study area during June and July 2002. Furthermore, a significant amount of time was also spent on opportunistic bird observations during the course of other field investigations in the HEZ study area. Additional winter surveys (July / August 2002) for *L. discolor* were also undertaken in the locality by Debbie Saunders (Swift Parrot Recovery Officer). Additionally, seven (7) observers traversed the HEZ study area for a period of 2.5 hours during August 2002 as part of the Regent Honeyeater / Swift Parrot Surveys as conducted throughout the eastern mainland.

Therefore, the amount of survey effort spent with regards to these species within the Pelaw Main By-pass study area, HEZ lands and general locality in recent times is considered to be substantial.

Both of these species appear to have a preference for foraging within larger, mature trees (D. Geering and D. Saunders pers. comms*;* Swift Parrot Recovery Team 2002). As such, potentially important foraging resources for these birds were identified along the proposed road alignment. To this end, each winter-flowering Eucalypt species that had a Diameter at Breast Height (DBH) greater than 50cm was counted and marked using a Trimble GPS unit.

4.4.5.2 Results

Despite targeted surveys, no sign of either of these species were recorded within the study area during recent surveys. This is most likely due to the lack of blossoming trees noted within the study area during survey periods. Records of both species have been noted from the broader locality during the 2005 season, including significant numbers of *L. discolor* (authors pers. obs.; D. Saunders pers. comm.). Furthermore, significant numbers of *X. phrygia* were recorded in the vicinity of the study area (at Quorrobolong) during 2000 and 2003 (A. Morris pers. comm.), whilst a single bird was recorded from nearby in the HEZ study area in 2005 (authors pers. obs.).

Surveys carried out during winter 2002 resulted in consistent records of *L. discolor* from Mulbring, approximately 8km to the south-east of the Pelaw Main By-pass study area (Harper Somers O'Sullivan 2002b). These results suggested that *L. discolor* has a certain degree of annual site fidelity to the locality and will actively forage and/or migrate through the area despite the lack of winter-flowering Eucalypts.

Although the 2005 Pelaw Main By-pass surveys were carried out during times when the species was known to be within the broader locality, no sign of the species could be noted therein. Furthermore, very few associative avifauna species (such as Little Lorikeets, White-naped Honeyeaters, Noisy Friarbirds) were recorded during field surveys, indicating that conditions were not ideal for either of these species to occur at the time of survey. The results of recent habitat surveys for both species along the Pelaw Main By-pass alignment indicate that nine (9) large (DBH >50cm) winter-flowering Eucalypts (*C. maculata* and *E. agglomerata*) would be removed or directly affected.

4.4.6 Green-thighed Frog

4.4.6.1 Methods

Targeted surveys for *Litoria brevipalmata* (Green-thighed Frog) were carried out in areas deemed to provide potential / preferred habitat. Such habitat was generally confined to the creeklines that traverse the study area. Such searches were largely concentrated around areas of potential habitat that occur along or in close proximity to the proposed road alignment. Potential habitat that occurs downstream of the road alignment was also surveyed. These surveys were undertaken during February and June 2003 during both wet and dry climatic conditions.

4.4.6.2 Results

Despite the recording of several frog species within the areas surveyed, no individuals of *L. brevipalmata* were recorded either by direct observation or audible call identification. However, due to drought conditions experienced in the region, surveys were not undertaken during conditions suitable for the detection of this species and further ongoing surveys for this species will be undertaken as part of the HEZ project. Potential habitat exists for this species throughout the study area within the network of creeklines and in wetland areas – including the identified Freshwater Wetland Complex and other small wetlands within the KSSW community. Along the road alignment, potential habitat for *L. brevipalmata* occurs within creekline crossings approximately 900m and 1150m along the road alignment (from Leggetts Drive) including the small ephemeral wetland situated adjacent to the creek crossing at the 900m chainage.

Individuals of this species were located in two separate locations / catchments within the HEZ study area (Harper Somers O'Sullivan 2002b). The habitat that is traversed by the Pelaw Main By-pass alignment is similar to that within which *L. brevipalmata* was recorded within the HEZ study area, being overland water flowpaths with 'pock-mark' depressions and intermittent pools. Indeed, one of the HEZ records is from approximately 1.85km upstream of the northern creekline that is traversed by the road alignment.

Areas that could possibly provide seasonal habitat for *L. brevipalmata* within the study area are depicted in Figure 4-9.

