

SOUTH32 Illawarra Metallurgical Coal



**BIODIVERSITY OFFSET
STRATEGY
OCTOBER 2023**





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DOCUMENT REVISION LOG

Persons authorising this plan

NAME	TITLE	DATE
Gary Brassington	Manager Approvals	24/10/2023

REVISION	DESCRIPTION OF CHANGES	DATE
1.0	New document - DRAFT	August 2015
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Persons involved in the review of this Plan;

NAME	TITLE	COMPANY	EXP (YRS)	DATE
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1. EXECUTIVE SUMMARY

A Strategic Biodiversity Offset (SBO) located at Maddens Plains, New South Wales to satisfy biodiversity offsetting requirements pursuant to Condition 2.15 of the Dendrobium Mine Development Consent (DA 60-03-2001) and Condition 2.14 of the Bulli Seam Operations Project Approval (08_0150) was approved by the Secretary on 16 December 2016.

Illawarra Metallurgical Coal (IMC) transferred the entire 598 ha Maddens Plains site to the NSW Government for inclusion into the National Parks Estate. The Maddens Plains site secures an important biodiversity corridor and establishes connectivity between the Illawarra Escarpment State Conservation Area and the Dharawal Nature Reserve.

The SBO provides like-for-like physical environmental offsets for the predicted impacts associated with both Dendrobium and Bulli Seam Mining Operations. An assessment of the vegetation on the proposed SBO land, based on mapping undertaken for the *Native Vegetation of the Illawarra Escarpment and Coastal Plain (NPWS 2002)*, shows that 140 ha of upland swamp is present to compensate for potential subsidence related impacts to upland swamps in the Dendrobium mining areas, as well as 386.9 ha of Exposed Sandstone Scribbly Gum Woodland / Sandstone Gully Apple-Peppermint Forest to compensate for the progressive clearing and subsequent rehabilitation of bushland for the Stage 4 Emplacement at West Cliff. 72 ha of other vegetation communities are also located at the Maddens Plains site. Additional environmental attributes such as; threatened flora and fauna, Aboriginal cultural heritage sites, waterways and cliff lines are also present or likely to be present at the SBO site.

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2. INTRODUCTION

Biodiversity offsets are required in accordance with requirements specified in the Dendrobium Mine Development Consent (DA 60-03-2001) (2001) and the Bulli Seam Operations Project Approval (MP 08-150) (2011).

In April 2015, the above-mentioned approvals were modified by adding a condition to enable the provision of SBO, whereby IMC could provide land that has conservation values which exceed the conservation values required to meet existing and proposed offsetting requirements prescribed in a condition of an approval, and that the excess conservation values could be relied upon to meet future offsetting requirements under the Dendrobium Mine Development Consent and the Bulli Seam Operations Project Approval.

IMC transferred 598 ha of high conservation value land at Maddens Plains to the NSW Government for incorporation into the National Parks estate. The SBO at Maddens Plains enables significant areas of like-for-like vegetation communities to be conserved in perpetuity in compensation for the predicted biodiversity impacts at both Dendrobium Mine and the Bulli Seam Operations.

The provision of the Maddens Plains land satisfies:

- Offset requirements for Upland Swamps located in Dendrobium Areas 3B and 3C identified in Table 3-1 (DPE, 2022, p. 5);
- Offset requirements for Upland Swamps in Dendrobium Areas 3A, 3B and 3C mapped on Figure 1 which cover swamps mapped at the time the SBO was prepared in 2016 (DPE, 2022, p. 5) and impacts on Swamp 15a which do not exceed performance measures under Condition 3 of Schedule 3 of the Consent (DPE, 2021, p 12); and
- Conditions 18 and 19 (excluding the part of condition 18(c) relating to *Persoonia hirsuta*) of Schedule 4 of the Bulli Seam Operations Project Approval (22 December 2011) as approved in Revision 2 of this SBO (March 2016).

2.1 Approval History

Dendrobium

The Dendrobium Mine Development Consent was granted by the then Minister for Urban Affairs and Planning in 2001. A substantial modification of the Dendrobium Mine development consent was granted in 2008 for a revised Area 3 longwall domain which was modified to avoid extraction beneath Wongawilli and Sandy Creeks.

Condition 3.14 of the modified Dendrobium Mine Development Consent required that IMC provide suitable offsets for loss of water quality or loss of water flows to Water NSW storages, clearing and other ground disturbance caused by its mining operations and/or surface activities within the

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mining area. The Department of Planning approved the transfer of 33 ha of freehold land owned by IMC within the Metropolitan Special Area to the then Sydney Catchment Authority (now WaterNSW) on 18 November 2010. The offset lands were transferred to the Sydney Catchment Authority in May 2013.

On 6 February 2013, the then Director-General of the Department of Planning and Infrastructure (DoPI) approved the Subsidence Management Plan (SMP) for the Dendrobium Mine Area 3B (DA3B). Condition 6 of the DA3B SMP approval required that IMC provide a suitable offset for all predicted and residual impacts on upland swamps.

Bulli Seam Operations

The West Cliff Stage 4 Coal Wash Emplacement was approved as part of the Bulli Seam Operations Project Approval (MP 08_0150) that was granted by the Planning Assessment Commission (under delegation of the Minister for Planning) on 22 December 2011. The West Cliff Coal Wash Emplacement Biodiversity Offset Strategy is required in accordance with Conditions 4.18-4.19 of the Bulli Seam Operations Project Approval. The conditions require that the offset strategy fulfil “maintain or improve” and seek to fulfil “like for like or better” conservation outcomes for the vegetation associations and *Persoonia hirsuta* impacted by clearing. IMC is also required to provide suitable long-term security for the offset.

The Bulli Seam Operations Project was also approved under the Environmental Protection and Biodiversity Conservation Act 1999 on 15 May 2012 (EPBC 2010/5350). Condition 6a of the EPBC Approval limits clearing of native vegetation at West Cliff Stage 4 Coal Wash Emplacement to no more than 60 ha. Conditions 1-3 of the EPBC Approval requires that an offset and research programme for *Persoonia hirsuta* be implemented.

All of the abovementioned approvals pre-date the NSW Biodiversity Offset Policy for Major Projects which commenced a transitional implementation period on 1 October 2014. The approvals also pre-date the draft *Addendum for upland swamps impacted by longwall mining subsidence*, which was exhibited in mid-2015 and finalised on 1 December 2016. Consequently, neither the Biodiversity Offset Policy nor the upland swamps addendum was applied in previous versions of this biodiversity offset strategy.

Agency consultation

In March 2012, IMC met with representatives from the Office of Environment and Heritage (OEH) in relation to the offset requirements for the Dendrobium and Bulli Seam Operations approvals. At this meeting, OEH recommended that land at Maddens Plains be investigated for its potential to satisfy the offset requirements of both approvals.

