Springvale Coal Mine

Swamp Offset Strategy

August 2022

DOCUMENT CONTROL

DOCUMENT DETAILS	**Title:**	Springvale Coal Mine Swamp Offset Strategy
	Applicant:	Springvale Coal Pty Ltd
	Date:	August 2022
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EXECUTIVE SUMMARY

The Springvale Coal Mine (Springvale) undermines Newnes Plateau Shrub Swamps (NPSS) and Newnes Plateau Hanging Swamps (NPHS) which are collectively commensurate with the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed Temperate Highland Peat Swamps on Sandstone (THPSS) Endangered Ecological Community (EEC). In accordance with the Springvale State Significant Development (SSD) 5594 development consent and EPBC approvals, any greater than negligible environmental consequences to THPSS and their associated threatened species will be required to be offset.

To minimise the risk of impacts to NPSS and NPHS, Springvale Coal implements adaptive management measures through mine design. At the time of preparing the Springvale Mine Extension Project Environmental Impact Statement (EIS), a thorough review of historical subsidence and environmental monitoring data was conducted to inform the mine design. The mine design proposed as part of the Springvale Mine Extension Project was with a void width of 261 metres with chain pillars of 58 metres. This mine design was developed to achieve sub-critical width-to depth ratios within the range of 0.65 and 0.75 and minimise subsidence impacts, particularly in relation to swamps.

Since the granting of the SSD 5594 development consent, and as the understanding of how NPSS were impacted by mining, further adaptive management measures have been committed to by Springvale Coal to minimise the risk or extent of impacts to NPSS. These measures included:

- Removing Longwall 422, 423 and 424 from the proposed mine plan;
- Shortening Longwall 421, 425 and 427 to avoid mining through major lineaments.
- Reduction in longwall lengths to both longwalls 431 and 432.

These adaptive management mine plan changes have resulted in the sterilisation of approximately 8.8 million tonnes of coal resource and a 3 year reduction in the production life of Springvale.

Despite the measures taken to minimise the risk of impacts to NPSS through adaptive management mine plan changes, changes to groundwater levels in NPSS have been measured at NPSS that can be attributed to Springvale's mining activities. Further impacts to NPSS are anticipated as a result of current and future proposed mining.

The extent of mine related impacts to NPSS is dependent on a number of factors. Not all NPSS have been impacted by mining at Springvale and the extent of impacts differs across each swamp based on the influence of various factors. There have been no impacts to NPHS observed to-date and no impacts predicted based on available monitoring data and their location above the YS4 aquitard.

To compensate for mining related impacts to NPSS, Springvale Coal has developed a multi-layered swamp offset strategy to satisfy the specific requirements of State and Commonwealth approvals. The swamp offset strategy proposed by Springvale Coal includes:

- Direct offsets including:
    - The support for securing of the Newnes, Wolgan and Ben Bullen State Forests into a State Conservation Area (SCA) to protect NPSS and NPHS. This would result in the 90% direct offset requirement under the Commonwealth offsets policy.
    - The contribution of $28 million to the management of the new SCA.
- Supplementary measures including:
    - The implementation of ongoing monitoring and research of NPSS and NPHS.
    - Ongoing investment into the analysis and reporting of data associated with the NPSS and NPHS to understand swamp impacts and any swamp recovery post mining.
    - Investigation into feasible and reasonable remediation measures and implementation of any identified feasible and reasonable mitigation measures.

1 INTRODUCTION

The Springvale Coal Mine (Springvale) is an underground coal mine located in the western coalfield of NSW approximately 15 km north-west of Lithgow. The mine is jointly owned by Centennial Springvale Pty Limited and Boulder Mining Pty Ltd, and is operated by Springvale Coal Pty Limited (Springvale Coal).

Springvale currently operates under State Significant Development consent (SSD 5594). This development consent was granted on 21 September 2015 by the (then) Planning Assessment Commission of NSW and allows Springvale to carry out mining operations until 31 December 2028. Additionally, Springvale operates in accordance with two Commonwealth approvals issued under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). EPBC 2011/5949 was granted on 14 March 2012 and allows Springvale to extract coal from Longwalls 415-418. EPBC 2013/6881 was granted on 15 October 2015 to expand underground mining proposed under SSD 5594.

Springvale undermine Newnes Plateau Shrub Swamps (NPSS) and Newnes Plateau Hanging Swamps (NPHS). NPSS is listed as an endangered ecological community (EEC) under the NSW *Biodiversity Conservation Act* 2016 (BC Act). NPSS and NPHS are collectively commensurate with the Temperate Highland Peat Swamps on Sandstone (THPSS) community which is listed as an EEC under the EPBC Act.

In accordance with the SSD 5594 development consent and EPBC approvals, any greater than negligible environmental consequences to THPSS (comprising NPSS and NPHS) and their associated threatened species will be required to be offset.

This version (version 9) has been prepared to address comments provided on 14 April 2022, from the Federal Department of Agriculture, Water and the Environment (DAWE) and to address condition 2 of the Swamp Offset Strategy (this Strategy) approval.

2 SCOPE

This Swamp Offset Strategy has been designed to satisfy the SSD 5594 development consent and EPBC approval requirements for offsets to be secured should greater than negligible impacts to NPSS or associated threatened species be realised. Specifically, this Swamp Offset Strategy is designed to satisfy offset obligations required under:

- SSD 5594 Schedule 3, Condition 3;
- SSD 5594 Schedule 3, Condition 4;
- SSD 5594 Schedule 3, Condition 5;
- EPBC 2013/6881 Condition 5;
- EPBC 2011/5949 Condition 14; and
- Department of Planning and Environment's conditional approval of the Swamp Offset Strategy.

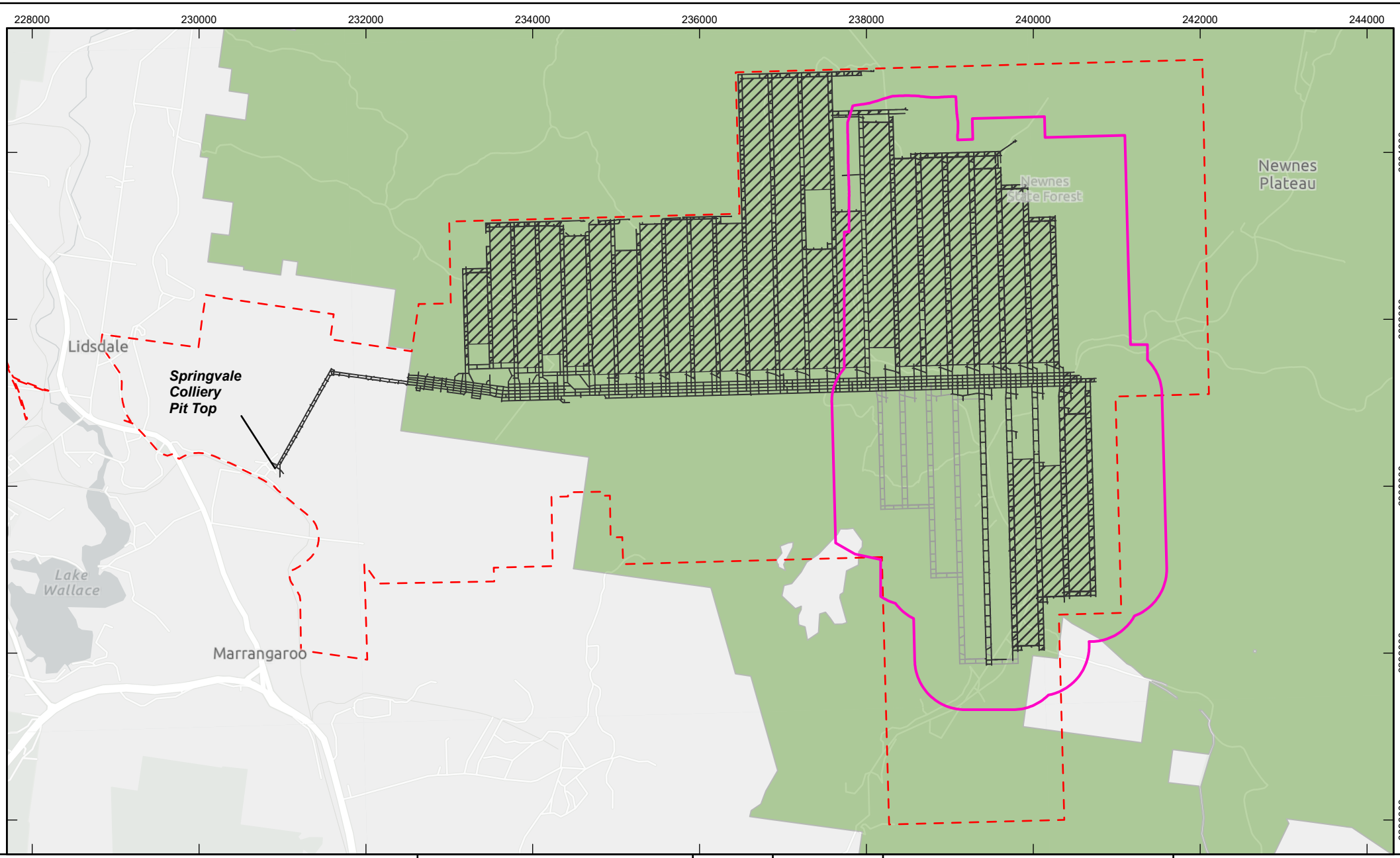
The relevant conditions are detailed in **Appendix 1**.

The area considered relevant to this Swamp Offset Strategy is referred to as the Consolidated Approval Area. The Consolidated Approval Area is shown on **Figure 1** and comprises:

- The EPBC 2011/5949 mining area;
- The EPBC 2013/6881 mining area; and
- The SSD 5594 mining area.

No impacts to NPSS or NPHS beyond the Consolidated Approval Area are anticipated and any impacts to NPSS beyond the Consolidated Approval Area is not subject to this Swamp Offset Strategy. Furthermore, no greater than negligible mining related impacts have been measured in NPHS to-date and no greater than negligible environmental impacts to NPHS are anticipated from future mining at Springvale. Any mining related

impacts to NPHS would constitute a breach of the SSD 5594 development consent performance criteria and be subject to further enforcement action by the Department of Planning, Industry & Environment (DPIE). Accordingly, this Swamp Offset Strategy addresses offsets associated with NPSS or associated threatened species.



PLOTFILE: N:\SHARED\PLOTS\Plans_PDF\PC7747_R1_Springvale Coal Mine Consolidated Approval Area Figure 1_20211202.pdf

Legend

- Springvale Holding Boundary
- Consolidated Approval Area
- Newnes State Forest
- Existing Mine Workings (Dated: 19/11/2021)
- Proposed Mine Workings (Dated: May 2021)

N

0 1,000 2,000 3,000
meters

Coordinate System: GDA 1994 MGA Zone 56

LOCATION	Springvale
SEAM	Lithgow
DRAWN	D.MacBain
CHECKED	J.Wearne
APPROVED	J.Wearne
SCALE	1:60,000 @ A4

SPRINGVALE COAL MINE
Consolidated Approval Area
---Figure 1---

CENTENNIAL SPRINGVALE

DATE: 2/12/2021 | PC7747 | R1

Esri, HERE, Garmin, METI/NASA, USGS

3 NEWNES PLATEAU SHRUB SWAMPS AND NEWNES PLATEAU HANGING SWAMPS

NPSS develop on the Newnes Plateau in the bases of valleys which are subject to periodic to permanent waterlogging from groundwater, surface water and direct rainfall. NPHS develop on flanks of valleys which are subject to infrequent waterlogging from perched groundwater systems, surface runoff and direct rainfall. NPSS are listed as an EEC under the BC Act and provide important habitat for a range of plants and animals.

Threatened flora and fauna species associated with THPSS and their conservation status is listed below:

- Blue Mountains Water Skink (*Eulamprus leuraensis*) is listed as Endangered under both the BC Act and the EPBC Act.
- Giant Dragonfly (*Petalura gigantea*) is listed as Endangered under the BC Act.
- Deane's Boronia (*Boronia deanei*) is listed as Vulnerable under both the BC Act and the EPBC Act.
- Red Crowned Toadlet (*Pseudophryne australis*) is listed as Vulnerable under the BC Act.
- Giant Burrowing Frog (Heleioporus australiacus) is listed as Vulnerable under both the BC Act and the EPBC Act.

