Instant Products Group: Lot 195 Great Northern Highway Muchea, Environment Protection and Biodiversity Conservation Act 1999; Matters of National Environmental Significance – Threatened Fauna and Ecological Communities

Project

Instant Products Group (IPG) is planning on constructing a warehouse and transport depot on Lot 195 Great Northern Highway in Muchea, in the Shire of Chittering in Western Australia (WA).

This summary document presents the results of database search results and a discussion of the potential impacts to Matters of National Environmental Significance from the project.

Database Search Results

Threatened Fauna

The results of a search carried out using the EPBC Act Protected Matters Search Tool and Department of Parks and Wildlife (DPaW) NatureMap database identified eleven (11) Threatened fauna species that could potentially occur within the Referral Area.

The threatened fauna species that were identified in the database searches and their likelihood to be present within the Referral Area are listed in Table 1.

Threatened Flora

The results of a search carried out using the EPBC Act Protected Matters Search Tool listed 17 species, or the species habitat, protected by the EPBC Act that may, are likely or are known to occur within 5 km of the Referral Area – one Critically Endangered species, 12 Endangered species and four Vulnerable species (Table 1).

Three of these 17 species were listed in NatureMap and Department of Parks and Wildlife (DPaW) database search results as occurring within 5 km of the Referral Area – *Acacia anomala*, *Grevillea curviloba* subsp. *incurva* and *Thelymitra stellata*. One additional species that was not included in the EPBC Act Protected Matters Search Tool results but is listed as Endangered under the EPBC Act, *Grevillea althoferorum* subsp. *fragilis*, was listed in the NatureMap and DPaW search results as occurring within 5 km of the Referral Area.

Threatened Ecological Communities

One federally protected TEC was listed in the EPBC Act Protected Matters Search Tool results (DotEE, 2017a). The Banksia Woodlands of the Swan Coastal Plain ecological community is listed as Endangered and the search results indicate that the community is likely to occur within the database search area.

Table 1: Threatened fauna species identified by database searches as potentially occurring within the Referral Area.

Species/Community	Conservation Status	Database Identified in	Likelihood of presence in Referral Area
BIRDS			
Calyptorhynchus latirostris (Carnaby's Black Cockatoo)	EPBC Endangered, WA Act Endangered	EPBC; NM	Highly likely, based on available habitat, and previous reports
Calyptorhynchus banksii naso (Forest red-tailed Black Cockatoo)	EBPC Vulnerable, WA Act Vulnerable	EPBC; NM	Highly likely, based on previous reports
Numenius madagascariensis Eastern Curlew	EPBC Critically Endangered, WA Act Vulnerable	EPBC	Unlikely to occur – Referral Area does not include required habitat of water bodies
Calidris ferruginea Curlew Sandpiper	EPBC Critically Endangered, WA Act Vulnerable	EPBC	Unlikely to occur – Referral Area does not include required habitat of water bodies
Botaurus poiciloptilus (Australasian Bittern)	EPBC Endangered, WA Act Endangered	NM	Unlikely to occur – Referral Area does not include required habitat of water bodies
Rostratula australis Australian Painted Snipe	EPBC Vulnerable, WA Act Endangered	EPBC	Unlikely to occur – Referral Area does not include required habitat of water bodies
Leiopoa ocellata Malleefowl	EPBC Vulnerable, WA Act Vulnerable	EPBC	Highly unlikely to occur
Falco peregrinus (Peregrine Falcon)	WA Act S7	NM	May occur – Referral Area contains habitat that can be used as foraging grounds
MAMMALS			
Dasyurus geoffroii Chudditch	EPBC Vulnerable, WA Act Vulnerable	EPBC	Unlikely based on habitat quality
Isoodon obesulus fusciventer (Southern Brown Bandicoot)	DPaW Priority 4	NM	Likely – suitable habitat exists
REPTILES			
Neelaps calonotos (Black-striped Snake)	DPaW Priority 3	NM	Possible – database records exist within suitable habitat
ECOLOGICAL COMMUNITY			
Banksia Woodlands of the Swan Coastal Plain	EPBC Endangered	EPBC	Highly likely – Referral Area contains suitable habitat and there known occurrences within 1.5 km of the Referral Area.
FLORA (EPBC listed only)			
Acacia anomala	Vulnerable	EPBC; NM; TPFL; WAH	Highly likely – Referral Area contains suitable habitat and there is a known record approximately 1.2 km north of the Referral Area
Andersonia gracilis	Endangered	EPBC	Unlikely – Referral Area does not contain suitable habitat
Anigozanthos viridis subsp. *terraspectans*	Vulnerable	EPBC	Unlikely – Referral Area does not contain suitable habitat