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IMC commenced investigation of the biodiversity attributes of the Maddens Plains property in 2012 and concluded that the property contained the same vegetation communities as those required for the offsets. IMC commenced negotiation with the owners of the property in 2013 and purchased the property in early 2014.

In a letter dated 11 December 2012, IMC requested an extension of time for the submission of the Biodiversity Offset Strategy for the West Cliff Coal Wash Emplacement Area as required by Conditions 4.18-4.19 of the Bulli Seam Operations Project Approval. On 20 December 2012, the Director-General of Planning and Infrastructure granted an extension to 31 December 2014 for the submission of the West Cliff Coal Wash Emplacement Area Biodiversity Offset Strategy.

In a letter dated 8 October 2013, IMC requested an extension of time for the submission of the Biodiversity Offset Strategy for DA3B as required by Condition 6 of the DA3B SMP Approval. On 18 October 2013, the DoPE granted an extension to 31 April 2014 for the submission of the Biodiversity Offset Strategy. Further extensions to 25 July 2014 were approved by the DoPE as negotiations continued to resolve outstanding matters.

In April 2015, the Dendrobium Mine Development Consent and Bulli Seam Operations Project Approval were modified by adding Conditions 2.15 and 2.14, respectively, to enable the provision of SBO, whereby IMC could provide land that has conservation values which exceed the conservation values required to meet current offsetting requirements. The modifications further provided that excess conservation values could be relied upon to meet future offsetting requirements pursuant to the Dendrobium Mine Development Consent and the Bulli Seam Operations Project Approval.

Throughout the period from 2013-2016, IMC undertook numerous meetings and held discussions with senior officers of the DoPE, Office of Environment and Heritage, relevant Ministerial Offices and Water NSW in relation to the suitability of the proposed offsets and the transfer of the Maddens Plains lands to the NSW Government for inclusion into the National Parks Estate.

On 16 December 2016, the Secretary DPE approved the SBO Revision 2 (March 2016) in accordance with Condition 2.15 of the Development Consent for the Dendrobium Coal Mine. The SBO (2016) has been relied upon to satisfy conditions related to Biodiversity Offset Strategies for Upland Swamps in subsequent SMP Approvals for the Dendrobium Mine.

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3. PREDICTED IMPACTS THAT REQUIRE OFFSETTING

3.1 Dendrobium Mine Upland Swamps

Upland swamps are commonly known as vegetated freshwater wetlands occurring in shallow basins located in low hills or mountains. They occur in either low sloped headwater tributary valleys (headwater swamps) that are characteristically derived from colluvial sand eroded from the ridgelines or along the riparian zone of creeks and streams (valley infill swamps) within the headwater valleys.

Figure 1 shows the location of Upland swamps in Dendrobium Area 3 as identified by National Parks vegetation mapping in 2002. There were eight headwater swamps and nine valley infill swamps identified within Dendrobium Area 3B (DA3B) and Dendrobium Area 3C (DA3C) and listed in (**Table 3-1**). Figure 1 also shows swamps identified by the 2002 mapping in Area 3A. It should be noted, however, that large swamps can display attributes of the two swamp types and often grade from one to the other rather than having a distinct change from one type to the other.

Eight upland swamps (1a, 1b, 3, 4, 5, 8, 10 & 11) were mapped as wholly or in part within the DA3B subsidence area associated with Longwalls 9-13. The area of the swamps in the Longwall 9-13 mining area as mapped in 2002 was 38.9 ha. The remaining four swamps (13, 14, 23, 35a & 35b) were mapped as wholly or in part within the DA3B mining area associated with Longwalls 14-18. The area of the swamps in the Longwall 14-18 mining area as mapped in 2002 was 15.2 ha. Four upland swamps (2, 6, 7 & 9) were mapped as wholly or in part within the DA3C mining area. The area of the swamps in DA3C as mapped in 2002 was approximately 7.4 ha. The SBO at Maddens Plains satisfies all the swamp biodiversity offsetting requirements for Dendrobium Mine as currently approved by DA 60-03-2001 by protecting in perpetuity, through reservation as National Park, 140 ha of 'like-for-like' upland swamp as detailed in Section 2.

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Table 3-1: Summary of Swamps identified in 2002 mapping within Dendrobium Areas 3B & 3C

Swamp	Headwater Swamp	Valley Infill Swamp	Description	Area (ha)
1a		X	MU43-Tea Tree Thicket; MU44b Restoid Heath; MU44c-Cyperoid Heath;	7.5
1b	X		MU44b-Restoid Heath; MU44c-Cyperoid Heath;	11.4
2		X	MU44a-Sedgeland	0.7
3	X		MU42-Banksia Thicket	3.5
4	X		MU44a-Sedgeland	0.8
5		X	MU42-Banksia Thicket; MU43-Tea Tree Thicket; MU44a-Sedgeland; MU44b-Restoid Heath.	7.5
6	X		MU42-Banksia Thicket	0.9
7	X		MU42-Banksia Thicket; MU44a-Sedgeland	4.3
8		X	MU42-Banksia Thicket; MU44a-Sedgeland;	1.0
9	X		MU44a-Sedgeland	1.5
10		X	MU42-Banksia Thicket; MU44a-Sedgeland;	1.1
11	X		MU42-Banksia Thicket; MU43-Tea Tree Thicket; MU44a-Sedgeland; MU44b-Restoid Heath;.	6.1
13	X		MU42-Banksia Thicket; MU43-Tea Tree Thicket; MU44a-Sedgeland;	2.6
14		X	MU43-Tea Tree Thicket; MU44a-Sedgeland;	5.7
23		X	MU42-Banksia Thicket; MU43-Tea Tree Thicket; MU44a-Sedgeland;	3.9
35a		X	MU43-Tea Tree Thicket.	1.2
35b		X	MU42-Banksia Thicket.	1.8
Total				61.5



3.2 Westcliff Stage 4 Emplacement Area

Up to 60 ha of native vegetation clearing was approved for the Stage 4 Coal Wash Emplacement Area at West Cliff Colliery. The vegetation communities within the Stage 4 Coal Wash Emplacement Area are described in **Table 3-2** and shown in Figure 2.

Table 3-2: Vegetation Communities within the Stage 4 Coal Wash Emplacement Area

Vegetation community	Area (ha)
Exposed Sandstone Scribbly Gum Woodland	39.4
Sandstone Gully Apple-Peppermint Forest	0.7
Sandstone Gully Peppermint Forest	16.8

Up to eight individual *Persoonia hirsuta* were previously identified within the West Cliff Stage 4 Coal Wash Emplacement Area. Surveys for *Persoonia hirsuta* undertaken at West Cliff in November 2012 did not identify any occurrence of *Persoonia hirsuta* within Stage 4 of the emplacement area. The loss of *Persoonia hirsuta* within Stage 4 of the emplacement area is likely due to natural senescence. No clearing has occurred to date in the Stage 4 emplacement area.



4. STRATEGIC BIODIVERSITY OFFSET

The SBO site is located at Maddens Plains, NSW, within the Wollongong Local Government Area (LGA).