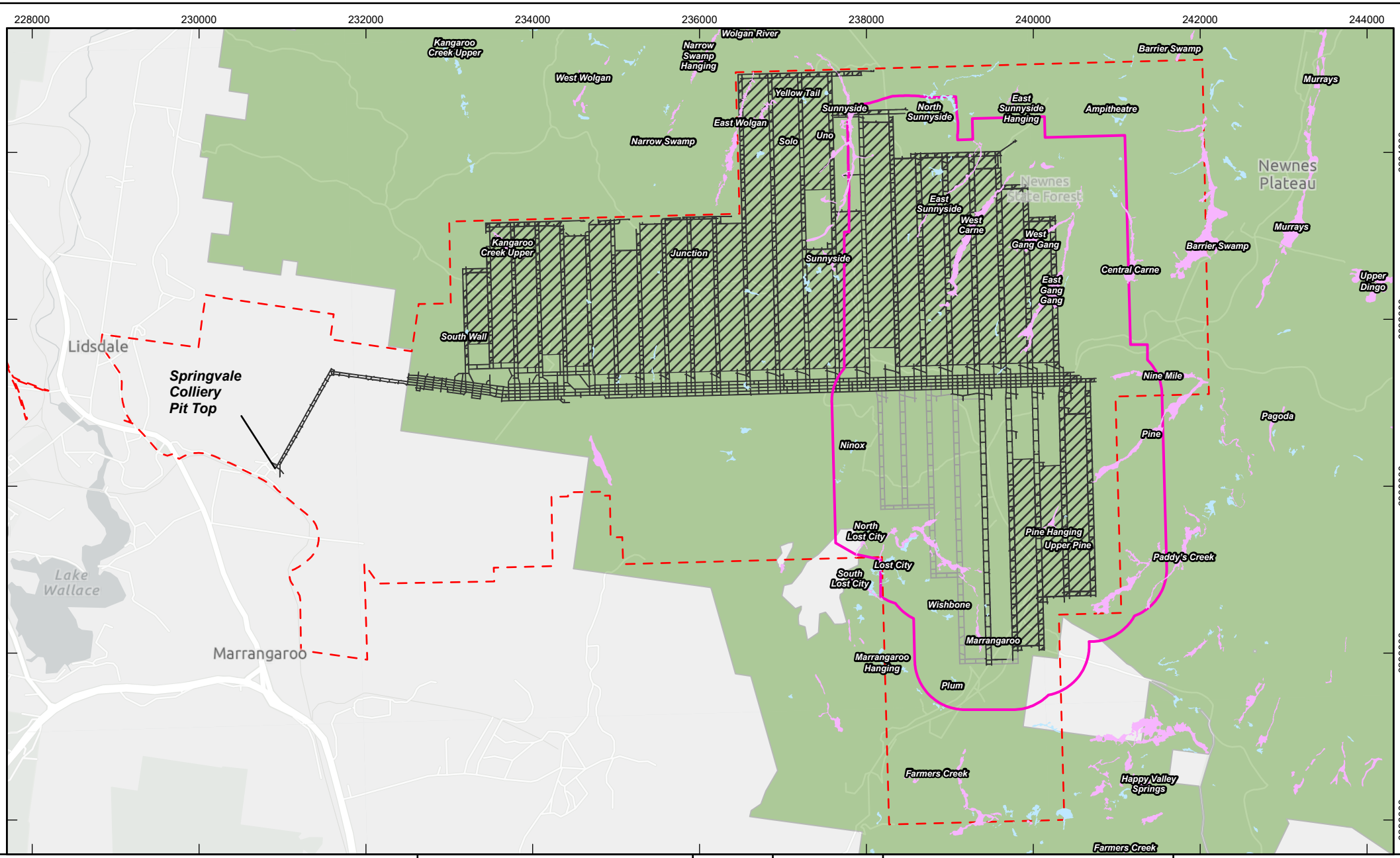
A significant component of the total area of mapped NPSS and NPHS occur within the Newnes State Forest as shown in **Figure 2**. There are 14 NPSS located within the Consolidated Approval Area (as shown on **Figure 3**) comprising:

- Sunnyside Swamp;
- Sunnyside East Swamp;
- Carne West Swamp;
- Gang Gang South West Swamp;
- Gang Gang East Swamp;
- Nine Mile Swamp;
- Pine Swamp;
- Pine Upper Swamp;
- Paddys Creek Swamp;
- Marrangaroo Creek Swamp;
- Marrangaroo Creek Upper Swamp;
- Carne Central Swamp;
- Lost City Swamp; and
- North Lost City Swamp.

NPHS located within the Consolidated Approval Area (as shown on **Figure 3**) comprise:

- Hanging swamp on western slope above Gang Gang East Swamp;
- Hanging swamp on south western slope above Pine Swamp Upper;
- Hanging swamps above Marrangaroo Creek Swamp;
- Lost City Hanging Swamps;
- Lost City North Hanging Swamps;
- Lost City South Hanging Swamps;

- Plum Hanging Swamp;
- Ninox Hanging Swamp;
- Wishbone Hanging Swamp; and
- Sunnyside North Hanging Swamp.



PLOTFILE: N:\SHARED\PLOTS\Plans_PDF\PC7748_R2_Springvale Coal Mine NPSS and NPHS within the Newnes State Forest Figure 2_20211202.pdf

Legend

- Springvale Holding Boundary
- Consolidated Approval Area
- Newnes State Forest
- Existing Mine Workings (Dated: 19/11/2021)
- Proposed Mine Workings (Dated: May 2021)

Swamps within Newnes State Forest

- Hanging
- Shrub

N

0 1,000 2,000 3,000
meters

Coordinate System: GDA 1994 MGA Zone 56

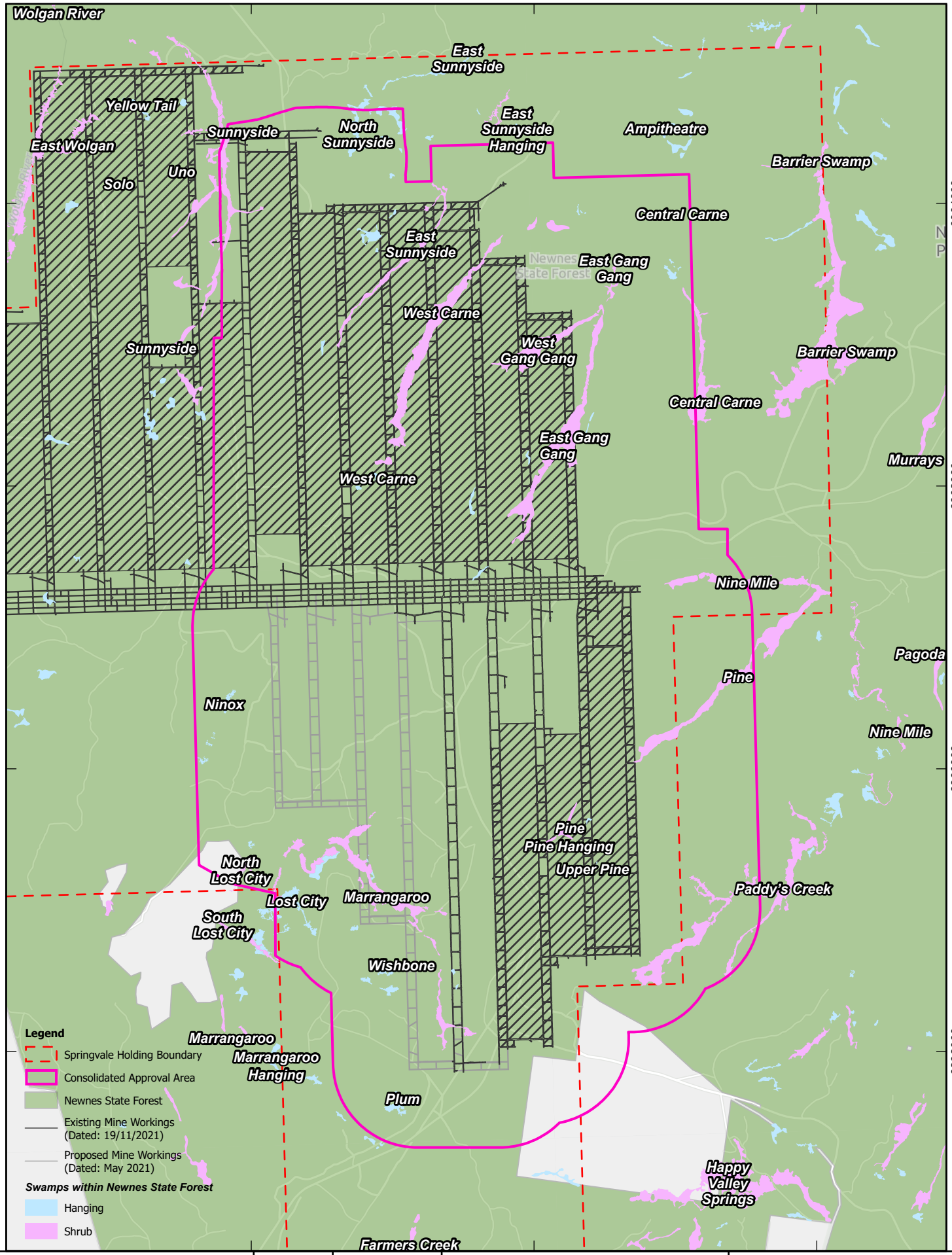
LOCATION	Springvale
SEAM	Lithgow
DRAWN	D.MacBain
CHECKED	J.Wearne
APPROVED	J.Wearne
SCALE	1:60,000 @ A4

SPRINGVALE COAL MINE
NPSS and NPHS
within the
Newnes State Forest
---Figure 2---

CENTENNIAL SPRINGVALE

DATE: 2/12/2021 | PC7748 | R2

Esri, HERE, Garmin, METI/NASA, USGS



PLOTFILE: N:\SHARED\PLOTS\Plans_PDF\PC7749_R2_Springvale Coal Mine NPSS and NPHS within the Consolidated Approval Boundary Figure 3_20211202.pdf

0 500 1,000 1,500 meters

Coordinate System: GDA 1994 MGA Zone 56

LOCATION	Springvale
SEAM	Lithgow
DRAWN	D.MacBain
CHECKED	J.Wearne
APPROVED	J.Wearne
SCALE	1:35,000 @ A4

SPRINGVALE COAL MINE
NPSS and NPHS
within the
Consolidated Approval Boundary
---Figure 3---

CENTENNIAL SPRINGVALE

DATE: 2/12/2021 | PC7749 | R2

Esri, HERE, Garmin, METI/NASA, USGS

4 HISTORY OF UNDERSTANDING SWAMP IMPACTS

Springvale Mine is located in the Western Coalfield of NSW, approximately 15 kilometres northwest of Lithgow. Lithgow is a traditional and strategically important coal mining centre that underpins cost effective generation of electricity for Sydney and other parts of NSW. Springvale provides the only reliable local supply of high-quality thermal coal to the Mt Piper Power Station, which provides 15% of NSW's electricity.

Underground coal mining commenced at Springvale in 1995 following the granting of development consent in July 1992. Monitoring of the environment on the Newnes Plateau substantially commenced in 2002 with investigations conducted to better understand the environment and any impacts as a result of mining activities.

At the time of preparing the Springvale Mine Extension Project Environmental Impact Statement (EIS), a thorough review of historical subsidence and environmental monitoring data was conducted to inform the mine design. The mine design proposed as part of the Springvale Mine Extension Project was with a void width of 261 metres with chain pillars of 58 metres. This mine design was developed to achieve sub-critical width-to depth ratios within the range of 0.65 and 0.75 and minimise subsidence impacts, particularly in relation to swamps.

Throughout the public exhibition period of the Springvale Mine Extension Project EIS and subsequent assessment by DPIE, concerns were raised regarding the effectiveness of the Springvale mine design to protect the swamp vegetation communities of the Newnes Plateau. There was a general consensus across a range of studies that predicting impacts on swamps is complex, and that, at the time, it was still unclear exactly how sensitive swamps were to mining subsidence.

Despite the evidence put forward by Springvale Coal, DPIE considered nine NPSS in the Springvale Mine Extension Project area were likely to experience greater than negligible environmental consequences, primarily due to the predictions in relation to the cracking and fracturing of the bedrock beneath NPSS and associated changes to the shallow groundwater regimes. Consequently, the DPIE proposed offsets be required for NPSS that experience a greater than negligible impact.