Species/Community	Conservation Status	Database Identified in	Likelihood of presence in Referral Area
Caladenia huegelii	Endangered	EPBC	Unlikely – Referral Area does not contain suitable habitat
Chamelaucium sp. Gingin (N.G. Marchant 6)	Endangered	EPBC	Highly likely – Referral Area contains suitable habitat
Conospermum densiflorum subsp. *unicephalatum*	Endangered	EPBC	Unlikely – Referral Area does not contain suitable habitat
Darwinia foetida	Critically Endangered	EPBC	Unlikely – Referral Area does not contain suitable habitat
Diuris micrantha	Vulnerable	EPBC	Unlikely – Referral Area does not contain suitable habitat
Diuris purdiei	Endangered	EPBC	Unlikely – Referral Area does not contain suitable habitat
Eleocharis keigheryi	Vulnerable	EPBC	Unlikely – Referral Area does not contain suitable habitat
Eucalyptus leprophloia	Endangered	EPBC	Possible – Referral Area contains suitable habitat however the nearest record is approximately 150 km to the north-west
Eucalyptus x *balanites*	Endangered	EPBC	Possible – Referral Area contains suitable habitat however the nearest record is approximately 70 km to the south soth-west
Grevillea althoferorum subsp. *fragilis*	Endangered	NM; TPFL; WAH	Highly likely – Referral Area contains suitable habitat and there is a known record approximately 1.5 km to the east south-east
Grevillea corrugata	Endangered	EPBC	Possible - Referral Area contains suitable habitat
Grevillea curviloba subsp. *curviloba*	Endangered	EPBC	Unlikely – Referral Area does not contain suitable habitat
Grevillea curviloba subsp. *incurva*	Endangered	EPBC; NM; TPFL; WAH;	Unlikely - Referral Area does not contains suitable habitat
Thelymitra dedmaniarum	Endangered	EPBC	Highly likely – Referral Area contains suitable habitat
Thelymitra stellata	Endangered	EPBC; NM; TPFL	Highly likely – Referral Area contains suitable habitat

EPBC = EPBC Act, WC = WC Act, EPBC = DotEE's EPBC Act Protected Matters Search Tool (DotEE, 2017a), NM = NatureMap (DPaW, 2007-), TPFL = DPaW's Threatened (Declared Rare) and Priority Flora database, WAH = Western Australian Herbarium.

Nature and Extent of Likely Impact

Impacts from the Referral Area are calculated assuming that all of the area will be cleared (12.37 ha); however, this will not be the case. While a defined infrastructure area will be cleared, small patches of native vegetation (approximately 3 ha) will be retained for landscaping in the Referral Area.

Threatened Fauna

Carnaby's Black Cockatoo (*Calyptorhynchus latirostris,* EPBC Endangered) and Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso,* EPBC Vulnerable) are identified as the only threatened species highly likely to occur within the Referral Area. Suitable foraging, night roosting, future potential breeding habitat (23 trees over 500 mm breast diameter), and two current potential breeding hollows for Black Cockatoos has been recorded within the Referral Area, as well as a small amount of foraging evidence (pine cone seed extraction) adjacent to the Referral Area (Biologic, 2016 (Attachment 8)). In addition, the fauna survey conducted by Phoenix (2015) recorded numerous sightings of Carnaby's Black-Cockatoo, evidence of feeding signs and suitable nesting trees overlapping the Referral Area. Ecological (2013) identified one potentially new roost site within the Muchea west area. Located approximately 20 km west of the Referral Area is the Gnangara pine plantation, a significant area for Carnaby's Black-Cockatoo as a feeding area during the non-breeding season of summer (Byrne et. al. 2015). Therefore, based on the lack of current breeding evidence found in previous fauna studies, and the significant foraging and night roosting sites recorded in the vicinity of the Referral Area, the only impacts from the proposed action are likely to be a small reduction in foraging and potential future breeding habitat.