The offset area is 598 hectares which includes extensive tracts of native bushland. The property descriptors and area of each lot is described in **Table 4-1**.

Table 4-1: Offset Land – property descriptors and area

Lot	Deposited Plan	Area (ha)
1	248386	62.7
1A	752054	131.1
3	1019453	107.0
4	1019453	113.3
5	1019453	59.9
6	1019453	117.6
74	1112039	6.7

The offset area comprises seven parcels of land that adjoin the Illawarra Escarpment State Conservation Area and Dharawal Nature Reserve (Figure 3). The offset area also adjoins the Special Area managed by the Water NSW. The offset area is approximately 25 km north east of Dendrobium Mine.

With the exception of the offset area at Maddens Plains and Crown Land holdings within Dharawal National Park, the vast majority of upland swamps within the region are within the Water NSW Special Area or the National Park Estate (Figure 4). As such, the Maddens Plains offset provides the only opportunity to physically provide a significant and contiguous like-for-like offset for upland swamps.

Given the like-for-like physical character of the offset area, its large extent and transfer of this land to the ownership of the NSW Government for reservation as national park, no detailed investigation of specific beneficial effects on water quality, water quantity, aquatic ecosystems and/or ecological integrity of the Water NSW special areas or water catchments is required. Improvements in the ecological connectivity between the Illawarra Escarpment State Conservation Area, Dharawal Nature Reserve and the Water NSW Special Area would accrue from inclusion of this offset area into the National Parks Estate.

4.1 Vegetation Communities in the Maddens Plains Offset

The vegetation communities that are present within the proposed Maddens Plains offset are shown in Figure 5 and described in **Table 4-2**.

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Table 4-2: Offset Area – Vegetation Communities and Area (NPWS, 2002)

Vegetation Community	Area (ha)
Upland Swamps: Banksia Thicket	56.9
Upland Swamps: Fringing Eucalypt Woodland	3.2
Upland Swamps: Mallee-Heath	3.6
Upland Swamps: Sedgeland-Heath Complex	76.0
Upland Swamps: Tea-Tree Thicket	0.6
Coachwood Warm Temperate Rainforest	12.3
Escarpment Blackbutt Forest	14.8
Escarpment Edge Silvertop Ash Forest	3.1
Exposed Sandstone Scribbly Gum Woodland	286.9
Sandstone Gully Apple-Peppermint Forest	100.0
Tall Blackbutt-Apple Shale Forest	3.3
Modified Lands	9.3
Acacia Scrub	2.3
Artificial Wetlands	1.6
Cleared	24.2
Weeds and exotics	0.7
Total	598 ha

The vegetation communities at the Maddens Plains offset generally have a low disturbance classification in the Illawarra Escarpment and Coastal Plain – Bioregional Assessment (NPWS, 2002). Access roads and transmission line easements run through some of the vegetation communities, thereby imposing a moderate disturbance classification in these areas. Photos of the relevant vegetation communities at the Maddens Plains offset site are shown below. The vegetation communities at Maddens Plains are of similar quality and the same vegetation community types as the upland swamps at Dendrobium Mine and sandstone forest/woodland at Stage 4 emplacement at West Cliff.



Photos of vegetation communities at the Maddens Plains offset site

<p>Upland Swamps: Sedgeland-Heath Complex</p>	<p>Upland Swamps: Banksia Thicket & Sedgeland-Heath Complex</p>
<p>Upland Swamps: Banksia Thicket</p>	<p>Upland Swamps: Banksia Thicket & Sedgeland-Heath Complex</p>



Photos of Sandstone Gully Apple-Peppermint Forrest & Exposed Sandstone Scribbly Gum Woodland vegetation communities at the Maddens Plains offset site



Sandstone Gully Apple-Peppermint Forrest & Exposed Sandstone Scribbly Gum Woodland

A range of threatened species are also likely to be present at Maddens Plains. These include flora and fauna species described in **Table 4-3**.

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Table 4-3: Threatened Species predicted or known to occur at the Maddens Plains offset site

Flora species	
Scientific name	Common name
Acacia bynoeana	Bynoe's wattle
Cynanchum elegans	White flowered Wax Plant
Epacris purpurascens var purpurascens	
Daphnandra sp. C 'Illawarra'	Illawarra socketwood
Pomaderris adnata	Sublime Point Pomaderris
Pultenaea aristata	Prickly bush pea
Syzgium paniculatum	Magenta lily pilly
Fauna species	
Scientific name	Common name
Heleioporus australiacus	Giant burrowing frog
Litoria littlejohni	Littlejohn's tree frog
Pseudophryne australis	Red crowned toadlet
Litoria aurea	Golden Bell Frog
Varanua rosenbergi	Rosenberg's goanna
Hoplocephalus bungaroides	Broad Headed Snake
Petalura gigantea	Giant Dragonfly

A range of other environmental attributes are present at Maddens Plains as described in **Table 4-4**.

Table 4-4: Other environmental attributes at the Maddens Plains offset site

Environmental Attributes	Size
1 st order streams	7463 m
2 nd order streams	4165 m
Aboriginal sites	23
Cliff lines	~1200 m
Steep slopes	Present*

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4.1.1 Magnitude of Upland Swamp Offset

The condition of the upland swamp vegetation communities at Dendrobium Mine at the time the SBO was approved is considered to be the benchmark condition. The magnitude of the predicted and approved impacts to upland swamps due to mining are described in the Development Consent, SMP, SMP Approval Conditions and SIMMCP. While no clearing of upland swamp will take place, changes in the size and composition of upland swamps may occur as a result of the loss of groundwater or changes to the groundwater regime attributed to the mining activity. However, changes in the size and composition of upland swamps may take a number of years to fully express. The upland swamps are known to be influenced by a variety of natural and/or anthropogenic factors (SIMMCP). A total of 61.5 ha of upland swamp are present in DA3B and DA3C based on 2002 mapping. Not all upland swamps within the Dendrobium mining areas will be mined beneath, thereby avoiding or minimising impact to these swamps.