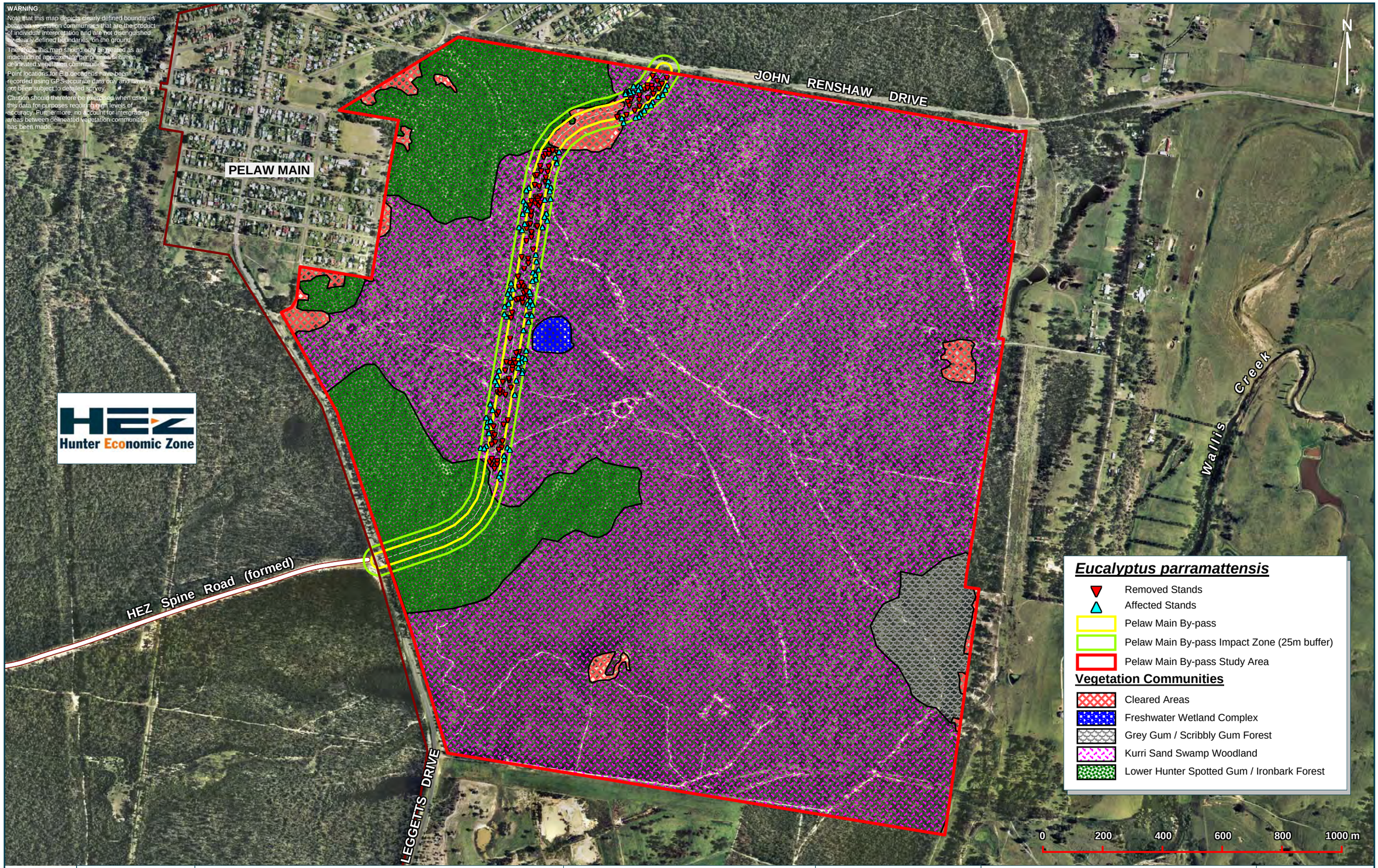
WARNING

Note that this map depicts clearly defined boundaries between vegetation communities that are the product of individual interpretation and are not distinguished by clearly defined boundaries on the ground.

Therefore, this map should only be treated as an indication of approximate peripheries between delineated vegetation communities.

Point locations for *E. p. decadens* have been recorded using GPS-accurate data only and have not been subject to detailed survey.

Caution should therefore be exercised when using this data for purposes requiring high levels of accuracy. Furthermore, no account for intergrading areas between delineated vegetation communities has been made.



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NOTES:

Hunter Economic Zone

SCALE: 1: 12000 at A3 Size
DATE: 11/11/2005
DRAWN: S. WATSON
PROJECTION: MGA Zone 56 (GDA 94)
LAYOUT REF: H:\HEZ\MAPINFO\20675 LINK - ROAD\2005 SIS NEW ALIGNMENT DOCUMENT FIGURES\20675-FIG 4-8 EUCALYPTUS PARRAMATTENSIS-A-A3.WOR