An assessment of the proposed action on Carnaby's Black Cockatoo (EPBC Endangered) is provided below in reference to the Significant Impact Guidelines 1.1 - Matters of National Environmental Significance (Table 2).

Table 2: Application of the Matters of National Environmental Significance Significant Impact Guidelines 1.1 to the Carnaby's Black-Cockatoo

Impact Criteria	Significant Impact Likely (Y/N)	Justification
Will the action lead to a long-term decrease in the size of a population?	N	The proposed action will not result in a long-term decrease in the size of the population. Previously conducted fauna surveys, in particular Biologic (2016) do not show any evidence breeding is occurring within the Referral Area, although the area does contain potential future breeding habitat (23 trees over 500 mm breast diameter) including two current potential breeding habitat tree hollows. Fauna studies conducted in the vicinity of the Referral Area identify other night roosting, foraging and potential breeding habitat in proximity to the Referral Area for the species.
Will the action reduce the area of occupancy of the species?	N	The proposed action will result in total loss of habitat (direct and indirect) of 13.7 ha that includes 23 trees of future potential breeding habitat (16 Marri and 7 Jarrah) (Biologic, 2016). This habitat has been recorded as Good condition. The large areas of foraging, night roosting and potential breeding habitat identified within 5 km of the Referral Area means that the overall area of occupancy of the species will not be reduced significantly.
Will the action fragment an existing population into two or more populations?	N	Clearing of 13.7 ha of foraging habitat, which includes 23 trees of future potential breeding habitat, will not fragment the existing population due to the amount of available habitat surrounding the Referral Area. The species is also aerial and mobile, and able to avoid the impacted area.

Impact Criteria	Significant Impact Likely (Y/N)	Justification
Will the action adversely affect habitat critical to the survival of a species?	N	Previously conducted fauna surveys, in particular Biologic (2016) do not show any evidence that breeding is currently occurring within the Referral Area, although the area does contain potential future breeding habitat (23 trees over 500 mm breast diameter) including two current potential breeding habitat tree hollows. The Referral Area contains 13.7 ha of foraging habitat. Fauna studies conducted in the vicinity of the Referral Area identify other night roosting, foraging and potential breeding habitat in proximity to the Referral Area for the species. Therefore, the action is not thought to adversely affect crucial habitat for the species.
Will the action disrupt the breeding cycle of a population?	N	The only current potential breeding habitat identified within the Referral Area are two tree hollows, although the Referral Area does contain 23 trees (16 Marri and seven Jarrah) of future potential breeding habitat (Biologic, 2016). No current breeding activity is identified, and therefore the proposed action is highly unlikely to disrupt the breeding cycle of a population of Carnaby's Black Cockatoos.
Will the action result in invasive species that are harmful to a endangered or critically endangered species becoming established in the endangered or critically endangered species' habitat?	N	It is not expected that the proposed action will result in the establishment of invasive species that are harmful to Carnaby's Black Cockatoo or its habitat.
Will the action introduce disease that may cause the species to decline?	N	It is not expected that the proposed action will result in the introduction of diseases that are harmful to Carnaby's Black Cockatoo.
Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	N	The action will not modify, destroy, remove, isolate or decrease the availability or quality of habitat available to the species to a significant extent. The total loss of habitat as a result of the proposed action (13.7 ha) represents only a very small portion of the potential habitat available in the vicinity, which includes night roosting, foraging and potential future breeding habitat. Only two current potential breeding habitat tree hollows have been identified within the Referral Area.
Will the action interfere with the recovery of the species?	N	Any clearing of habitat from the Referral Area would not interfere with the recovery of the species, as the geographic range of the species is very large in comparison to the size of the population that would use the site.