There have been ongoing discussions between IMC and DPE regarding precisely what swamp offsets are satisfied by the SBO and commentary included in Reasons for Approval documents for Longwall 19 in Area 3A (DPE, 2021, pp 11-12), Longwalls 22 and 23 in Area 3C (DPE, 2022, pp 5-6) and most recently for Longwall 19A in Area 3A (DPE, 2023, pp 7-8). Key points include:

- The Department agrees that the residual conservation values within the SBO can be used to offset any impacts on upland swamps caused by LW19.... However, this offset does not extend to impacts which would cause a breach of Condition 3 of Schedule 3 of the consent (ie: *The Applicant must ensure that subsidence does not cause erosion of the surface or changes in ecosystem functionality of Swamp 15a and that the structural integrity of its controlling rockbar is maintained or restored, to the satisfaction of the Secretary.*). This condition provides a strict performance measure and cannot be satisfied via offsets. Nonetheless, impacts on Swamp 15a which do not exceed this standard can be offset via the SBO (DPE, 2021, p 12);
- The Department confirms that the SBO satisfies offsetting requirements for the swamps in:
 - Areas 3B and 3C identified in Table 3-1 of the SBO; and
 - Areas 3A, 3B and 3C mapped on Figure 1 of the SBO (which cover swamps mapped at the time the SBO was prepared in 2016 (DPE, 2022, p 5);
- The Department also confirms that the SBO satisfies impacts to the vegetation communities of the upland swamps, as well as other environmental attributes such as 1st and 2nd order streams and threatened fauna species (including the Littlejohn’s Tree Frog and Red-crowned Toadlet) (DPE, 2022, p 5);
- The Department notes that Swamps 7 and 9 are listed in Table 3-1 of the SBO and Swamp 153 is shown (although not labelled) on Figure 1 of the SBO. On this basis, the Department considers that the SBO satisfies the offsetting requirements for these swamps (DPE, 2022, p 5);
- Three other swamps (Swamps 154, 155 and 156) are located wholly or partially within the 35° angle of draw line and may experience subsidence related impacts. Two of these swamps (Swamps 155 and 156) are shown on Figure 1 of the SBO and, therefore, any impacts to these would be considered to be already offset. However, Swamp 154 is not listed in Table 3-1 or shown on Figure 1 of the SBO, and is therefore not currently offset.

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The Department has recommended that a subsidence performance measure requiring “*minor environmental consequences*” for this swamp, including:

- negligible erosion of the surface of the swamp;
 - minor changes to the hydrology of the swamp;
 - minor changes in the size of the swamp;
 - minor change in the ecosystem functionality of the swamp; and
 - maintenance or restoration of the structural integrity of the bedrock base of any significant permanent pool or controlling rockbar within the swamp (DPE, 2022, p 6);
- Consistent with the SMP approval for LW 21, if mining causes an exceedance of this performance measure, South32 would be required to either avoid, remediate or offset (or any combination of these measures) in order to meet the condition requirement (DPE, 2022, p 6);
 - The Department notes that this performance measure is already included in the SMP LW 21 approval for Area 3C Swamps 9, 144 and 145. However, as noted by the Panel for Swamp 7, as these swamps are already offset by the SBO (as they are shown on Figure 1), the performance measure is largely irrelevant for these swamps (DPE, 2022, p 6);
 - The Department notes that the above approach to offsetting for swamps in Areas 3A, 3B and 3C will apply to existing approved and future proposed mining in Area 3. Therefore, additional swamps offsets, beyond that provided by the land at Maddens Plains, may be required in future (DPE, 2022, p 6);
 - The Departments Statement of Reasons for LW 19 indicates that, as Area 3A (including LW 19) and swamps in the area were shown in Figure 1 of SBO, the swamps were therefore considered to be included in the offset. Figure 1 of the SBO labels and/or shows Swamps 12, 15a, 15b, 15c and 34, however it does not show Swamp 148. The Department therefore considers that Swamp 148 has not currently been offset (DPE, 2023, p 7).

The Longwall 19A SMP approval specifies subsidence impact performance measures for Swamp 148 under Condition 8 of Schedule 3 as “*minor environmental consequences*” including:

- minor erosion of the surface of the swamp;
- minor change in the size of the swamp;
- minor change in the ecosystem functionality of the swamp;
- minor change to the composition or distribution of species within the swamp; or
- maintenance or restoration of the structural integrity of rockbar base of any significant permanent pool or controlling rockbar within the swamp.

Key points relating to whether the SBO satisfies impacts to “*other environmental impacts*”, including 1st and 2nd order streams and threatened fauna species were outlined in the Longwall 19A Reasons for Approval (DPE, 2023, p 8) and include:

- BCD raised concerns regarding existing and potential future impacts of longwall mining at Dendrobium on threatened fauna species dependent on streams and swamps (e.g.

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Littlejohn’s Tree Frogs and Giant Dragonflies), and inadequate offsets for impacts to these species.

- In accordance with existing conditions of consent, South32 submitted an updated Swamp Rehabilitation and Research Program (SRRP) in May 2023. The SRRP contained a *Littlejohn’s Tree Frog Research Report* prepared by the University of Newcastle which provided clear evidence of the impact on mining at Dendrobium on the frog species. Significantly, the report found that there has been a 33% reduction in recruitment of Littlejohn’s treefrog in Area 3B with models suggesting the population within Area 3B could be extinct within 30 years. The SRRP also contain research results on the impact of mining on other species, including the Giant Dragonfly, however the impact results were inconclusive, primarily due to the limited survey season that focused on longwall mining impacts.
- The SRRP and Niche identified that the Littlejohn’s treefrog species is not solely dependent on swamps for habitat and breeding, but is rather more likely to be dependent on pools within streams. The species is known to exist and breed within 1st and 2nd order steams and associated pools within Dendrobium Areas 3A and 3B.
- The Department notes that the existing conditions of consent require South32 to “mitigate and/or offset any adverse impacts on groundwater dependent ecosystems, aquatic ecosystems or riparian vegetation” (refer to condition 17b, Schedule 4). The Department acknowledges that the existing conservation values of the Maddens Plains offset site may not provide adequate offset to ensure protection of this species. It is understood that there are currently no records of this species within the offset area.
- In response to a request from the Department, South32 has subsequently engaged Niche to conduct further investigations into the conservation values of the Maddens Plains offset area which include surveys for Littlejohn’s Treefrog. The Department notes that South32 has also engaged specialists to conduct studies to inform a ‘Restoration of Littlejohn’s tree frog populations within the Dendrobium mine-lease area project’ (described in Section 5.10 of the SRRP). South32 proposes that the project would involve conducting seven studies that each contribute knowledge to support tailored mitigation and conservation actions for Littlejohn’s Tree Frog.
- The Department has recommended a condition requiring South32 to provide 6 monthly updates on the status and outcome of the surveys and studies detailed in the SRRP. This will inform the Department and relevant agencies on the adequacy of the offsetting and/or mitigation requirements for threatened species impacted by mining at Dendrobium.

The DPE “Reasons for Approval” statements above have recently been relied upon for mine planning in Dendrobium Areas 3A and 3C. In summary, the Maddens Plains land satisfies offset requirements for upland swamps located in:

- Dendrobium Areas 3B and 3C identified in Table 3-1; and
- Dendrobium Areas 3A, 3B and 3C mapped on Figure 1 which cover swamps mapped at the time the SBO was prepared in 2016 and impacts on Swamp 15a which do not exceed performance measures under Condition 3 of Schedule 3 of the Consent.

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4.1.2 Magnitude of Stage 4 Emplacement Area

The sandstone forest and woodland vegetation communities at West Cliff Stage 4 Emplacement Area are considered to be in benchmark condition. EcoLogical Australia (2011) assessed the condition of the sandstone forest and woodland vegetation communities at Maddens Plains as benchmark condition. Clearing of native vegetation at West Cliff Stage 4 Emplacement Area is limited to 60 ha by the Bulli Seam Operations Preferred Project Report and Condition 6 (a) of the EPBC Approval.