In line with the Draft Swamp Offset Policy requirements at the time, offsets would not be required to be secured or credits retired until the outcomes of mining were confirmed through targeted monitoring. This approach was in recognition of the level of uncertainty in relation to the extent and severity of subsidence-induced impacts to swamps. This approach was supported by the then Planning and Assessment Commission in granting development consent SSD 5594 for the Springvale Mine Extension Project.

Following the granting of development consent, the Springvale Independent Monitoring Panel was established in accordance with the requirements of SSD 5594 Schedule 3, Condition 11. The role of the Independent Monitoring Panel was to provide advice on:

- The adequacy of monitoring and associated performance indicators;
- The preparation and implementation of Extraction Plans (in so far as they relate to swamps, biodiversity and land management);
- Adaptive management options; and
- Calculation of the swamp offset liability.

Through the involvement of the Independent Monitoring Panel, the hypothesis that swamps could be impacted by far field movements associated with mining through significant geological lineaments was tested. The monitoring program for swamps evolved over the years to better understand the influence of lineaments on shallow groundwater systems that support the swamp vegetation communities. This monitoring program has resulted in an improved understanding of how groundwater systems are influenced by lineaments with impacts to swamps being identified well beyond the immediate mining area and to a distance of up to 1600 metres from the mining voids.

Consequently, as a result of changes in understanding of how swamps are impacted by mining, further mine design adaptive management measures (as detailed in Section10) have been implemented to minimise the risk and extent of potential impacts to NPSS and NPHS.

5 MINING IMPACTS TO NPSS AND NPHS

Numerous Case Studies have been prepared by Springvale Coal which relate to the understanding of groundwater impacts to NPSS and underground mining, including the interaction with significant geological structures. There is increasing evidence, as identified above, that directly undermining significant fault zones (lineaments) in the strata overlying the Lithgow Seam can cause changes to standing water levels in swamps overlying the significant fault zones.

The extent of mine related impacts to NPSS and NPHS is dependent on a number of factors including:

- The location of NPSS / NPHS in relation to underground mining;
- The presence of significant fault zones;
- The distance the NPSS / NPHS is along the strike of significant fault zones in relation to mining activities; and
- The presence and influence of the YS4 aquitard.

Not all NPSS within the Consolidated Approval Area have been impacted by mining. The extent of impacts differs across each swamp based on the influence of the above factors. There have been no impacts to NPHS observed to-date and no impacts predicted based on available monitoring data and their location above the YS4 aquitard. **Table 1** below summarises the known and predicted impacts to NPSS and NPHS as a result of mining at Springvale.

Table 1 – Summary of Mining Impacts to NPSS and NPHS

Swamp	Impact
Sunnyside Swamp	No impact based on available monitoring data. (i.e. no long-term declines in shallow swamp aquifer levels or ecological triggers). Consistent with baseline Control swamps.
Sunnyside East Swamp	Full impact based on available monitoring data (i.e. long-term declines in shallow swamp aquifer levels and ecological triggers). Permanent groundwater impact by end 2013.
Carne West Swamp	Full impact based on available monitoring data (i.e. long-term declines in shallow swamp aquifer levels and ecological triggers). Permanent groundwater impact by end 2014.
Gang Gang South West Swamp	Full impact based on available monitoring data (i.e. long-term declines in shallow swamp aquifer levels and ecological triggers). Partial impact by end 2014, full impact by mid-2017.
Gang Gang East Swamp	Full impact based on available monitoring data (i.e. long-term declines in shallow swamp aquifer levels and ecological triggers). Permanent groundwater impact by March 2018.
Nine Mile Swamp	Partial impact (i.e. long-term declines in some shallow swamp aquifer levels however not all). Approx. 50% of swamp unimpacted.
Pine Swamp	Partial impact (i.e. long-term declines in some shallow swamp aquifer levels however not all). Approx. 50% of swamp unimpacted.

Swamp	Impact
Pine Upper Swamp	Full impact based on available monitoring data (i.e. long-term declines in shallow swamp aquifer levels). Strong post-bushfire recovery.
Paddys Creek Swamp	No impact (i.e. no long-term declines in shallow swamp aquifer levels or ecological triggers). Temporary change with full recovery - consistent with baseline control swamps.
Marrangaroo Creek Swamp	Full impact predicted. Greater than negligible declines in shallow aquifer levels predicted.
Marrangaroo Creek Upper Swamp	Full impact predicted. Greater than negligible declines in shallow aquifer levels predicted.
Carne Central Swamp	Partial impact (i.e. long-term declines in some shallow swamp aquifer levels however not all)
Lost City Swamp	No impact anticipated based on setback from mining area and limited lineament influence.
North Lost City Swamp	No impact anticipated based on setback from mining area and limited lineament influence.
Hanging Swamps	No impacts to-date and no impacts predicted based on available monitoring data and location of NPHS above the YS4 aquitard.

6 OFFSET POLICY CONSIDERATIONS

Both State and Commonwealth approvals consider the requirement for offsets to swamps, should greater than negligible impacts from mining be realised. Since the preparation of the Springvale Mine Extension Project EIS commenced, there has been significant evolution in policies that govern biodiversity offsets in NSW as summarised below. The evolution of these policies over time has had a significant cost implication to the Springvale Mine Extension Project not considered at the time the EIS was prepared.

6.1 NSW Biodiversity Offsets Policy for Major Projects

The NSW Biodiversity Offsets Policy for Major Projects commenced on 1 October 2014 (the Policy) and applies to state significant development and state significant infrastructure projects under the *Environmental Planning and Assessment Act 1979* (EP&A Act). The Policy, however, does not provide guidance around certain impacts of a project on biodiversity that are not associated with clearing of vegetation, particularly in relation to subsidence related impacts.

As the Policy was not designed to manage subsidence related impacts to biodiversity, the (then) NSW Office of Environment and Heritage (now Biodiversity, Conservation and Science Directorate (BCS)) released the draft policy Framework for Biodiversity Offsets for Upland Swamps and Associated Threatened Species Impacted by Longwall Mining Subsidence in May 2015.

The release of this draft policy came during the final stages of the assessment process for the Springvale Mine Extension Project. The finalised version of the Addendum to NSW Biodiversity Offsets Policy for Major Projects: Upland Swamps Impacted by Longwall Mining Subsidence was released in December 2016 and is

hereafter referred to as the Offset Policy Addendum. The Offset Policy Addendum is to be applied where 'reasonable and feasible' to all new extraction plans for projects that have an existing development consent for longwall mining that may cause subsidence impacts on upland swamps.

The NSW Biodiversity Offsets Policy, including the Offset Policy Addendum, is a relevant consideration for Springvale mining operations associated with SSD 5594.

6.2 NSW Biodiversity Offset Scheme

The Biodiversity Offsets Scheme was established under the *Biodiversity Conservation Act 2016* and came into effect on 25 August 2017. The Biodiversity Offsets Scheme was designed to create a transparent, consistent and scientific based approach to biodiversity assessment and offsetting for all types of development that are likely to have a significant impact on biodiversity.

The Biodiversity Offsets Scheme is not applicable to Springvale.

6.3 Commonwealth Environmental Offsets Policy

The Commonwealth Environmental Offsets Policy was released in September 2012. Where offsets to residual impacts to Matters of National Environmental Significance are required, the Commonwealth Environmental Offset Policy states 90 percent (by area) must be met with direct offsets. Actions that have a measurable conservation gain are referred to as direct offsets. As defined in the EPBC Act Environmental Offsets Policy, conservation gain can be obtained by:

- Improving existing habitat for the protected matter;
- Creating new habitat for the protected matter;
- Reducing threats to the protected matter;
- Increasing the values of a heritage place; and/or
- Averting the loss of a protected matter or its habitat that is under threat.

The remaining 10 per cent of the offset liability may be met by outcomes obtained from compensatory measures such as research programs related to impacted matters. Deviation from the 90 per cent direct offset requirement will only be considered where:

- It can be demonstrated that a greater benefit to the protected matter is likely to be achieved through increasing the proportion of other compensatory measures in an offsets package; or
- Scientific uncertainty is so high that it isn't possible to determine a direct offset that is likely to benefit the protected matter.

7 OFFSET LIABILITY

As noted in **Section 6.1**, the Offset Policy Addendum is only to be applied to new Extraction Plans where reasonable and feasible.

Schedule 3, Condition 5 of the SSD 5594 development consent states that the offset liability required to be secured by Springvale Coal is to be set by the Secretary of the DPIE, in consultation with BCS, following consideration of:

- The estimated liability using the Framework for Biodiversity Assessment (FBA) in accordance with the 'Policy'; and
- Advice from the Independent Monitoring Panel.

The estimated liabilities have been calculated and presented as part of each Extraction Plan.

8 SECURITY BONDS

Table 2 summarises the security bonds that are held by the DPIE (as of November 2021) to cover the potential liability to NPSS in lieu of a swamp offset strategy being in place. A total value of $14 million is held covering eight swamps. The security bonds accumulated since mining under SSD 5594 commenced averages out to $1.75 million a swamp.

Table 2 – Springvale Swamp Security Bonds

Swamp	Bank Security Held	Relevant Conditions
Sunnyside East	$1,000,000	In satisfaction of Schedule 3 Condition 4 of the development consent
Carne West Swamp	$1,666,666.66	In satisfaction of Schedule 3 Condition 4 of the development consent and 420-422 Extraction Plan conditions of approval
Gang Gang East	$1,666,666.66	In satisfaction of the LW 419 and 420-422 Extraction Plan conditions of approval
Gang Gang South West	$1,666,666.66	In satisfaction of the LW 419 and 420-422 Extraction Plan conditions of approval
Pine Swamp	$2,000,000.00	In satisfaction of the LW 424-427 Extraction Plan conditions of approval
Pine Upper Swamp	$2,000,000.00	In satisfaction of the LW 424-427 Extraction Plan conditions of approval
Marrangaroo Creek Swamp	$2,000,000.00	In satisfaction of the LW 424-427 Extraction Plan conditions of approval
Marrangaroo Creek Upper Swamp	$2,000,000.00	In satisfaction of the LW 424-427 Extraction Plan conditions of approval
TOTAL	**$14,000,000**	

9 ADAPTIVE MANAGEMENT

Mine design is the key management control to reducing the environmental consequences to sensitive surface features. Selection of appropriate mine design takes into consideration risk, costs, benefits, consequences to resource development and the resilience of sensitive surface features to change. Adaptive management through mine design changes is a key tool implemented by Springvale Coal to reduce or mitigate the risk of impacts to swamps as a result of underground mining.

New information and the use of new improved technology informed Springvale Coal's decision to modify its mine design criteria to support the Springvale Mine Extension Project EIS. The mine design changes at this stage of the project focussed on narrowing longwall panels and increasing chain pillar widths to maintain a sub-critical width-to depth ratio in order to minimise subsidence impacts.

Since the approval of the Springvale Mine Extension Project by then then Planning and Assessment Commission, Springvale Coal has continued to implement proactive adaptive management measures to reduce the risk of impact to swamps based on the best available knowledge at the time. Since the granting of the Springvale Mine Extension Project development consent, to reduce the risk of impacts to NPSS and NPHS, Springvale Coal has committed to:

- Removing Longwalls 422, 423 and 424 from the proposed mine plan.
- Shortening Longwalls 421, 425 and 427 to avoid mining through major lineaments.
- Reduction in longwall lengths to both Longwalls 431 and 432 to:
    - Reduce the risk of impact to Lost City and Lost City North NPSS vegetation communities.
    - Avoid undermining the pagodas located at the end of Longwall 432 to reduce the risk of any mining related impacts occurring.
    - Avoid directly undermining a significant portion of Marrangaroo Swamp above Longwalls 431 and 432, potentially reducing the extent of mining related impacts to the swamp.

The Longwalls 428-432 Extraction Plan is being finalised in consultation with DPIE, including the final layout of Longwalls 429 and 430.

As shown in **Table 3**, these adaptive management mine plan changes have resulted in the sterilisation of approximately 8.8 million tonnes of coal resource and has had a 3 year reduction in the production life of Springvale. This represents a loss of over $567 million of revenue and over $40 million in royalties, when compared using the assumptions presented in the Springvale Mine Extension Project EIS.