An assessment of the proposed action on Forest Red-tailed Black Cockatoo (EPBC Vulnerable) is provided below in reference to the Significant Impact Guidelines 1.1 - Matters of National Environmental Significance (Table 3).

Table 3: Application of the Matters of National Environmental Significance Significant Impact Guidelines 1.1 to the Forest Red-tailed Cockatoo

Impact Criteria	Significant Impact Likely (Y/N)	Justification
Will the action lead to a long-term decrease in the size of a population?	N	The proposed action will not result in a long-term decrease in the size of the population. Previously conducted fauna surveys, in particular Biologic (2016) do not show any evidence breeding is occurring within the Referral Area, although the area does contain potential future breeding habitat (23 trees over 500 mm breast diameter) including two current potential breeding habitat tree hollows. Fauna studies conducted in the vicinity of the Referral Area identify other night roosting, foraging and potential breeding habitat in proximity to the Referral Area for the species.
Will the action reduce the area of occupancy of the species?	N	The proposed action will result in total loss of habitat (direct and indirect) of 11.4 ha, which includes 23 trees of future potential breeding habitat (16 Marri and 7 Jarrah) (Biologic, 2016). This habitat has been recorded as Good condition. The large areas of foraging, night roosting and potential breeding habitat identified within 5 km of the Referral Area means that the overall area of occupancy of the species will not be reduced significantly.
Will the action fragment an existing population into two or more populations?	N	Clearing of 11.4 ha of foraging habitat, which includes 23 trees of future potential breeding habitat, will not fragment the existing population due to the large amount of available habitat surrounding the Referral Area. The species is also aerial and mobile, and able to transverse the impacted area.
Will the action adversely affect habitat critical to the survival of a species?	N	Previously conducted fauna surveys, in particular Biologic (2016) do not show any evidence that breeding is currently occurring within the Referral Area, although the area does contain potential future breeding habitat (23 trees over 500 mm breast diameter) including two current potential breeding habitat tree hollows. The Referral Area contains 11.4 ha of foraging habitat. Fauna studies conducted in the vicinity of the Referral Area identify other night roosting, foraging and potential breeding habitat in proximity to the Referral Area for the species. Therefore, the action is not thought to adversely affect crucial habitat for the species.
Will the action disrupt the breeding cycle of a population?	N	The only current potential breeding habitat identified within the Referral Area are two tree hollows, although the Referral Area does contain 23 trees (16 Marri and seven Jarrah) of future potential breeding habitat (Biologic, 2016). Therefore, the proposed action is highly unlikely to disrupt the breeding cycle of a population of Forest Red-tailed Black Cockatoos.
Will the action result in invasive species that are harmful to a endangered or critically endangered species becoming established in the endangered or critically endangered species' habitat?	N	It is not expected that the proposed action will result in the establishment of invasive species that are harmful to Forest Red-tailed Black Cockatoo or its habitat.
Will the action introduce disease that may cause the species to decline?	N	It is not expected that the proposed action will result in the introduction of diseases that are harmful to Forest Red-tailed

Impact Criteria	Significant Impact Likely (Y/N)	Justification
		Black Cockatoos.
Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	N	The action will not modify, destroy, remove, isolate or decrease the availability or quality of habitat available to the species to a significant extent. The loss of habitat as a result of the proposed action (11.4 ha), composed of 16 Marri and seven Jarrah trees, represents only a very small portion of the potential habitat available in the vicinity, which includes night roosting, foraging and potential future breeding habitat. Only two current potential breeding habitat tree hollows have been identified within the Referral Area.
Will the action interfere with the recovery of the species?	N	Any clearing of habitat from the Referral Area would not interfere with the recovery of the species, as the geographic range of the species is very large in comparison to the size of the population that would use the site.

Threatened Flora

None of the flora species listed in the search results were recorded during a combined Level 2 (L2) and targeted flora and vegetation assessment carried out by Maia Environmental Consultancy Pty Ltd (Maia) in March and October 2016 (Maia, 2017).

Threatened Ecological Communities

Maia mapped and described three vegetation types (MVTs) in the Referral Area: *Eucalyptus* Mallee Woodland (*Et***MWL** (1)), *Corymbia* and *Eucalyptus* Forest (*CcEm***F** (2)) and *Eucalyptus* and *Corymbia* Forest (*EmCc***F** (3)).