The magnitude of the compensatory offset for the impacts at West Cliff Stage 4 Emplacement Area was proposed to be an aerial 2:1 ratio in the Bulli Seam Operations Project Environmental Assessment – Statement of Commitments. Condition 4.18 of the Bulli Seam Operations Project Approval requires an offset strategy to compensate for the impacts to fulfil ‘maintain or improve’ and seek to fulfil ‘like for like or better’ conservation outcomes for the vegetation associations and the *Persoonia hirsuta* impacted by clearing.

As shown in **Table 3-1**, 56.9 ha of native vegetation comprising of Exposed Sandstone Scribbly Gum Woodland (39.4 ha), Sandstone Gully Apple-Peppermint Forest (0.7 ha) and Sandstone Gully Peppermint Forest (16.8 ha) is approved to be progressively cleared as a part of the West Cliff Stage 4 Coal Wash Emplacement. The emplacement will be progressively rehabilitated with native species endemic to the site with the objective to achieve the benchmark condition over time.

The NPWS (2002) Illawarra Escarpment and Coastal Plain – bioregional assessment shows that the Maddens Plains offset contains 286.9 ha of Exposed Sandstone Scribbly Gum Woodland and 100.0 ha of Sandstone Gully Apple-Peppermint Forest. In total, the Maddens Plains offset site provides 386.9 ha of the same vegetation communities that will be progressively cleared and rehabilitated at Stage 4 emplacement, thereby producing an offset ratio of 6.4:1.

Conditions 1-2 of the Bulli Seam Operations EPBC Approval requires that a *Persoonia hirsuta* offset be provided and managed in accordance with a *Persoonia hirsuta* Offset Management Plan. A map of the *Persoonia hirsuta* offset area is shown in Figure 6. The *Persoonia hirsuta* Offset Management Plan was approved by the Australian Department of the Environment on 22 November 2013. The *Persoonia* offset area encompasses the 18 ha core *Persoonia* area at West Cliff Mine. The *Persoonia* offset area has been secured via a Special Condition added to Consolidated Coal Lease (CCL) 724 in accordance with section 238 of the Mining Act. The *Persoonia hirsuta* Offset Management Plan includes a considerable amount of research into the biology of *Persoonia hirsuta* which should be considered as a supplementary offset.

IMC has undertaken targeted research on *Persoonia hirsute* since 2013, including:

- Habitat and demography
- Population genetics;
- Seed biology, germination and recruitment and propagation, and
- Pollination.

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The University of Wollongong (UOW) and Mt Annan Royal Botanic Gardens (RBG) have been engaged to conduct the research. The ‘targeted’ research by UOW consists of a series of honours projects. Mt Annan RBG are undertaking trial propagation using cuttings collected from the West Cliff population. *P. hirsuta* has been successfully propagated vegetatively and by seed. Mt Annan RBG (in collaboration with IMC and Centennial Coal) has undertaken a number of ACARP funded research projects on seed germination biology, alternative ex situ storage of *Persoonia* germplasm for restoration and relocation plantings of *P. hirsute* onto the North Cliff site.

By implementing the *Persoonia hirsuta* Offset Management Plan, the requirements of Condition 4.18 of the Bulli Seam Operations Project Approval to fulfil “maintain or improve” and seek to fulfil “like for like or better” conservation outcomes for the *Persoonia hirsuta* is achieved.

4.1.3 Securing the Maddens Plains Offset

IMC secured the Maddens Plains Offset by transferring this land to the ownership of the NSW Government for reservation as National Park under the National Parks and Wildlife Act 1974. Registration of the transfer was completed on 22 May 2018.

The transfer of the Maddens Plains site to the ownership of the NSW Government for inclusion into the National Parks Estate meets all the offset requirements of the Dendrobium Mine development consent and the Bulli Seam Operations Project Approval as detailed in Section 2.

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5. REVIEW OF ACTUAL ENVIRONMENTAL CONSEQUENCES ON UPLAND SWAMPS

Actual impacts of the development on upland swamps are regularly reviewed against predicted impacts. The reviews include detailed consideration of:

- Predictions in relevant Subsidence Management Plans;
- Performance measures;
- Monitoring results;
- Any measures to mitigate or remediate subsidence impacts and/or associated environmental consequences; and
- Predicted and actual long-term impacts.

Swamp Impact, Monitoring, Management and Contingency Plans (SIMMCP) are prepared in accordance with Condition 6 of Schedule 3 of the Dendrobium Mine Development Consent and include detailed monitoring programs and trigger action response plans. Monitoring programs for Dendrobium Area 3 seek to collect at least 2 years of baseline data (subject to timing and approval timeframes). Monitoring is generally conducted through the mining period and at least for 2-years following active subsidence. The monitoring design is structured around the BACI concept: Before, After, Control and Impact. Predicted impact areas are compared with control areas and measurements taken both before and after an impact event (longwall mining) occurs. Where measurable impacts occur, comparisons of before and after data quantify changes at an impact site after mining.

Review of monitoring data is undertaken on an ongoing basis by the IMC Environmental Field Team. Technical specialists are engaged to undertake detailed assessment of actual environmental consequences against predicted impacts. Results of these investigations are reported in:

- Regular four monthly reporting;
- End of Panel Reporting;
- Annual Review.

A summary of the Dendrobium Area 3 monitoring program including monitoring frequency and reporting is provided in Table 5-1.

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Table 5-1: Monitoring Type, Frequency and Reporting

Type of Monitoring	Frequency	Reporting
Observational, photo point and water monitoring	Pre and post mining for 2 years, monthly when longwall is within 400 m of monitoring site Weekly inspection and pool water levels when longwall is within 400 m of monitoring site Reference sites 6-monthly	End of Panel Annual Review
Erosion monitoring	ALS base surveys were completed in December 2005, with a verification base survey performed in 2013, immediately prior to the commencement of Longwall 9 extraction Ground based surveys to be completed for each longwall after each longwall or to define any new erosions identified by ALS survey	End of Panel Annual Review
Shallow groundwater level	For open hole sites: Monthly monitoring pre, during and post mining for two years to be reviewed annually Reference sites 6 monthly For instrumented sites: Automatic groundwater level monitoring pre, during and post mining (1-hour interval or similar) Monitoring post mining for five years to be reviewed annually	End of Panel Annual Review
Pool levels	Hourly water levels for logged sites Manual benchmarks and visual observations- monthly prior to and after mining; weekly during mining	End of Panel Annual Review
Soil moisture	Instrumented soil moisture monitoring pre, during and post Monitoring post mining for five years to be reviewed annually	End of Panel Annual Review
Terrestrial flora – composition and distribution of species	A baseline monitoring campaign prior to mining during spring Annual post-mining in spring for two years or as otherwise required General observation of active mining areas during all other monitoring	Annually
Terrestrial flora – swamp size	Baseline mapping prior to mining with repeat mapping after each longwall or as determined by observational monitoring i.e. if dieback or invasion of non-swamp species is observed	Annually
Terrestrial fauna – Threatened frog species	Surveys are undertaken in winter each year to target active breeding periods (these can be variable depending on prevailing conditions)	Annually

Views of BCD and WaterNSW would be taken into account in the above reports.