Table 3 – Coal Sterilisation Resulting from Adaptive Management Mine Plan Changes

Panel	Length Reduction	Tonnage Reduction
421	288	356,778
422	1,907	2,346,595
423	1,285	1,381,505
424	2,555	3,066,000
425	215	258,000
427	155	186,000
431	586	750,448
432	397	411,496
Total to date	**7,388**	**8,756,822**

In addition to the mine design changes at the Springvale Mine, Centennial withdrew the Angus Place Mine Extension Project on 28 July 2021. The Angus Place Mine Extension Project was a large longwall extension to the Angus Place Colliery. The Angus Place Mine Extension Project was predicted to result in significant impacts to five additional NPSS and associated NPHS.

In place of the Angus Place Mine Extension Project, Centennial Angus Place are proposing an alternative bord and pillar first workings mining project known as the Angus Place West Project. As a result of the withdrawal of the Angus Place Mine Extension Project and pursuit of an alternative low impact bord and pillar operation, the impacts predicted to NPSS and NPHS will no longer be realised.

10 OFFSET STRATEGY

As required by the State and Commonwealth approvals that govern the Springvale Mine, offsets are required for NPSS where mining results in greater than negligible impacts.

According to the Environment NSW website, NPSS covers an estimated 650 hectares, of which approximately 160 hectares occurs within Blue Mountains and Wollemi National Parks. The remaining extent occurs in Ben Bullen State Forest and on freehold land.

Due to the limited area of swamps available to secure on freehold land, it is not possible to 'like-for-like' offset to satisfy the Springvale offset liability in accordance with the Biodiversity Offsets Policy for Major Projects.

Furthermore, payment into the Biodiversity Conservation Fund of the calculated maximum liability for NPSS does not satisfy obligations under the Commonwealth EPBC approvals and is not considered reasonable or feasible given:

- Maximum offsets liabilities are not experienced in all swamps;
- Long term swamp impacts and recovery post bushfire are not clearly understood; and
- The significant cost identified in comparison to accumulated guarantees held by DPIE to date.

As such Springvale Coal has developed a multi-layered swamp offset strategy to compensate for current and potential future impacts to NPSS within the Consolidated Approval Area as a result of mining at Springvale and to satisfy the specific requirements of State and Commonwealth approvals.

10.1 Direct Offset

10.1.1 Transfer of Land into State Conservation Area and Monetary Contribution

Within the Springvale Consolidated Approval Area, 89.59 hectares of NPSS are potentially impacted by mining.

The Newnes,Wolgan and Ben Bullen State Forests are subject to a variety of land uses that can result in other non-mining impacts to NPSS. These land uses include:

- Forestry activity – Forestry is the most intense land use on the plateau and includes tree logging, track construction, undergrowth clearing and burning. These activities lead to significant land changes through increased run-off and sediment transport, vegetation removal, weed invasion and an altered fire regime. These impacts are experienced throughout the plateau including the THPSS systems;
- Four-wheel drive and motor bike activity – The plateau is freely accessible to the public including recreational four wheel drive enthusiasts and motor bike riders. These activities are unregulated and result in the development of tracks in and adjacent to the THPSS. These tracks are unplanned and unmaintained and can result in accelerated runoff, erosion and weed invasion;
- Feral pig activity – This results in land disturbance during pig foraging activity, in addition to accelerated erosion and a decrease in water quality in drainage lines;
- Hunting – This activity can affect native wildlife numbers and movements. New tracks are often formed which results in increased erosion and run-off; and
- General public access – This can lead to an increased incidence of bushfires, introduction of weeds, introduction of feral animals and accumulation of rubbish.

Springvale Coal has supported the transfer of the State Forest land, currently owned and managed by the Forestry Corporation of NSW, into a SCA to protect and improve the condition of NPSS, NPHS and their associated threatened species from various anthropogenic impacts. With the area of land being located adjacent to existing National Parks, the proposed land transfer would provide a continuum of habitat for the protection of these species and their associated habitats. The transfer of proposed land into a SCA, coupled with an appropriate land management strategy, would result in the protection of the unique biodiversity and geodiversity of the Newnes Plateau into perpetuity while ensuring impacts from coal mining, future sand mining, forestry and recreational users are appropriately managed.

Protection of a vast majority of THPSS remaining in existence will be brought under the SCA which will provide an overall conservation outcome. It is envisaged that management of the land by NPWS under a SCA will improve the quality of THPSS, as well as other endangered species, and enable compliance with a SCA Plan of Management (to be developed and managed by NPWS).

It is noted that under the *National Parks and Wildlife Act 1974* (NPW Act), specifically section 30G, SCAs are managed to:

- Conserve biodiversity, maintain ecosystem function, protect natural phenomena and maintain natural landscapes;
- Conserve places, objects and features of cultural value;
- Have regard to the conservation of the area's natural and cultural values in:
    - Providing for the undertaking of uses permitted under other provisions of the NPW Act in such areas (including mining);
    - Providing for the development of any part of a special area that is permitted under the NPW Act; and
    - Providing for the sustainable use of any existing structures, buildings or modified natural areas.
- Provide for the sustainable visitor or tourist use and enjoyment that is compatible with the conservation of the areas natural and cultural values, along with uses permitted under other provisions of the NPW Act;
- Provide for appropriate research and monitoring.

The NPWS will prepare a Plan of Management for the SCA in accordance with the NPW Act which will include (at the discretion of the NPWS) sub plans and management actions associated with and including (but not limited to):

- Road and fire trail management;
- Pine plantation rehabilitation;
- Swamp (including THPSS) restoration;
- Fire management;
- Pest and weed management; and
- Threatened species management.

Centennial will engage with NPWS to facilitate DAWE engagement regarding the draft Plan of Management.

THPSS within the Consolidated Approval Area, considered as being required to be offset, along with the remaining swamps within the Newnes, Wolgan and Ben Bullen State Forests, that forms part of Springvale Coal's direct offset package, are shown on **Figure 4**. THPSS mapping confidence (identification) is shown in **Figure 5** (i.e. low, medium and high) and varies according to information sources as outlined below:

High: THPSS mapped and monitored as part of the Springvale/ Angus Place operations. Boundary mapping determined from high resolution imagery.

Medium: THPSS identified from regional mapping products with vegetation types confirmed from field validation. Boundaries unmodified from regional mapping products.

Low: THPSS identified from regional mapping products that occur on unknown geologies (e.g. alluvium) and vegetation typing. Verification required.

THPSS included in the strategy is limited to THPSS identified as having a moderate to high mapping confidence. THPSS with a low confidence rating are excluded from the calculations and can only be included after field verification works.

The transfer of land would satisfy the 90% direct offset obligations for THPSS impacted by mining at Springvale in accordance with the Commonwealth offset policy requirements of EPBC 2011/5949 and 2013/6881. The EPBC calculations are provided in **Appendix 2** as modified by the peer review findings provided in **Appendix 3**.

In addition, Springvale Coal has committed to a $28 million monetary contribution towards the management and protection of the land proposed to be transferred to a State Conservation Area via the execution of an Offset Deed. This $28 million monetary contribution covers the 14 NPSS listed in **Section 3** and has been agreed with NSW Government, with consideration of the offset calculator.

In accordance with the Offset Deed executed with NPWS (*Minister for Environment and Heritage for and on behalf of the Crown in right of NSW*) on 8 July 2022, the following instalment payments will be made to discharge the Current Offset Liability

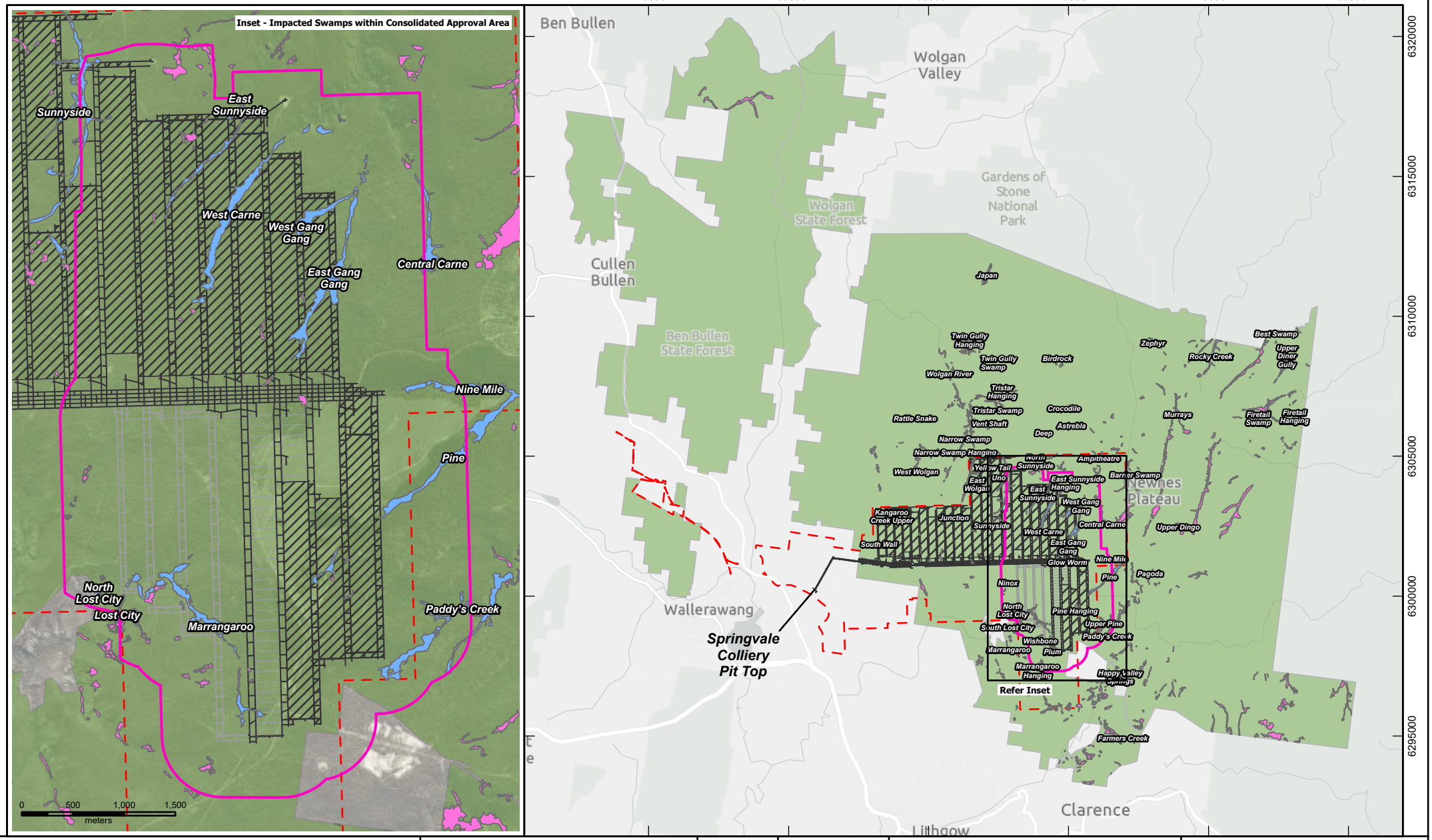
a) $1 Million within 5 business days of execution of the above-mentioned deed

b) $1 Million by 31 January 2023 and

c) $6,500,000 by 30 June 2023 and by each anniversary of 30 June 2023 for a further three years until the Current Offset Liability has been fully paid

The monetary contribution is for impacted and potentially impacted swamps with a residual amount towards the management of other swamps within the Consolidated Approval Area.

Further details regarding how NPWS will utilise this monetary contribution to protect and enhance the biodiversity values of the proposed SCA will be provided by NPWS. It is noted that the Independent Monitoring Panel in advice dated 25 January 2022, indicated that first priority use of the $28 million should focus on measures to reduce impacts on the hydrology of the swamps and adjacent landscapes within the Consolidated Approval Area, including those non-mining impacts related to past forestry activities and illegal recreational vehicle use. This advice will be provided to NPWS during future consultation/negotiations.