One of the MVTs mapped in the Referral Area (*Et***MWL** (1)) matches most of the criteria for the federally protected Banksia Woodlands of the Swan Coastal Plain threatened ecological community but lacks the characteristic dominant *Banksia* tree / shrub stratum. The ecological community occurs on the Swan Coastal Plain and is characterised by a prominent tree layer of *Banksia* with scattered eucalypts (DotEE, 2017b).

Quadrats sampled by Maia in the Referral and a broader Survey Area were compared with sites surveyed by Gibson *et al.* (1994) from a floristic survey of the southern Swan Coastal Plain (SCP survey) using the methodology outlined in Maia (2017). Quadrats sampled in MVT *Et***MWL** (1) grouped with SCP survey sites from FCT21c and FCT28 in the regional analysis and both FCTs are included in the TEC.

MVT *Et***MWL** (1) is described as a Mallee Woodland of *Eucalyptus todtiana* with a Low Shrubland of *Eremaea pauciflora* var. *pauciflora, Hibbertia hypericoides* subsp. *hypericoides* +/- Tall Scattered Shrubs of *Banksia menziesii* and *B. attenuata*. The condition of the vegetation at one of the three quadrats assessed in this vegetation type was rated as Excellent (2), at another it was rated as Very Good (3) and at the third as Good (4). The average condition rating for this vegetation type was Very Good and the main disturbance noted was previous clearing. The vegetation of the Referral Area including areas comprising MVT *Et***MWL** (1) has been disturbed in the past with varying degrees of regeneration noted throughout.

Based on Google Earth imagery (Google Inc., 2017) most of the visible disturbance occurred prior to 2004 (the oldest Google Earth image of the Referral Area is dated 18/12/2004). There is also evidence of waste water and depositional silt draining onto the vegetation in the south-west of the Referral Area from the neighboring quarry pit which may have affected species regeneration.

MVT *Et***MWL** (1) occurs in lower lying areas with a surface layer of deep white sand in the south-western section of the Referral Area. A similar vegetation type was noted in an adjacent lot south of the Referral Area with a dominant *Banksia* tree and tall shrub stratum and this may represent a less disturbed patch of this vegetation type.

For EPBC Act referral, assessment and compliance purposes, the national ecological community is limited to patches that meet the key diagnostic characteristics, condition thresholds and minimum patch size (DotEE, 2017b). The thresholds relevant to the Referral Area, along with a brief discussion of each step and its relevance to MVT *Et***MWL** (1) is included in **Table 4.**

Table 4: Banksia Woodlands of the Swan Coastal Plain ecological community and Maia vegetation type *E*tMWL (1)

Banksia Woodlands of the Swan Coastal Plain ecological community - key diagnostic characteristics, condition thresholds and minimum patch size	**Relevance to MVT *Et*MWL (1)**
Step 1 - Key diagnostic characteristics	
Location and physical environment	
The Banksia Woodlands ecological community primarily occurs in the Swan Coastal Plain IBRA bioregion.	The Survey Area occurs on the Swan Coastal Plain IBRA bioregion and the Dandaragan Plateau subregion.
o This covers the coastal plain from around Jurien Bay south, through Perth, to around Dunsborough. It also includes the Dandaragan Plateau.	
o Pockets of the Banksia Woodlands ecological community also extend into the adjacent lower parts of the Darling and Whicher escarpments that lie within the Jarrah Forest IBRA bioregion to the immediate east and south of the Swan Coastal Plain.	
AND	
Soils and landform	
The Banksia Woodlands ecological community:	
o typically occurs on well drained, low nutrient soils on sandplain landforms, particularly deep Bassendean and Spearwood sands and occasionally on Quindalup sands;	MVT *Et***MWL** (1) was recorded on deep white sands.
o is also common on sandy colluvium and aeolian sands of the Ridge Hill Shelf, Whicher Scarp and Dandaragan Plateau; and	
o in other less common scenarios (e.g. tranisitional substrates, sandflats).	
AND	
Structure	
The structure of the ecological community is a low woodland to forest with these features:	