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6. RESIDUAL ENVIRONMENTAL OFFSET

Where mine-related impacts of the development on upland swamps are identified to be beyond those approved and are not satisfied by this BSO, suitable residual environmental offset would be provided via the following:

- Identifying and purchasing the required “like for like” credits, where available; or
- Other suitable payment into the Biodiversity Conservation Fund; or
- Retirement of credits for stewardship sites.

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7. REFERENCES

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Niche (2014) Maddens Plains BioBanking calculations, August 2014

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FIGURES

Figure 1. Dendrobium Area 3 Swamps

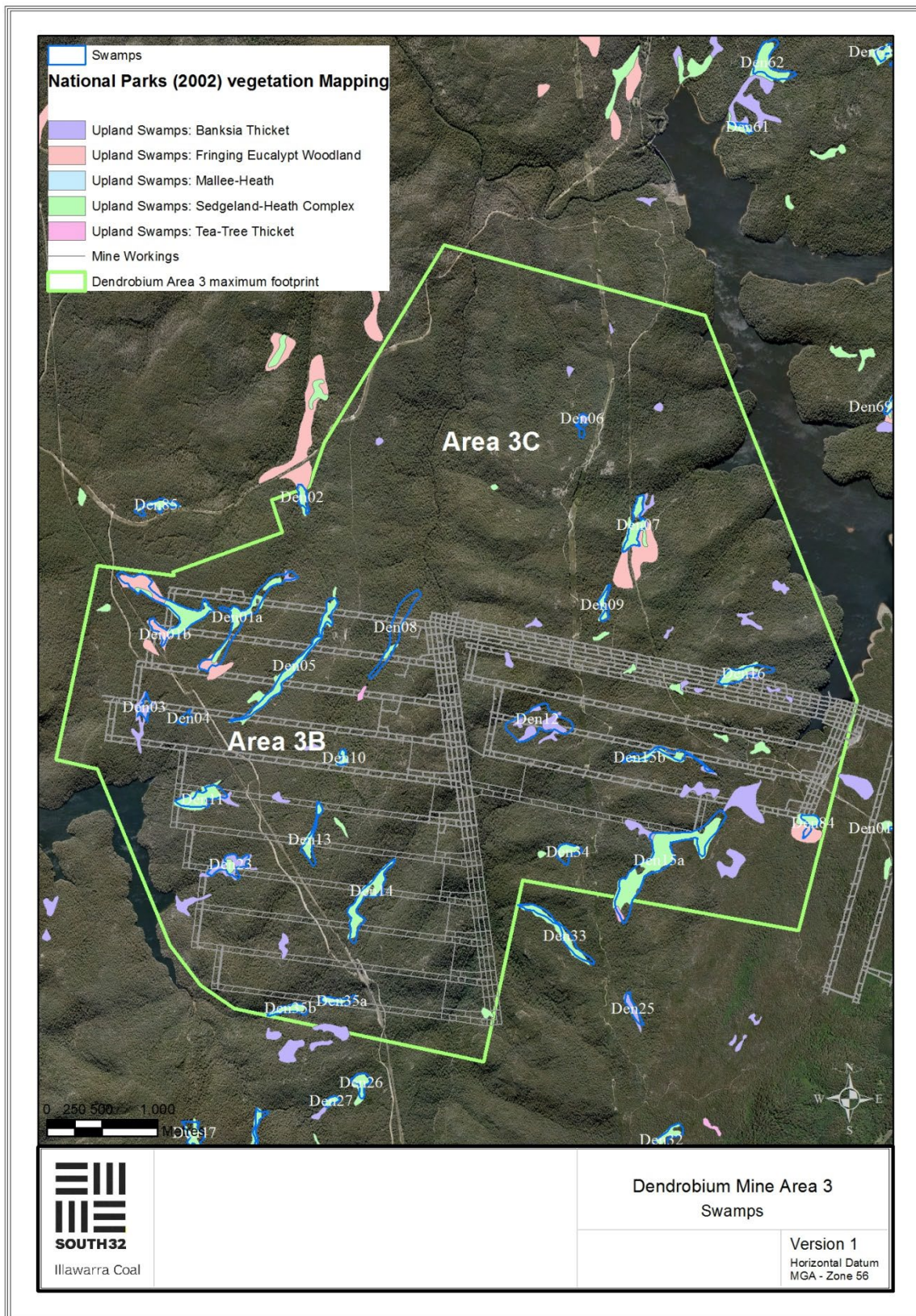