PLOTFILE: N:\SHARED\PLOTS\Plans_PDF\FASS10013_Springvale Coal Swamps Associated with Offset Strategy Figure 4_20220204.pdf

Legend

- Springvale Holding Boundary
- Consolidated Approval Area
- Existing Mine Workings (Dated: 28/01/2022)
- Proposed Mine Workings (Dated: May 2021)
- State Forest

Swamps within State Forest

- Impacted (Area: 89.59 ha)
- Unimpacted (Area: 452.11 ha)

N

0 4,000 8,000
meters

Coordinate System: GDA2020 MGA Zone 56

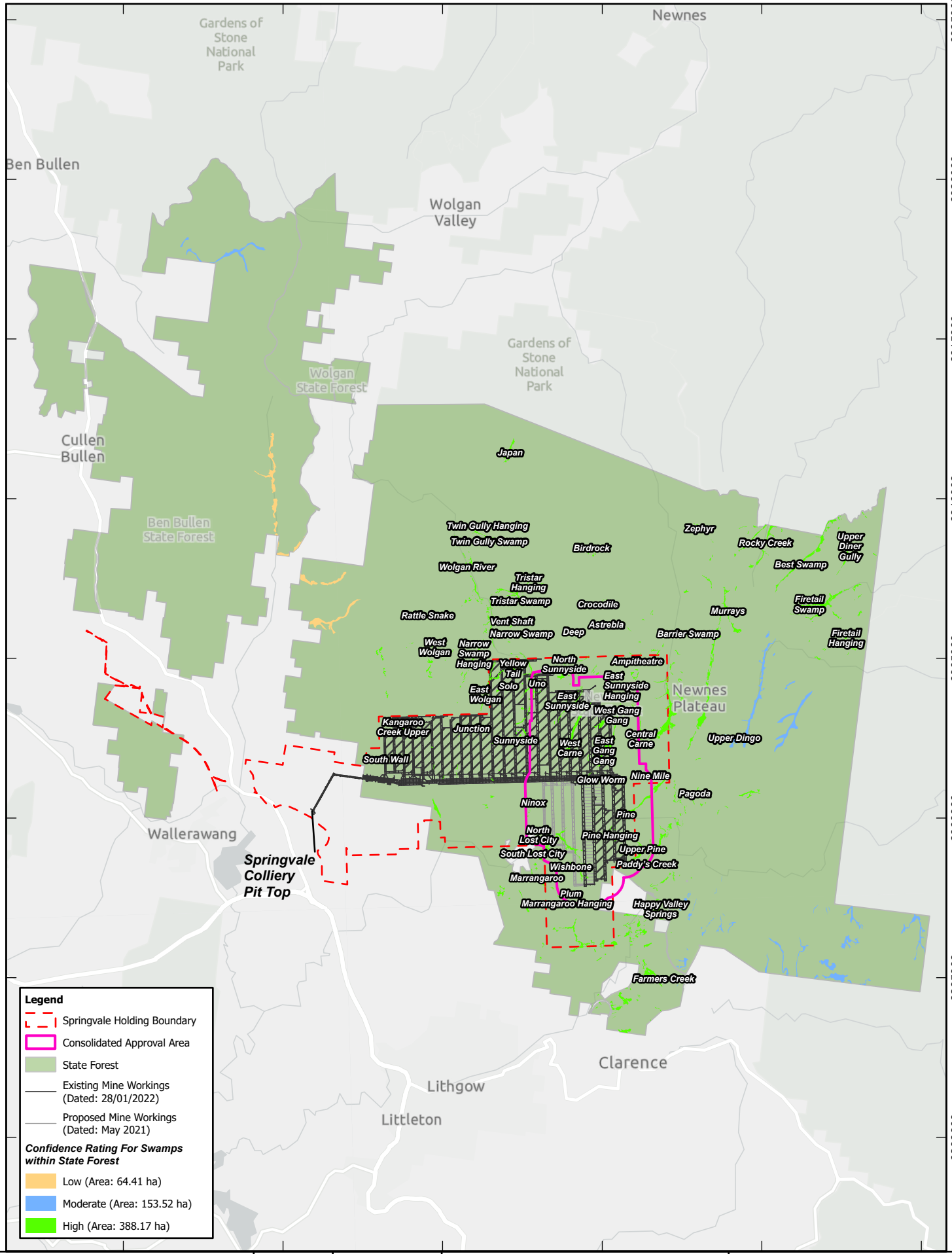
LOCATION	Springvale
SEAM	Lithgow
DRAWN	D.MacBain
CHECKED	M.Aitkens (RPS)
APPROVED	N.Gardiner
SCALE	1:180,000 @ A4

SPRINGVALE COAL MINE
Swamps Associated with Offset Strategy
---Figure 4---

CENTENNIAL SPRINGVALE

DATE: 4/02/2022 | FASS10013 | R0

Esri, HERE, Garmin, METI/NASA, USGS, Maxar



PLOTFILE: N:\SHARED\PLOTS\Plans_PDF\FASS10014_Springvale Coal Mine Confidence Rating For THPSS Identification Figure 5_20220204.pdf

0 2,000 4,000 6,000 meters

Coordinate System: GDA2020 MGA Zone 56

LOCATION	Springvale
SEAM	Lithgow
DRAWN	D.MacBain
CHECKED	M.Aitkens (RPS)
APPROVED	N.Gardiner
SCALE	1:155,000 @ A4

SPRINGVALE COAL MINE
Confidence Rating
For
THPSS Identification
---Figure 5---

CENTENNIAL SPRINGVALE

DATE: 4/02/2022 | FASS10014 | R0

Esri, HERE, Garmin, METI/NASA, USGS

10.2 Additional Management Actions

In addition to the direct offset detailed above, Springvale Coal propose a number of other management actions as summarised below. These actions are required under SSD 5594 and would continue to be implemented following the transfer of land to SCA.

10.2.1 Ongoing NPSS and NPHS Monitoring

Springvale Coal proposes to continue to invest in monitoring of NPSS and NPHS to build on and improve the understanding of how these ecosystems are impacted by mining, identify subsequent changes over time and identify any future potential regeneration of swamps following the cessation of mining. This ongoing investment by Springvale Coal in monitoring the NPSS and NPHS will be able to be used to inform policy and planning decisions in relation to mining operations that may have the potential for impact to these, or similar, vegetation communities. As such, the commitment by Springvale Coal to the ongoing monitoring of NPSS and NPHS forms an important component of the proposed Swamp Offset Strategy.

Secondary extraction relevant to Marrangaroo Swamp will be concluded with Longwall 432, which is currently anticipated for extraction in 2026. Consequently, monitoring of NPSS at Springvale will continue until 2029 (negligible results) or 2031 (more than negligible impacts). Monitoring will be undertaken in accordance with Plans including:

- Longwalls 415-432 Swamp Monitoring Program;
- Longwalls 415-432 Water Management Plan;
- Longwalls 415-432 Biodiversity Management Plan; and
- Longwalls 428-432 Biodiversity and Water Management Plan.

Monitoring to be completed in accordance with these Plans includes:

- Groundwater monitoring (ridge piezometers, vibrating wire piezometers, shallow aquifer piezometers and swamp piezometers);
- Soil moisture monitoring;
- Surface water monitoring;
- Flora monitoring (in accordance with the Brownstein et al (2014) methodology);
- Threatened species monitoring programs:
    - *Boronia deanei* for a minimum 3 years post-mining in relevant longwall panels (negligible results). If more than negligible results are identified (and considered to be mining related), monitoring will continue annually for no less than 5 years post-mining in the respective panel(s) for Longwalls 428-432.
    - Blue Mountains Water Skink monitoring will be in place for 5 years post completion of mining in the respective relevant panel(s) (for Longwalls 428-432 only). Monitoring is completed in accordance with the Blue Mountains Water Skink Research and Monitoring Program, based upon outcomes of monitoring/research and in consultation with stakeholders this Plan may be subject to change. Giant Dragonfly monitoring will be completed annually (between January and February) for no less than 5 years post-mining in respective panel(s) for Longwalls 428-432.
    - Terrestrial and riparian fauna species (e.g. amphibians, reptiles, cave dwelling microbats and Brush-tailed Rock Wallaby) will be monitored prior to undermining and post-mining (negligible results for one year; more than negligible results and considered to be mining related for up to 3 years).
- Subsidence monitoring in accordance with the Longwalls 428-432 Subsidence Monitoring Program.

Consultation will be undertaken with NPWS, BCS and DAWE regarding identifying key surface water and groundwater monitoring infrastructure to be retained by NPWS that would assist with longer term hydrological trends and the protection and enhancement of the threatened swamp ecological communities. Consultation will also be used to confirm any post mining data collection that may be deemed necessary for regulators to be satisfied there is negligible risk of any additional mining impacts.

In addition to the $8.5 million investment made by Springvale Coal into the monitoring of swamps since 2014 to-date, future ongoing monitoring and research of swamps represents a further investment of over $1 million/year or a total of approximately $8 million over the next 8 years until 2029 (negligible results) or $10 million over the next ten years until 2031.

Centennial will engage with BCS and NPWS to understand monitoring data requests and formats. Following engagement, agreed swamp monitoring data will be provided to BCS and NPWS.

Centennial will consult with BCS and NPWS to discuss queries regarding monitoring programs and alignment.

10.2.2 Swamp Impact Analysis

Following the completion of monitoring obligations under the various approvals, Springvale Coal will prepare a detailed Environmental Monitoring Report for each THPSS within the Consolidated Approval Area that provides an analysis of monitoring data, identifies if impacts are mining related and assess the extent of any impact to NPSS and associated threatened species.

The detailed (final) Environmental Monitoring Report for Temperate Highland Peat Swamps on Sandstone (THPSS – i.e. both NPSS and NPHS) within the Consolidated Approval Area will be completed by end of 2024 (with staged submission of swamp reports), subject to availability of adequate post-mining data (e.g. Marrangaroo Swamp).

10.2.3 Remediation

The Temperate Highland Peat Swamps on Sandstone: evaluation of mitigation and remediation techniques (DAWE, 2014) provides theoretical and applied remediation techniques relevant to the swamps that may be impacted by mining at Springvale. The key concern regarding the impact of subsidence on THPSS and waterways is the formation of fracture networks in the substrate, which can severely alter the hydrological regime of water bodies. A variety of techniques have been proposed by industry for remediation of THPSS. The following sections provide an overview of commonly reported options:

- Surface sealing techniques.
- Injection grouting.
- Permeation grouting.
- Cross-bore injection of gels.
- Use of grout curtains.
- Self-amelioration.
- Other surface treatments.

If a swamp assessment finds that mining impacts have occurred, a feasibility investigation will be undertaken to understand if remediation is a potential option and if so what methods could be used. Should suitable remediation options be identified, Springvale Coal will develop remediation methodologies and completion criteria in consultation with relevant regulators. Prior to implementation of any feasible/suitable remediation works, an appropriate swamp remediation monitoring and maintenance program would be developed. This program would be used to determine if remediation works are successful, identify any maintenance works required and to mitigate potential risks (e.g. erosion).

All remediation works (subject to feasibility and approval by DPIE, and approval by the NPWS) will be incurred by Springvale.

10.2.4 Management Actions

In addition to the actions outlined in Sections 10.2.1 – 10.2.3, Centennial will:

- Develop a timetable for the transition of monitoring infrastructure to NPWS prior to mine closure;
- Prepare a decommissioning and rehabilitation plan for surface water and groundwater monitoring locations no longer required prior to mine closure;
- Commit to pay for the decommissioning of the redundant networks and rehabilitation of each of the surface water and groundwater monitoring sites not proposed for future use by NPWS.
- Prepare an updated assessment of remediation technologies and a Remediation Action Plan (RAP) prior to the cessation of mining for those swamps where offset arrangements are insufficient or not in place, and impact is more than negligible, and remediation (if suitable remediation methodologies are available) is required to repair the landscape sufficiently to improve the natural hydrological processes of the affected swamps or creeks;
- Ensure any RAP received agency sign off prior to the cessation of mining in 2026 and that all costs would be met by Centennial Coal in addition to the $28 million contribution;
- Ensure during consultation/mine closure planning that it is clearly understood what Centennial Coal is committing to regarding monitoring, management and remediation of swamps once the land is transferred into the Parks Estate as a SCA and also once mining ceases (noting that works outlined in Section 10.2 will be completed); and
- Commit to the following ongoing monitoring components across the Consolidated Approval Area with regard to ecology, surface water and groundwater:
    - The maintenance of all required monitoring networks (and installation of any new sites), associated data collection and reporting requirements across both NPSS and NPHS be in accordance with recent Extraction Plan approvals and the latest (updated) Swamp Monitoring Program and Water Management Plan;
    - Maintaining ownership and responsibility for the maintenance of and data collection from all monitoring networks until at least the cessation of mining; and
    - An orderly transition of key sites and data to NPWS occur as part of the mine closure activities.