Banksia Woodlands of the Swan Coastal Plain ecological community - key diagnostic characteristics, condition thresholds and minimum patch size	**Relevance to MVT *Et*MWL (1)**
o A distinctive upper sclerophyllous layer of low trees (occasionally large shrubs more than 2 m tall), typically dominated or co-dominated by one or more of the Banksia species identified below; **AND**	MVT *Et***MWL** (1) lacks the characteristic dominant *Banksia* stratum and is dominated by *Eucalyptus todtiana* mallees, an associated species for the community. Woodland dominated by *Banksia attenuata* was noted in a relatively undisturbed patch of vegetation in an adjacent lot to the south of the Survey Area. The area in which MVT *Et***MWL** (1) occurs has been disturbed and this has most likely affected the floristic composition of the MVT.
o Typically occurs on well drained, low nutrient soils on sandplain landforms, particularly deep Bassendean and Spearwood sands and occasionally on Quindalup sands;	
o Emergent trees of medium or tall (>10 m) height Eucalyptus or Allocasuarina species may sometimes be present above the Banksia canopy; **AND**	
o A often highly species-rich understorey that consists of a layer of sclerophyllous shrubs of various heights and a herbaceous ground layer of cord rushes, sedges and perennial and ephemeral forbs, that sometimes includes grasses. The development of a ground layer may vary depending on the density of the shrub layer and disturbance history.	
AND	
Composition	
The canopy is most commonly dominated or co-dominated by *Banksia attenuata* (candlestick banksia, slender banksia) and/or *B. menziesii* (firewood banksia). Other *Banksia* species that dominate in some examples of the ecological community are *B. prionotes* (acorn banksia) or *B.ilicifolia* (holly-leaved banksia); **AND**	
The patch must include at least one of the following diagnostic species:- *Banksia attenuata* (candlestick banksia), *Banksia menziesii* (firewood banksia), *Banksia prionotes* (acorn banksia), *Banksia ilicifolia* (holly-leaved banksia); **AND**	
If present, the emergent tree layer often includes *Corymbia calophylla* (marri), *E. marginata* (jarrah), or less commonly *Eucalyptus gomphocephala* (tuart); **AND**	
Other trees of a medium height that may be present, and may be codominant with the Banksia species across a patch, include *Eucalyptus todtiana* (blackbutt, pricklybark), *Nuytsia floribunda* (Western Australian Christmas tree), *Allocasuarina fraseriana* (western sheoak), *Callitris arenaria* (sandplain cypress), *Callitris pyramidalis* (swamp cypress) and *Xylomelum occidentale* (woody pear); **AND**	

Banksia Woodlands of the Swan Coastal Plain ecological community - key diagnostic characteristics, condition thresholds and minimum patch size	**Relevance to MVT *Et*MWL (1)**
The understorey typically contains a high to very high diversity of shrub and herb species that often vary from patch to patch. Some of the more widespread and potentially characteristic species present in the ecological community are outlined above in Section 1 of the Approved Conservation Advice.	
And in descriptions of vegetation types that relate to the Banksia Woodlands (e.g. Gibson *et al.*, 1994).	
Step 2 - Condition thresholds	
To be considered as part of the ecological community, a patch should meet at least the Good (4) Condition category based on Keighery (1994) Vegetation Condition Scale (GoWA, 2000).	The average condition rating for MVT *Et***MWL** (1) was Very Good (3) which is within the condition threshold.
Step 3 - Minimum patch size	
Where patches meet different levels of condition, different minimum patch sizes apply:	MVT *Et***MWL** (1) is mapped over 2.71 ha which meets the minimum patch size for the condition rating of Very Good (3).
(1) "Pristine" Pristine or nearly so – no minimum patch size	
(2) "Excellent" Vegetation structure intact – 0.5 ha	
(3) "Very Good" Vegetation structure altered – 1 ha	
(4) "Good" Vegetation structure altered but retains basic vegetation structure – 2 ha	
Step 4 - Further information to assist in determining the presence of the ecological community and significant impacts	
Other factors such as land use history, structural form of the patch, landscape position, ecological connectivity, patch continuity are also considered when determining the presence of the ecological community.	The understorey within this MVT has been previously cleared and is lacking the characteristic *Banksia* woodland component of the ecological community. Connectivity to a relatively undisturbed patch of *Banksia* woodland in the adjacent lot to the south of the Project Area is cut off by an access driveway to the neighbouring lot.