SPECIES IMPACT STATEMENT
PELAW MAIN BY-PASS

FIGURE 4-8

DISTRIBUTION OF EUCALYPTUS PARRAMATTENSIS SSP. DECADENS ALONG THE ROAD ALIGNMENT

JOB REF: **20675**

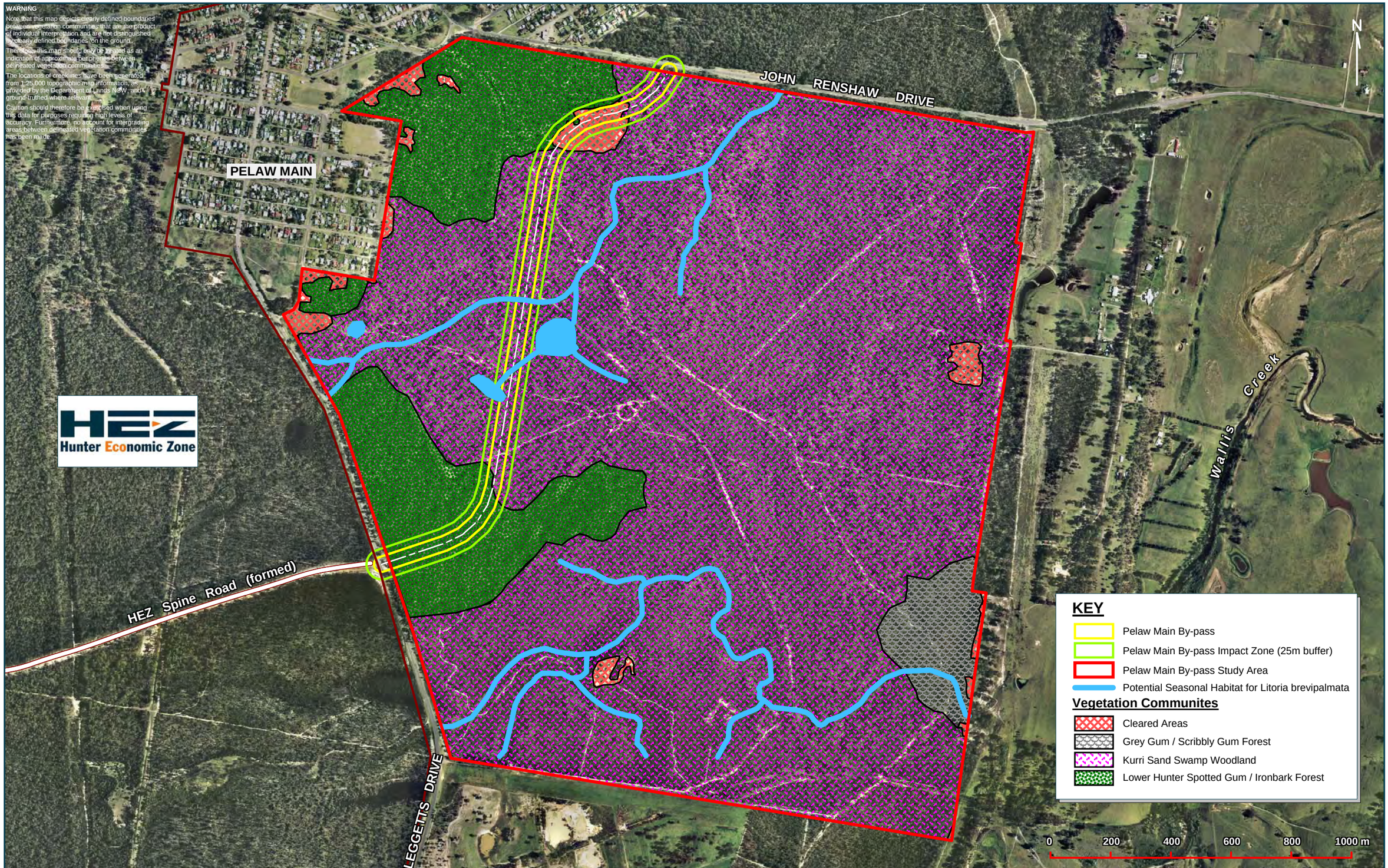
WARNING

Note that this map depicts clearly defined boundaries between vegetation communities that are the product of individual interpretation and are not distinguished by clearly defined boundaries on the ground.

Therefore, this map should only be treated as an indication of approximate peripheries between delineated vegetation communities.

The locations of creeklines have been generated from 1:25,000 topographic map information, as provided by the Department of Lands NSW, and ground-truthed where relevant.

Caution should therefore be exercised when using this data for purposes requiring high levels of accuracy. Furthermore, no account for intergrading areas between delineated vegetation communities has been made.



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LAYOUT REF: H:\HEZ\MAPINFO\20675 LINK - ROAD\2005 SIS NEW ALIGNMENT DOCUMENT FIGURES\20675-FIG 4-9 LITORIA BREVIPALMATA-A-A3.WOR

SPECIES IMPACT STATEMENT
PELAW MAIN BY-PASS

FIGURE 4-9

AREAS THAT COULD PROVIDE SEASONAL HABITAT FOR LITORIA BREVIPALMATA

JOB REF: **20675**