11 ROLES AND RESPONSIBILITIES

Apart from those roles, responsibilities and actions committed to in **Section 10**, Centennial will consult with NPWS to develop a clear understanding of roles, responsibilities and actions of future NPWS responsibilities and ongoing Centennial Coal responsibilities. These roles, responsibilities and actions will be clearly defined and revised to accurately reflect them in this Swamp Offset Strategy, which will be submitted to DAWE following execution of the deed with NPWS as per the NSW conditional approval.

It is noted that the Independent Monitoring Panel in advice dated 25 January 2022, the Panel has been advised that it will have ongoing involvement in reviewing monitoring and providing advice during the life of the mine. If this overlaps with the transfer to NPWS, any role for the Panel which relates to management of transferred areas should be specified. This will be discussed further in consultation with NPWS to ensure the ongoing role of the Independent Monitoring Panel is clearly understood, with necessary details to be reflected in this Swamp Offset Strategy.

Appendix 1 – Relevant Approval Conditions

Condition Number	Approval Conditions
EPBC 2011/5949 – Longwalls 415-417	
Condition 14	The Response Strategy must include measures for remediating or offsetting all severe impacts particularised by the Minister on the temperate highland peat swamps on sandstone ecological community arising from the action. The Response Strategy must be a stand-alone document and include but not be limited to: a) a description of the severe impact including extent, duration, and expected cause. This should include a description of how the impact may affect temperate highland peat swamps on sandstone b) the objectives on the Response Strategy c) the proposed response actions to be taken and how the proposed actions will be implemented d) a description of how the strategy will deliver an overall conservation outcome that improves or maintains the viability of temperate highland peat swamps on sandstone and associated threatened species e) the estimated cost of all proposed response actions f) the strategy must clearly state the person responsible for implementing remediation actions, including their position or status and contact details g) description of record keeping and reporting procedures
EPBC 2013/6881 – Longwalls 418-432	
Condition 5	To minimise impacts on Temperate Highland Peat Swamps, in addition to Conditions 4, 5 and 6 (Schedule 3) on the New South Wales development consent: a) Greater than negligible environmental consequences on Temperate Highland Peat Swamps, and therefore offset liabilities, must be initially determined based on changes to the shallow groundwater aquifer as measured using piezometers in accordance with Conditions 6 to 10. b) Where monitoring identifies a change to the shallow groundwater aquifer below an undermined Temperate Highland Peat Swamp and that change cannot be reasonably attributed to other specific factors to the satisfaction of the Minister, the swamp will be considered to have experienced a greater than negligible environmental consequence of the action. c) 90 per cent (by area) of offset liabilities for Temperate Highland Peat Swamps must be met with direct offsets, within the meaning of the Commonwealth offsets policy. d) If after five (5) years, the approval holder can demonstrate to the satisfaction of the Minister that a greater than negligible environmental consequence on Temperate Highland Peat Swamps identified under Condition 5a has been reversed, has not eventuated or has only partially eventuated, whether due to active remediation or

Condition Number	Approval Conditions
	passive (natural) equilibration, any offsets already provided in relation to that identified consequence may be held by the approval holder and used to offset future liabilities. e) Except in relation to Sunnyside East and Carne West Swamps, the approval holder must not commence longwall mining before the corresponding maximum predicted offset liability has been determined in accordance with Conditions 4 and 5 (Schedule 3) on the New South Wales development consent and approved in writing by the Minister.
SSD 5594 – Longwalls 418-432	
Schedule 3, Condition 3	**Offsets** If the Applicant exceeds the performance measures in Table 1 and the Secretary determines that: (a) it is not reasonable or feasible to remediate the subsidence impact or environmental consequence; or (b) remediation measures implemented by the Applicant have failed to satisfactorily remediate the subsidence impact or environmental consequence; then the Applicant shall provide a suitable offset to compensate for the subsidence impact or environmental consequence, to the satisfaction of the Secretary. The offset must give priority to like-for-like physical environmental offsets, but may also consider payment into the Biodiversity Conservation Fund, or funding or implementation of supplementary measures such as: • actions outlined in threatened species recovery programs; • actions that contribute to threat abatement programs; • biodiversity research and survey programs; and/or • rehabilitating degraded habitat. *Note: Any offset required under this condition must be proportionate with the significance of the impact or environmental consequence.*
Schedule 3, Condition 4	**Swamp Offset Bond for First Swamps Undermined** Prior to the commencement of mining, unless otherwise agreed by the Secretary, the Applicant shall lodge a Swamp Offset Bond of $2,000,000 with the Department. If, after 12 months of completion of all mining under this consent within 400 metres of either Sunnyside East or Carne West Swamps, monitoring demonstrates that no greater than 'negligible environmental consequences' have resulted to the swamp from mining under this consent, to the satisfaction of the Secretary, then the Secretary will release the half of the Bond that applies to that swamp. If monitoring demonstrates that greater than 'negligible environmental consequences' have resulted to either of these shrub swamps from mining under this consent, and that

Condition Number	Approval Conditions
	these consequences have stabilised for a period of at least 12 months, then the Applicant must offset the environmental consequences to that swamp to the satisfaction of the Secretary within any period specified by the Secretary. The offset liability will be set by the Secretary in consultation with OEH, following consideration of: (a) the estimated liability using the Framework for Biodiversity Assessment in accordance with the NSW Biodiversity Offsets Policy for Major Projects; and (b) advice from the Independent Monitoring Panel that will be established by the Secretary for the development. Once the Applicant has offset the environmental consequences to the satisfaction of the Secretary, the relevant proportion of the Swamp Offset Bond will be returned to the Applicant. *Notes:* - *Alternative funding arrangements, such as provision of capital and management funding as agreed by OEH as part of a Biobanking Agreement or transfer to conservation reserve estate, can be used as part of the Swamp Offset Bond. A bank guarantee can be lodged in place of a cash bond.*
Schedule 3, Condition 5	**Swamp Offsets for all other Shrub Swamps** Prior to the commencement of mining operations under an approved Extraction Plan which are predicted to cause greater than negligible environmental consequences to either Gang Gang South West, Gang Gang East, Pine, Pine Upper, Paddys, Marangaroo Creek or Marrangaroo Creek Upper Swamp, the Applicant shall demonstrate that it can satisfy the maximum predicted offset liability for the total area of swamp(s) predicted to be impacted under that Extraction Plan. If, after 12 months of completion of all mining under this consent within 400 metres of any of these shrub swamps, monitoring demonstrates that no greater than 'negligible environmental consequences' have resulted to the swamp from mining under this consent, to the satisfaction of the Secretary, then the Applicant will not be required to secure the offset or retire the credits relating to that swamp. If monitoring demonstrates that greater than 'negligible environmental consequences' have resulted to any of these shrub swamps from mining under this consent, and that these consequences have stabilised for a period of at least 12 months, then the Applicant must offset the environmental consequences to that swamp to the satisfaction of the Secretary within any period specified by the Secretary. The offset liability will be set by the Secretary in consultation with OEH, following consideration of: a) the estimated liability using the Framework for Biodiversity Assessment in accordance with the NSW Biodiversity Offsets Policy for Major Projects; and b) advice from the Independent Monitoring Panel that will be established by the

Condition Number	Approval Conditions
	Secretary for the development. *Note: Alternative funding arrangements, such as provision of capital and management funding as agreed by OEH as part of a Biobanking Agreement or transfer to conservation reserve estate, can be used as part of the Swamp Offset.*
Conditional approval for the Swamp Offset Strategy (dated 28 March 2022)	
Condition 2	Within one month of executing the offset deed, Centennial must resubmit an updated offset strategy to the Planning Secretary that includes details of the payment and bank guarantee schedule for the monetary contribution to the Minister that reflects the executed deed offset

Appendix 2 – EPBC Offset Calculator Output

Offset Assessment Guide Calculations

The Offset Assessment Guide (the guide) has been populated and run using the following justifications for allocating the numbers used for particular inputs. Ultimately, the guide has been used to comply with the EPBC Offset Policy and to ascertain the offset liability in relation to the Project impacts outlined above. It should be noted that an Offset Management Plan (OMP) will provide further information to support the below justifications and associated proposed management measures.

For the purposes of the EPBC calculations summarised below, only the NPSS component of THPSS has been included. This is based on the statement that; 'no greater than negligible mining related impacts have been measured in NPHS to-date and no greater than negligible environmental impacts to NPHS are anticipated from future mining at Springvale'.

Time over which loss is averted (years)

The proposed transfer from State Forest to State Conservation Area (Offset site) will ensure the THPSS within the proposed offset area is protected for a minimum of 20 years (refer to section 10.1.1 for the proposed Securing Mechanism). Consequently, the maximum period of 20 years was selected in the guide.

Time until ecological benefit (years)

Within the Offset site the THPSS persists in a relatively intact state and management measures will be undertaken to reduce potential threats, and benefit shall be achieved within a 20-year time horizon.

Quality of Impact (Project) site

The THPSS habitat quality was measured using the Framework for Biodiversity Assessment (FBA) methodology to ascertain the Vegetation Integrity Scores (VIS) in accordance with the Development Consent (SSD_5594). A local benchmark condition was averaged out across plots collected across the Newnes State Forest which have resulted in an approximate VIS of 7. This score is conservative as it accounts for the confounding factors of forestry and recreational use being present within the State Forest area rather than using the OEH Benchmark of 10 (100/100). Based on this method of assessment, the habitat quality to be impacted by the Project was scored as 7 out of 10 (see the OMP for further details).

Start Quality of Offset site

Similarly, the proposed Offset site habitat quality has been calculated by using the FBA methodology to establish a local benchmark condition averaged out across plots collected within the Newnes State Forest. Based on this method of assessment, the habitat quality of the Offset site was scored as 7 out of 10 (refer to the OMP for further details).

Future quality without offset

It is conservatively estimated that as the Project footprint currently persists as a 7 out of 10 and it is likely that the ongoing forestry related impacts within the Offset site may result in it declining in quality to a 6 out of 10.

Future quality with offset

It is predicted that in the Offset site, with appropriate management (in accordance with the OMP), the habitat quality of the THPSS within the proposed Offset site can be increased from the current score of 7, to an 8 out of 10.

Confidence in result – future quality (%)

Within the Offset site, methods of active and passive management are to be adopted that have been demonstrated to provide successful rehabilitation outcomes and should reduce threats on the THPSS while increasing habitat quality through improving species diversity and recruitment of key indicator species. Management measures necessary to meet identified environmental outcomes of the Offset site are proposed to include:

1. Access and fencing;
2. Weed management;
3. Habitat management;
4. Pest animal management; and
5. Fire management.

More details pertaining to the specific actions will be prescribed by the OMP with the aim of maintaining and improving the overall quality of habitat provided by the Offset site. Ultimately, management measures will be designed to increase native biodiversity, with benefits to extend beyond the THPSS.

Specific habitat quality increases have been made primarily by increasing the Site condition FBA VIS scores through Management Actions such as access and fencing, weed management and habitat management.

Given the Offset area is only proposed to undergo a marginal 1-point increase in quality (from a 7 to an 8), the confidence in the management actions (which include ongoing monitoring and adaptive management) being successful is high.

The aim of the monitoring program outlined in the OMP is to determine if the objectives of the OMP are being met and that all performance and completion criteria measures are being effectively achieved. Additionally, the monitoring program will allow identification of corrective actions required, to inform adaptive management through the implementation of Trigger Action Response Plans (TARPs). To account for uncertainties and to improve management response, all impacts to biodiversity will be adaptively managed using an Adaptive Management Framework (AMF) and the OMP will also contain a risk assessment for the proposed management objectives. The OMP details the milestones for the performance and completion criteria which will be used to measure the success of the proposed quality increases through detailed management actions, that have been proven to be successful in the past. Furthermore, if the management actions are not on the predicted trajectory for the VIS increases in future habitat quality, the TARPs have been designed to identify any shortfalls and the AMF will be applied to remedy the shortfall back towards the desired quality scores.

Given the above information and the detailed management measures outlined in the OMP, the confidence in the Offset site (intact) habitat quality is conservatively rated at 85%.

Risk of loss without offset (%)

The Guidance for deriving ‘Risk of Loss’ estimates when evaluating biodiversity offset proposals under the EPBC Act (DoEE 2017) states that; ‘this process involves comparing a ‘with offset’ scenario to a ‘without offset’ (or ‘business as usual’) scenario’. The ‘business as usual’ scenario within the Project footprint is primarily forestry practices, which have a long history of clearing and degradation of the environment.