MVT *Et***MWL** (1) meets most of the criteria for the TEC, however, it lacks the characteristic dominant *Banksia* stratum and was dominated by *Eucalyptus todtiana* mallees. *Eucalyptus todtiana* is listed as an associated species for the ecological community. The average species richness for this MVT was also relatively low (28.3 species) compared to FCT 21c (40 species) and FCT 28 (55 species). Due to the disturbance history of the Referral Area it is likely that this association is a modified form of the ecological community. Woodland dominated by *Banksia attenuata* was noted in a relatively undisturbed patch of vegetation in an adjacent lot to the south of the Referral Area, however, this vegetation was not mapped by Maia.

Table 5: Impact from the Referral Area to MVT *Et*MWL (1).

Vegetation type	Mapped in Survey Area	Estimated clearing in Referral Area	
	ha	ha	Proportion of mapped area (%)
*Et***MWL** (1)**:**	2.71	2.26	83.39

MVT *Et***MWL** (1) occurs mostly (83%) in the Referral Area and only 17% of it is mapped in the surrounding Survey Area. Impact to *Et***MWL** (1) is high even though the clearing footprint is low because the MVT is mapped mostly in the Referral Area with only a small thin strip mapped along the southern edge of the Survey Area. However, this MVT may extend into the lot adjacent to and south of the Survey Area but this area was not mapped by Maia and not included in the calculations.

Table 6: Application of the Matters of National Environmental Significance Significant Impact Guidelines 1.1 to the ecological community

Impact Criteria	Significant Impact Likely (Y/N)	Justification
Will the action reduce the extent of an ecological community?	N	The proposed action will require clearing of 2.71 ha of MVT *Et***MWL** (1) which is a modified / degraded form of the Banksia woodland TEC. A minimum of 0.45 ha of this MVT will be retained outside of the Referral Area along the southern edge of the Survey Area. Approximately 0.43 ha of this MVT will also be retained in landscaping. Woodland dominated by *Banksia attenuata* was noted in a relatively undisturbed patch of vegetation in an adjacent lot to the south of the Referral Area and is most likely pre-disturbance representation of this MVT and the Banksia Woodlands TEC. Two locations of FCT 23b (which is a component of the TEC and a state listed priority 3 priority ecological community) were listed in the results of a DPaW ecological community database search. The closest location is approximately 1.4 km south of the Referral Area and the second is approximately 1.7 km north-west of the Referral Area. FCTs 21c, 22, 23a and 23b (which are all components of the TEC) have been recorded at Bush Forever site 97 which is located at Kirby Road Bushland approximately 13 km to the south-west of the Referral Area. FCTs 23a and 28 (which are components of the TEC) have also been recorded at Bush Forever site 292 is which is located in DPaW managed Bullsbrook Nature Reserve approximately 10 km to the south. Due to the small area of clearing required, the fact that the vegetation is a modified form of the TEC and that better quality patches of TEC that occur nearby, it is unlikely that the proposed action will have a significant impact on the extent of the TEC.
Will the action fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	N	The proposed action will require clearing of 2.71 ha of MVT *Et***MWL** (1) which is a modified form of the Banksia woodland TEC. The understorey within this MVT has been previously cleared and is lacking the characteristic *Banksia* woodland