Figure 2: Vegetation at West Cliff Stage 4 Emplacement

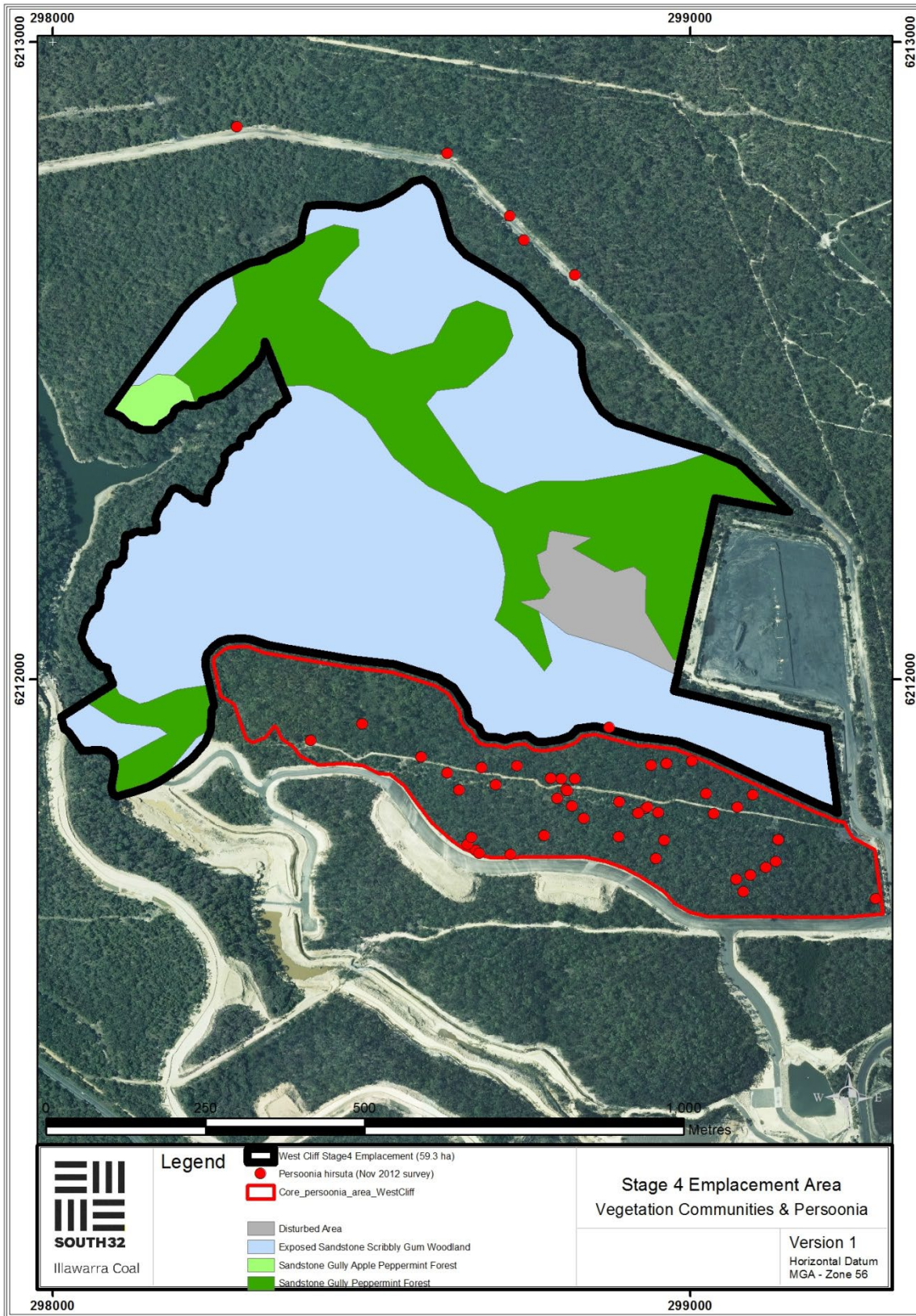


Figure 3. Strategic Biodiversity Offset at Maddens Plains

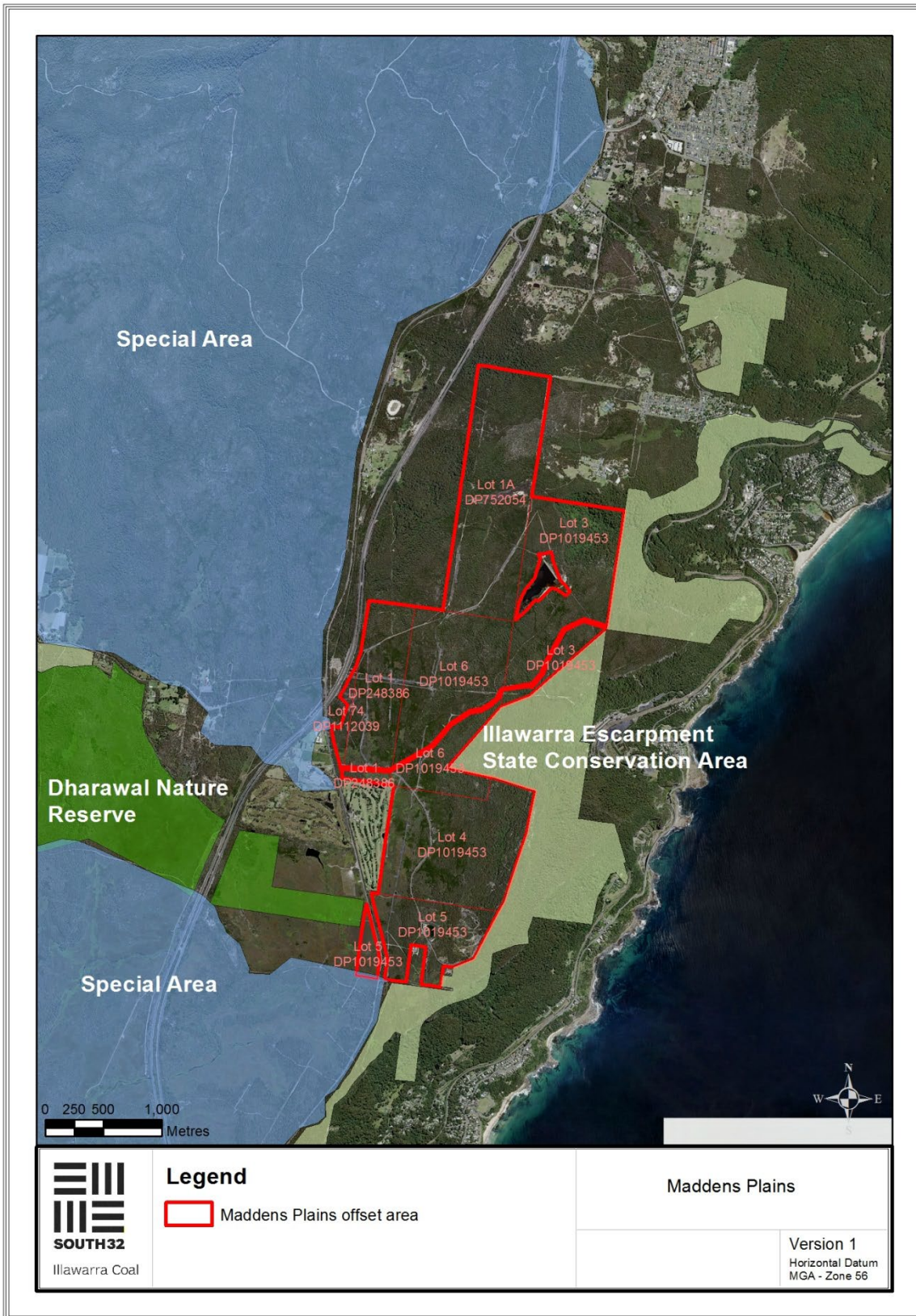


Figure 4. Regional Distribution of Upland Swamps

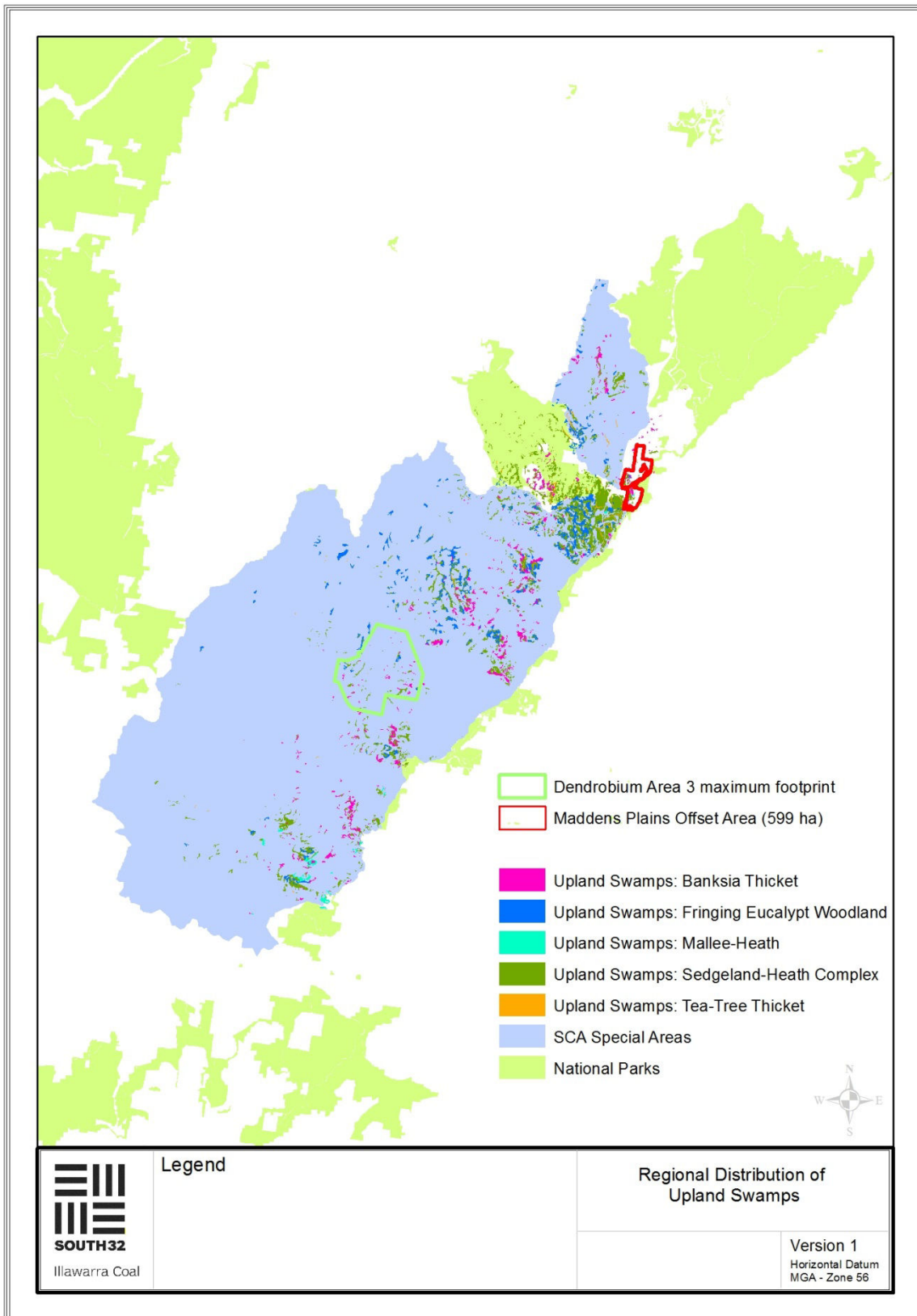


Figure 5. Maddens Plains Vegetation Communities

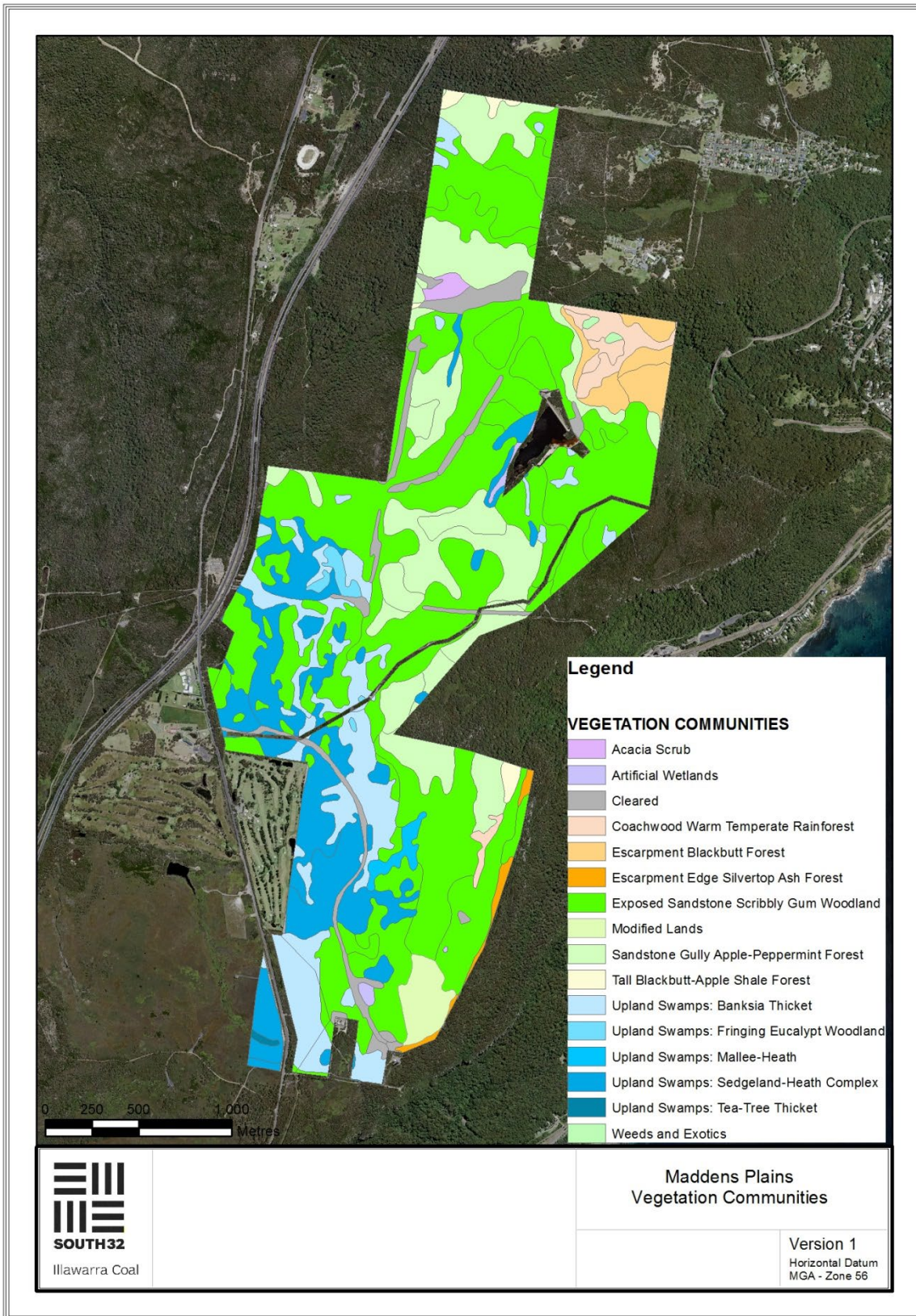


Figure 6. Approved Persoonia Offset at West Cliff