The National Environmental Science Program (NESP) Guidance for deriving ‘Risk of Loss’ estimates provides a background rate of decline predicted by DoEE (2017) for the Lithgow LGA is 3.75%. Given this, it is considered appropriate to use 3.75% averted loss score for the THPSS.

Risk of loss with offset (%)

The Offset site will be secured in accordance with the EPBC Act Environmental Offset Policy. The legally binding mechanism will be registered on the land title and will be binding on current and future landholders (refer to Section 10.1.1 for further details). As such, the risk of loss with the offset legally secured is rated as 0%.

Confidence in result – risk of loss (%)

The Offset site will be protected in perpetuity, adopting approved methods of active and passive management that have been demonstrated to provide successful rehabilitation outcomes. Therefore, the confidence in risk of loss is rated at 85%.

Offset Summary and results

Based on the values and justifications presented above and in the Offset Management Plan (OMP), the proposed offsets will provide **107.41%** of the offset obligations for the THPSS for impacts associated with the NPSS component of THPSS.

Table 1: Summary of Offset Assessment Guide Calculator inputs and outcomes

Offset Assessment Guide Criteria	Offset site (intact zone)
Impact Area	89.59 ha
Impact Quality	7
Proposed Offset site	452.11 ha
Start area quality	7
Time horizon	20 years
Time until ecological benefit	20 years
Future quality without offset	6
Future quality with offset	8
Confidence in quality results	85%
Risk of loss without offset (averted loss)	3.75%
Confidence in risk of loss score	85%
Risk of loss with offset	0
Percent of Impact Offset	**107.41%**

Notes:
The above assumptions are considered to be conservative and do not include the consideration of any THPSS within the Consolidated Approval Area

Appendix 3 – RPS Peer Review of EPBC Offset Calculator Variables (Quality and Area)

MEMO

Date: 4 February 2022
To: Natalie Gardiner
From: Mark Aitkens
Pages: 9 inc. this page
Regarding: PR146348

Springvale Colliery Swamp Offset Strategy: Peer Review of EPBC Offset Calculator data inputs (quality and area)

The EPBC Offsets Calculator was used to support the preparation of the Swamp Offset Strategy (v7) for the approved Springvale Coal Mine Expansion Project (Centennial 2021). Various data inputs were specified in Attachment 2 of the offset strategy together with explanations.

This memo provides a peer review of two variables used being 'quality' and 'area'. Findings are provided accordingly. Data supporting this review is available for verification. Revised EPBC Offset Calculations are provided using amended variables.

Calculating Quality

Overview

The term 'Quality', as used in the EPBC Offsets Policy, is an important habitat measure used in calculating the '% of impact offset'. This is an input to the EPBC Act Offset calculator, which is used to determine the adequacy of a proposed offset.

An estimate of quality is required for the impact area and the offset area, with the latter requiring the estimation of future quality states which would be achieved with and without offsetting. As there is no specified approach specified in the How to use the offsets assessment guide (https://www.awe.gov.au/sites/default/files/documents/offsets-how-use.pdf) for calculating quality, the value used in the EPBC Offsets calculator for the Springvale Extension Project (the Project) has been derived from the 'site value score' produced by the NSW BioBanking Credit Calculator (BBCC) as required for Maximum Offset Liability calculations (i.e. State offsetting calculations).

The State approval for the Project required the calculation of the Maximum Offset Liability for Newnes Plateau Shrub Swamps [Temperate Highland Peat Swamp on Sandstone (THPSS)] where impacts may occur. These calculations were performed in accordance with the Upland Swamps Policy as described in the Framework for Biodiversity Assessment (FBA). Offsets are quantified by the BBCC using data obtained from application of the BioBanking Assessment Methodology 2014 (BBAM 2014) as required by the FBA.

The BBCC uses landscape and vegetation zone data to calculate the offset liability. Site value scores relate solely to vegetation zones and are calculated from site attributes data obtained from a BioBanking plot. Landscape attributes are of no relevance to this calculation. The BBCC produces the 'site value score' by numerically comparing the BioBanking plot data obtained for a vegetation zone with published benchmark data for the corresponding vegetation type. Benchmark data is set by the State regulator (i.e. formerly Office of Environment and Heritage, now Environment Energy and Science) and imbedded in the BBCC.

Alternatively, benchmark data can be varied by the assessor where suitable local data is available (i.e. local data that is considered to reflect pre-European condition state).

In the case of the Project, it was considered that more appropriate site values were applicable given availability of swamps nearby the Project, which were in or close to benchmark (pre-European) condition state. This local knowledge allows for reconsideration of the default benchmark data, as this data was established without plot data and is therefore more generic and less representative of local conditions.

The mean 'site value score' for impact swamps, as calculated from BioBanking plot data, was used to estimate 'quality' as defined in the EPBC Offset calculator. A conversion is required to change the 'site value score' from a scale of 0-100 to a quality scale of 0-10.

It is important to note that the 'start quality' value used for offset swamps in the EPBC Act offset calculations was conservative as it is the same as the mean 'site value score' used for impact swamps. This is despite many of these offset swamps being in a or close to benchmark (pre-European) condition state. A less conservative application would consider a higher 'start quality' and corresponding adjustment for future quality, where the effect would be a greater net present value and hence higher '% of impact offset' calculations. This conservative reduction in the quality of the offset swamps effectively down weights the value of these swamps as an offset without adversely affecting the impact calculations.

Data Inputs

THPSS is synonymous with the BioMetric Vegetation Type referred to as *Baeckea linifolia – Grevillea acanthifolia* subsp. *acanthifolia* shrub/sedge swamp on sandstone, Sydney Basin Bioregion (i.e. HN633). This vegetation type is consistent across all swamp vegetation assessed and so has no bearing on the 'site value score' calculation other than for the benchmark data attributed to it.

Attributes measured in a BioBanking Plot

Ten variables (attributes) are measured in a BioBanking plot, which are listed below:

- Plant Species Richness;
- Native Over-storey Cover;
- Native Mid Storey Cover;
- Native Ground Cover – grasses;
- Native Ground Cover – shrubs;
- Native Ground Cover – other;
- Exotic Plant Cover;
- Number of Tree Hollows;
- Overstorey Regeneration; and
- Length Fallen Logs (m).

Biobanking Plot data used to calculate the Maximum Offset Liability was obtained from impact swamps and reference swamps that form part of the swamp monitoring program. Reference swamps are regarded as being in a pre-European condition state. These have been deduced with consideration to the follow factors:

- Fire frequency and intensity [i.e. exclusion of sites known to have experienced fire in the last 40 years (Benson and Baird 2012)];
- Minimal evidence of trampling and grazing from feral herbivores;
- Minimal influence from logging and/ or silviculture;

- Minimal soil disturbance;
- Minimal exotic weed incursion; and
- Evidence of native flora recruitment (i.e. indicator of intact ecological function).

Data obtained from reference swamps was used to establish 'a more appropriate local dataset' (i.e. revised local benchmark). Reference swamps considered to be in an undisturbed state and likely reflective of pre-European conditions include Barrier, Firetail and Best Swamps. This data is summarised in Attachment 1.

Benchmark Data

The default benchmark data imbedded in the BBCC for the vegetation type HN633 was reviewed against attribute data obtained from BioBanking plots performed within suitable nearby reference swamps (i.e. Barrier, Firetail and Best Swamps). If default benchmark data was representative of reference swamps on the Newnes Plateau, it would be expected to see similarities in plot attributes between these two groups of swamps. However, there was considerable difference between default benchmark values and reference plots as shown in the comparison provided in **Table 1**. This suggested a strong need to use more appropriate local data in the BBCC, as use of default values would not be representative when calculating the 'site value score' for this vegetation type on the Newnes Plateau.

Table 1 Comparison Default Benchmark and More Appropriate Local Dataset for HN633 located on the Newnes Plateau

Plot Attributes	Default Benchmark	More appropriate local dataset	Comment
Plant Species Richness	>=24	>=18	Reduced species richness
Native Over-storey Cover	27.8 to 58.6	12.3 to 75.0	Larger range in overstory cover
Native Mid Storey Cover	3.4 to 7.8	1.8 to 8.7	Consistent
Native Ground Cover – grasses	4.0 to 4.0	0.0 to 4.0	Consistent
Native Ground Cover – shrubs	61.6 to 74.4	46.6 to 86.2	Larger range in native ground cover - shrubs
Native Ground Cover – other	69.6 to 96.8	89.0 to 100.0	Narrower range in ground cover - other
Exotic Plant Cover	0.0	0.0	Consistent
Number of Tree Hollows	>=0	>=0	Consistent
Overstorey Regeneration	1.00	1.00	Consistent
Length Fallen Logs (m)	>=5	>=0	Lower threshold

The use of the 'more appropriate local dataset' as a local benchmark has increased the confidence in determining vegetation quality for THPSS offset calculations on the Newnes Plateau. This local data properly accounts for any artifacts often evident in broader regional datasets that may or may not properly describe local variation.

Site Value Score

The 'site value score' calculated by the BBCC ranges from zero (i.e. vegetation with no condition) to 100 (highest condition). **Table 2** documents the site value scores calculated for impact swamps where a corresponding Maximum Offset Liability calculation used actual plot data collected within those swamps.

Table 2 Impact Swamps and calculated BBCC 'Site Value Scores' using the 'More Appropriate Local Dataset'

Swamp	Number of Plots	Site Value Score
Carne West	8	70.00
Gang Gang	4	69.57
Carne Central	9	75.00
Paddy's Creek	9	64.17
Pine	6	92.50
Marrangaroo	12	64.17
Total/ Mean	48	72.57

A Maximum Offset Liability calculation was not prepared for Sunnyside Swamp as it was not required by the State consent. Maximum Offset Liability calculations for Lost City and Lost City North Swamps are not reported above as those swamps were impacted by the Gospers Mountain fire at the time of survey. As such, the Maximum Offset Liability calculations for these swamps has relied on pre-fire data obtained from the adjoining Marrangaroo Swamp, so are considered as estimates only.

Effect of Bushfire on Quality

Overview

A major wildfire event known as the Gospers Mountain fire occurred in 2019/20 resulting in a widespread burn of native vegetation across the Newnes Plateau involving all areas of THPSS. The intensity of this wildfire event was sufficient to burn the wettest swamps (e.g. Barrier/ Broad Swamp) as aided by the preceding dry period and weather conditions during the fire event.

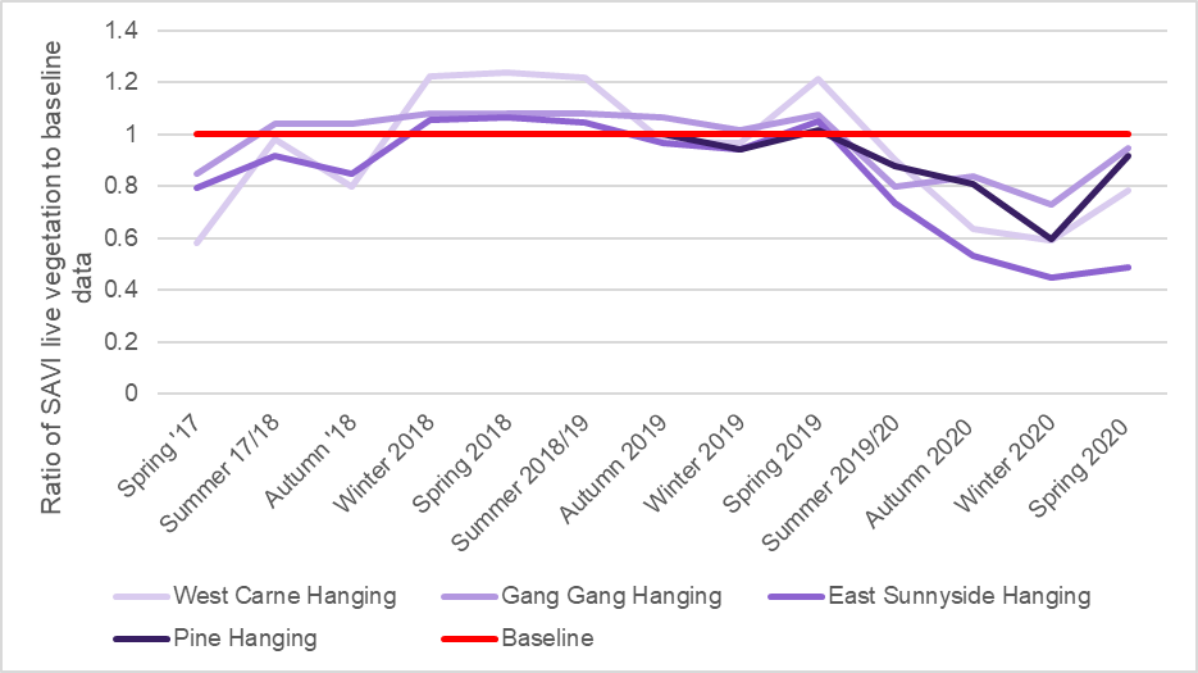
The post fire recovery time for a peat swamp is not well understood; however, fire is known to have a considerable impact on the floristics and structure on these swamps (Benson and Baird 2012). While THPSS naturally experiences episodic fire events (i.e. THPSS is surrounded by dry sclerophyll and heathland vegetation formations that routinely burn), it is sensitive to frequent and/ or hot fires. Any increase in fire frequency and/ or intensity can lead to long-term degradation and contraction of THPSS. Lasting adverse fire impacts are likely attributed to a loss of organic peat matter that exceeds the net accumulation rate, which may occur after intense wildfire events where desaturated peat substrates burn (Benson and Baird 2012).