Impact Criteria	Significant Impact Likely (Y/N)	Justification
		component of the ecological community. A minimum of 0.45 ha of this MVT will be retained outside of the Referral Area along the southern edge of the Survey Area. Approximately 0.43 ha of this MVT will also be retained wherever possible within the Referral Area for landscaping. Connectivity to a relatively undisturbed patch of *Banksia* woodland in the adjacent lot to the south of the Project Area is cut off by an access driveway on the adjacent lot. Due to the modified state of the vegetation, small scale of clearing and the retention of approximately 0.88 ha of the MVT, it is unlikely that the proposed action will fragment or increase fragmentation of an ecological community.
Will the action adversely affect habitat critical to the survival of an ecological community?	N	Due to the disturbance history of the Referral Area and that *Et***MWL** (1) is a modified / degraded form of the TEC, it is unlikely that the proposed action will adversely affect habitat critical to survival of the Banksia Woodlands TEC.
Will the action modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns?	N	The proposed action will not alter the hydrology of the site for the following reasons: a) The development area has been set back from the centrally located intermittent water course in accordance with the specific requirements of the State Planning Framework to minimise any potential negative impacts arising from the proposed development and use of the land for its intended purposes; b) A significant proportion of stormwater collected from roofed catchments within the development area will be captured and re-used; c) A wastewater re-use system is proposed to be installed to minimise any potential impacts upon ground and surface water quality; and d) All effluent and stormwater drainage infrastructure will be provided, managed and maintained in accordance with the conditions of any development approval that may ultimately be issued by the Shire of Chittering.
Will the action cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting?	N	The average native species richness for this MVT was relatively low (28.3 species) compared to floristically similar community types (FCT 21c an average of 40 species and FCT 28 an average of 55 species). This MVT also had a high number of environmental weed species (20 species) and no conservation significant flora recorded in it. Due to the disturbance history of the vegetation in the Referral Area, it is unlikely that the action will cause a substantial change in the species composition of an occurrence of an ecological community.
Will the action cause a substantial reduction in the quality or integrity of an	N	The proposed action will implement the following actions to ensure that a substantial reduction in the quality or integrity of an

Impact Criteria	Significant Impact Likely (Y/N)	Justification
occurrence of an ecological community? Including, but not limited to: • assisting invasive species, that are harmful to the listed ecological community, to become established, or • causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.		occurrence of an ecological community does not occur: • Standard weed hygiene and Phytophthora Dieback hygiene practices will be employed to prevent the introduction or spread of weeds / the disease into native vegetation in areas around the Referral Area. • Clearing boundaries will be clearly marked prior to construction and no clearing of vegetation outside of this boundary shall occur. • Strict compliance with all conditions of any development approval that may ultimately be issued by the Shire of Chittering.
Will the action interfere with the recovery of an ecological community?	N	The proposed action is unlikely to interfere with the recovery of the ecological community, given that the vegetation representing the TEC in the Referral Area is modified and lacking the characteristic Banksia stratum and therefore is not an accurate representation of the TEC.

Conclusions

Fauna

The fauna species most likely to be affected are Carnaby's Black Cockatoo and Forest Red-tailed Cockatoo, and the Referral Area is thought to contain some foraging habitat and potential future breeding and night roosting habitat for the two species. The Referral Area contains 23 trees over 500 mm breast diameter height (16 Marri and seven Jarrah) that are considered potential future breeding habitat based on DSEWPaC (2011) guidelines, with two trees considered current potential breeding habitat. However, previous fauna surveys have not found any evidence of Black Cockatoo currently breeding within the Referral Area. In addition, there are known night roosts in the vicinity as recorded by Phoenix (2015) and Ecological (2013), as well as significant foraging grounds e.g. the Gnangara Pine Plantation. Given the small impact area (direct and indirect) of the proposed action (13.7 ha; includes 16 Marri and seven Jarrah trees over 500 mm diameter) (Biologic, 2016), the mobile nature of the species, the lack of current breeding evidence, and the number of recorded night roosts and feeding grounds in the vicinity of the Referral Area, the proposed actions are not likely to have significant impacts on these species.

Other threatened species identified as potentially occurring within the Referral Area are considered as either migratory or unlikely to reside long-term due to habitat type and quality, and therefore the proposed action is also not likely to have a significant impact on these species.

Ecological Communities

Although MVT *Et***MWL** (1) meets most of the criteria for the Banksia Woodlands TEC, it is lacking the characteristic Banksia stratum due to historical disturbance within the Referral Area. The proposed action is not expected to have a significant environmental impact at a national, regional or local scale and can be managed through appropriate environmental management measures.

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