Deane's Swamp is an example of a swamp with known fire history for the last ~40 years (i.e. burnt in 1983, 2003 and 2019/20). Classed as a 'dry' shrub swamp type for reasons relating to location and elevation, Benson and Baird (2012) identified fire as the likely reason for a reduced abundance of longer-lived shrubs (probably *Baeckea utilis* and *Leptospermum grandifolium*) with sedges such as *Gymnoschoenus sphaerocephalus* persisting in the centre of the swamp. These floristic changes appear supported by data obtained from an unburnt wet swamp over the same timeframe (i.e. Broad Swamp or Barrier) where the vegetation patterns were stable.

Monitoring

The post fire environment in a swamp is expected to comprise a mosaic of burnt ground with no photosynthetic activity (i.e. exposed peat), vegetative refugia afforded by areas of higher moisture (and thus less prone to burn) and new regenerating vegetation cover. The immediate net change is typically biased by the extent of burnt ground (i.e. peat or mineral earth depending on fire severity and water saturation).

By way of example, information recently supplied to the Independent Monitoring Panel for longwalls 428 to 432 shows how photosynthetic activity changes in hanging swamps both seasonally and after a fire event (spring 2017 to 2020). Remotely sensed data obtained from monitoring programs is provided in **Graph 1**.



Graph 1 Remotely sensed live cover as a proportion of baseline levels

As expected, photosynthetic activity dropped across all monitored hanging swamps located above longwall mining immediately after the Gospers Mountain fire (December 2020). This coincided with a sudden and substantial loss of above ground live vegetation, with burnt peat/ mineral earth being prominent in the post fire environment. Recovery in photosynthetic activity is apparent although at least one swamp is recovering more slowly (i.e. East Sunnyside). Reasons for this slower recovery rate are likely to relate to a greater loss in organic matter as it is a drier swamp type and/ or may have experienced greater fire intensity.

Quality Values

From a Project approval perspective, it is considered that quality values used in the EPBC Offsets calculator should reflect the swamp condition at the time of approval and/ or prior to extraction as this is the condition state applicable to the Project. It is from this moment that Centennial has some measure of control over the ongoing quality of the swamps.

The Gospers Mountain wildfire in 2019/20 occurred during the operational period and has impacted quality at a time where EPBC offsets were calculated. The extent of these impacts is varied, but according to Benson and Baird (2012) and monitoring data, it can be assumed that swamp vegetation will recover with the extent and timeframe of that recovery dictated by local circumstances. Determining a quality score using post fire data will most likely underestimate swamp quality and may also unintentionally mask any Project related impacts that ought to be incorporated into offsetting calculations.

Further, it is important to note that the only quantitative dataset available to objectively measure quality using an acceptable method (BBAM 2014) was collected prior to the 2019/20 Gospers Mountain fire. The use of this dataset best approximates quality at the time of the approval and therefore minimises any time related change that might be attributed to the Project and/or interaction effects with the Gospers Mountain fire.

On this basis, it is considered that the pre-fire quality scores estimated from BioBanking plots are an appropriate measure of quality that minimises the effect of factors occurring after the date of Project approval. It can be reasonably assumed that offset swamps will recover from the Gospers Mountain fire event, although the recovery extent and timeframe will depend on local circumstances (i.e. prior fire history and/ or existing anthropogenic effects) and effects of any future unplanned events (e.g. frequent fires) with the latter being outside the control of Centennial. However, to this extent, it is considered that the proposed

change in tenure (i.e. transfer from State Forest to State Conservation Area) and associated biodiversity conservation objectives and land management practices will reduce threats such as frequent fire events.

Quality used in the EPBC Offsets Calculator

All data used to calculate the 'site value score' for swamps that may be impacted by longwall mining and the local benchmark was obtained from BioBanking plots performed prior to the Gospers Mountain fire in 2019/20. This data was obtained from at least 10 independent swamps with four being used in the local benchmark data calculations. At least 68 plots have been used and is representative of the local conditions relevant to the Newnes Plateau. The following 'quality' values have been derived from 'site value scores' and used in the EPBC Offsets calculator.

Table 3 Quality values used in the EPBC Offsets calculator

Swamp Class	Site Value Score	Quality	Comment
Impact	72.57	7	Based on data
Offset	>72.57	7	Conservative estimate

The quality value of 7 used for offset swamps is a conservative estimate and adopts a precautionary approach (i.e. makes qualified assumption on the future quality of all swamps in the post Gospers Mountain fire). Swamp quality is expected to improve over time provided subsequent wildfire events (i.e. intensity and frequency) are managed and are not detrimental to swamp recovery.

Calculating Area

The swamps requiring offsetting are defined as shrub swamps classified as THPSS that occur within the Project area as mapped in the EPBC 2013/6880 approval.

Swamps outside this definition are available for consideration as offset swamps. Those available to the offset strategy are defined as follows:

- Shrub or hanging swamps classified as THPSS; and
- THPSS occurring within the Newnes or Ben Bullen State Forests.

Local and regional mapping has been used to identify swamps and delineate their boundaries. Local mapping is the product of ongoing monitoring programs where swamp type and boundaries are ground verified. Regional swamp mapping is a government product where limited ground verification has occurred. In the case of the latter, some uncertainty exists and has been identified accordingly.

Levels of mapping certainty have been ascribed to THPSS available for offsetting purposes as listed below:

- High (i.e. ground verified by monitoring programs);
- Moderate (i.e. regional vegetation mapping with some ground truthing to confirm THPSS); and
- Low (i.e. regional vegetation mapping with known uncertainties).

Area calculations have excluded swamps with a low mapping certainty as there is sufficient uncertainty to warrant inclusion. Offset swamps with moderate certainty are included (i.e. known THPSS) but the accuracy of area calculations for these swamps is likely to be less than those classified as high.

The area calculations obtained in this review by GIS for swamps that qualify for inclusion in the offset strategy are provided in the **Table 4**. Values provided in the EPBC Offset calculator are also provided.

MEMO

Date: 28 January 2022
Regarding: PR146348

Table 4 Review of Impact and Offset Area Calculations for THPSS within the Newnes and Ben Bullen State Forests

Calculation Treatment	Swamp Offset Strategy (ha)	RPS Peer Review (ha)
Impact	87.71	89.59
Offset	447.88	452.11

Findings

This peer review provides for the following findings:

- The quality value of 7 used for impact and offset swamps is appropriate. The use of a 7 is conservative, precautionary and appropriately considers quality prior to extraction;
- The quality value of 6 for offset swamps without a conservation covenant and associated management is appropriate as unmanaged threats such as increased fire regimes and anthropogenic impacts are more likely without a conservation covenant and would erode quality into the future;
- While conservative, the quality value of 8 used for offset swamps with a conservation covenant is appropriate as a tenure change with associated conservation management is likely reduce the incidence and/ or severity of threats; and
- Discrepancies found in the area calculations for impact and offset swamps are not material. Revised EPBC Offset calculations that use these adjusted numbers do not significantly alter the '% of impact offset' calculation and do not change the adequacy of the offset.

A difference of 1.86 ha is noted for the impact area calculation and 4.25 ha for the offset area. These differences are not of material effect to the EPBC Offsets calculator as the '% of impact offset' does not fall below the minimum (90%) direct offset requirement (i.e. 108.68% versus 107.41%; see Attachment 2 for revised calculations). The GIS dataset used to calculate these areas is provided for independent verification.

Closure

The above findings indicate that the variables used for quality and area in the EPBC Act offset calculator for v7 of the Swamp Offset Strategy are suitable for informing the adequacy of the offset strategy. Notwithstanding the area discrepancies, the '% of impact offset' calculation remains above the minimum (90%) direct offset requirement meaning that the offset provision specified in the offset strategy remains adequate.

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References

Benson, D. & Baird, I.R.C. (2012). Vegetation, fauna and groundwater interrelations in low nutrient temperate montane peat swamps in the upper Blue Mountains, New South Wales. Cunninghamia, 12, 267-307. doi:10.7751/cunninghamia.2012.12.021

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Attachment 1 **BioBanking Plot Data obtained from Reference Swamps (offset swamps)**

BioBanking Benchmark Calculator

Data entry: Local reference sites

To develop the benchmark, enter your transect/plot data that is collected from the reference sites. The benchmark will be generated automatically. The benchmark can then be transcribed manually into the Credit Calculator at *Step 5b: Enter Vegetation Transect/Plot Information* by selecting the *Edit Benchmarks* button.

Locating local reference sites and the field methods for measuring the vegetation condition variable must be made in accordance with the guidelines set out in section 3.4.3 and Appendix 2 of the Operational Manual.

Where a local reference site has been used to develop a benchmark for a biobank assessment, a copy of the site attribute data, description of the site and any other information that supports the local benchmark must be submitted to DECC as part of the application for the biobanking statement or agreement.

Vegetation formation	62
Vegetation class	18
Vegetation type	24

50-m transect	Benchmarks			Plots 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Native plant species	≥		18	21	18	15	22	18	17	14	16	14	18	21	20	28	25	17	19	13	14	18	16
Native over-storey cover	12.3	to	75.0	32.5	10	62	24	62	18	24	14	79	19	34	23.5	62	74.5	29.5	9	30	17	12.5	86
Native mid-storey cover	1.8	to	8.7	6	4	6	4	0	4	6	8	0	2	4	3	8.5	4	6.5	10	7.5	2	8	11.5
Native ground cover (grasses)	0.0	to	4.0	0	0	4	0	0	0	2	0	0	0	0	4	4	0	0	0	0	0	2	0
Native ground cover (shrubs)	46.6	to	86.2	66	34	72	70	88	48	74	58	78	74	82	60	76	86	64	65	82	34	62	100
Native ground cover (other)	89.0	to	100.0	100	100	80	100	100	100	100	100	100	100	100	98	92	90	100	0	100	100	100	100
50m x 20m plot																							
Number of trees with hollows	≥		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total length of fallen logs	≥		0	0	0	0	0	0	0	0	0	7	0	0	10	0	15	0	0	0	0	0	15

	Median	10th percentile	90th percentile
Native plant species	18	14	22.3
Native over-storey cover	26.75	12.25	74.95
Native mid-storey cover	5	1.8	8.65
Native ground cover (grasses)	0	0	4
Native ground cover (shrubs)	71	46.6	86.2
Native ground cover (other)	100	89	100
Number of trees with hollows	0	0	0
Total length of fallen logs	0	0	10.5

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Attachment 2 **Revised EPBC Offset Calculator Result**

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community Clear row	Yes		Area	89.59	Hectares	
			Quality	7	Scale 0-10	
			Total quantum of impact	62.71	Adjusted hectares	

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?
Ecological Communities																			
Area of community	Yes	62.71	Adjusted hectares	452.11	Risk-related time horizon (max. 20 years)	20	Start area (hectares)	452.11	Risk of loss (%) without offset	4%	Risk of loss (%) with offset	0%	16.95	85%	14.41	11.35	67.36	107.41%	Yes
									Future area without offset (adjusted hectares)	435.2	Future area with offset (adjusted hectares)	452.1							
					Time until ecological benefit	20	Start quality (scale of 0-10)	7	Future quality without offset (scale of 0-10)	6	Future quality with offset (scale of 0-10)	8	2.00	85%	1.70	1.34			