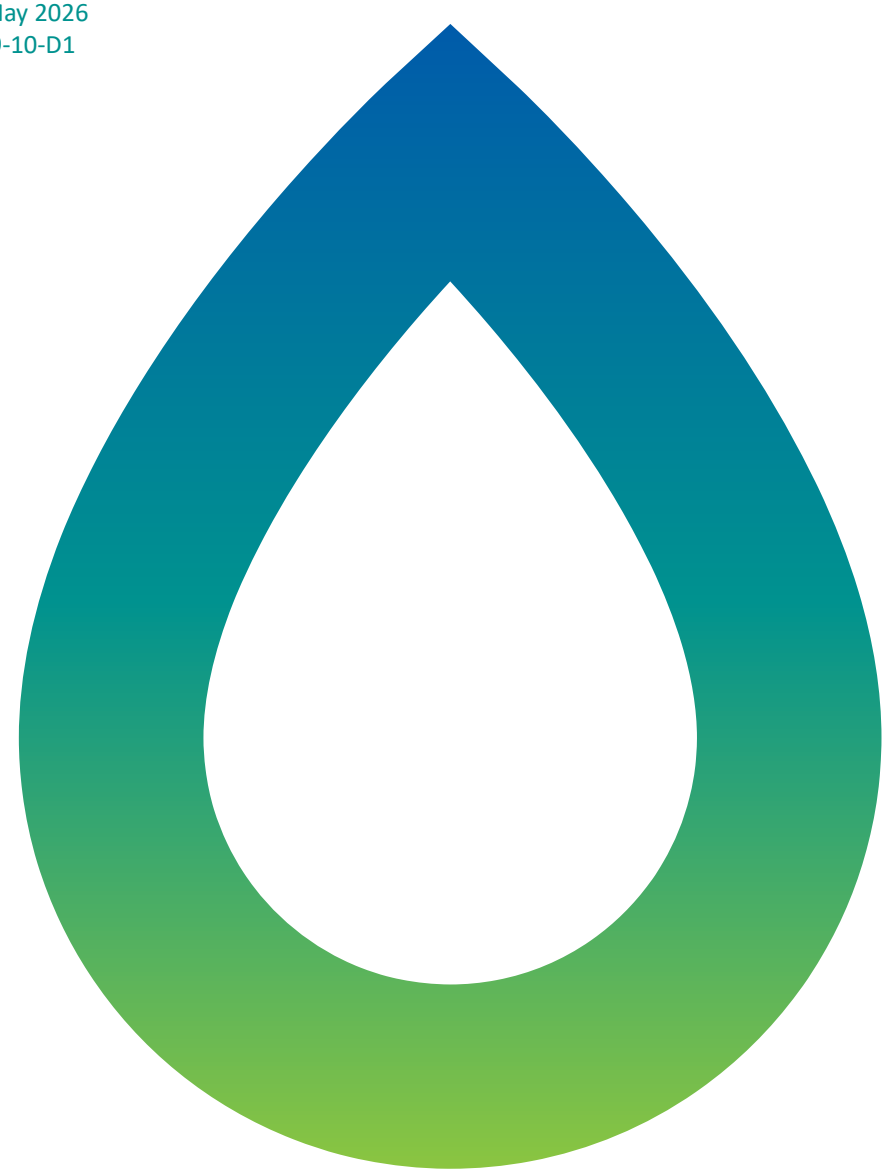
PROGRESSIVE REHABILITATION AND CLOSURE PLANNING – BLACKWATER MINE

Final Void Water Balance

Whitehaven Coal Limited

20 May 2026

1559-10-D1



DETAILS

Report Title	Progressive Rehabilitation and Closure Planning – Blackwater Mine, Final Void Water Balance
Client	Whitehaven Coal Limited

THIS REVISION

Report Number	1559-10-D1
Date	20 May 2026
Author	JG
Reviewer	GR

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1 INTRODUCTION

Whitehaven Coal Limited, owner of Blackwater Mine (BWM), commissioned WRM Water & Environment Pty Ltd to undertake a water balance assessment to support the mine's Progressive Rehabilitation and Closure Plan (PRCP). The PRCP is required under Environmental Authority EPML00717813 and relevant Queensland and Commonwealth legislation, including the *Environmental Protection Act 1994* and the *Environment Protection and Biodiversity Conservation Act 1999*.

The closure plan incorporates a series of residual final voids, classified as Non-use Management Areas (NUMAs), which require detailed assessment to demonstrate long-term hydrological stability, environmental protection, and public safety following mine closure.

Water levels within the final voids are expected to vary over time in response to prevailing climatic conditions and the balance between evaporation losses and inflows from rainfall, surface runoff, and groundwater.

HydroBalance (2026) conducted a final void water balance assessment using the GoldSim software platform. This report summarises the final void assessment approach and modelling results.

2 PROPOSED FINAL VOIDS

2.1 FINAL VOID CONFIGURATION

The proposed final landform layout is presented in Figure 2.1 to Figure 2.3 and comprises fifteen (15) residual final voids:

- Ramp 8 (R8);
- Bonnie Doon (BD);
- Mimosa/Besgrove (MB);
- Ramp 30 (R30);
- Deep Creek (DC);
- Stewarton North(ST-N);
- Stewarton South(ST-S);
- Tannyfoil (TF);
- South Ballamoo (SB);
- Kenmare (KM);
- Ramp 74 (R74);
- Togara/North Marshmead (TNM);
- South Marshmead (SM);
- Kennedy (KE); and
- Comet Downs East (CDE).

2.2 FINAL VOID GEOMETRY

The proposed BWM final landform incorporates 15 residual voids that span across the reaches of the Blackwater Creek, Taurus Creek, Deep Creek, Two Mile Creek and Burngrove Creek catchments.

This final landform would form during mining, including the in-pit backfilled spoil surface sitting atop a mined pit shell. A digital elevation model (DEM) of the proposed final landform design surface "20251104 BWM PRCP Rev3 LF4.2 1x1m grid" (Rev3 final landform) was provided by BWM in November 2025.

A summary of the final void geometries is provided in Table 2.1, including the year that the works commence.

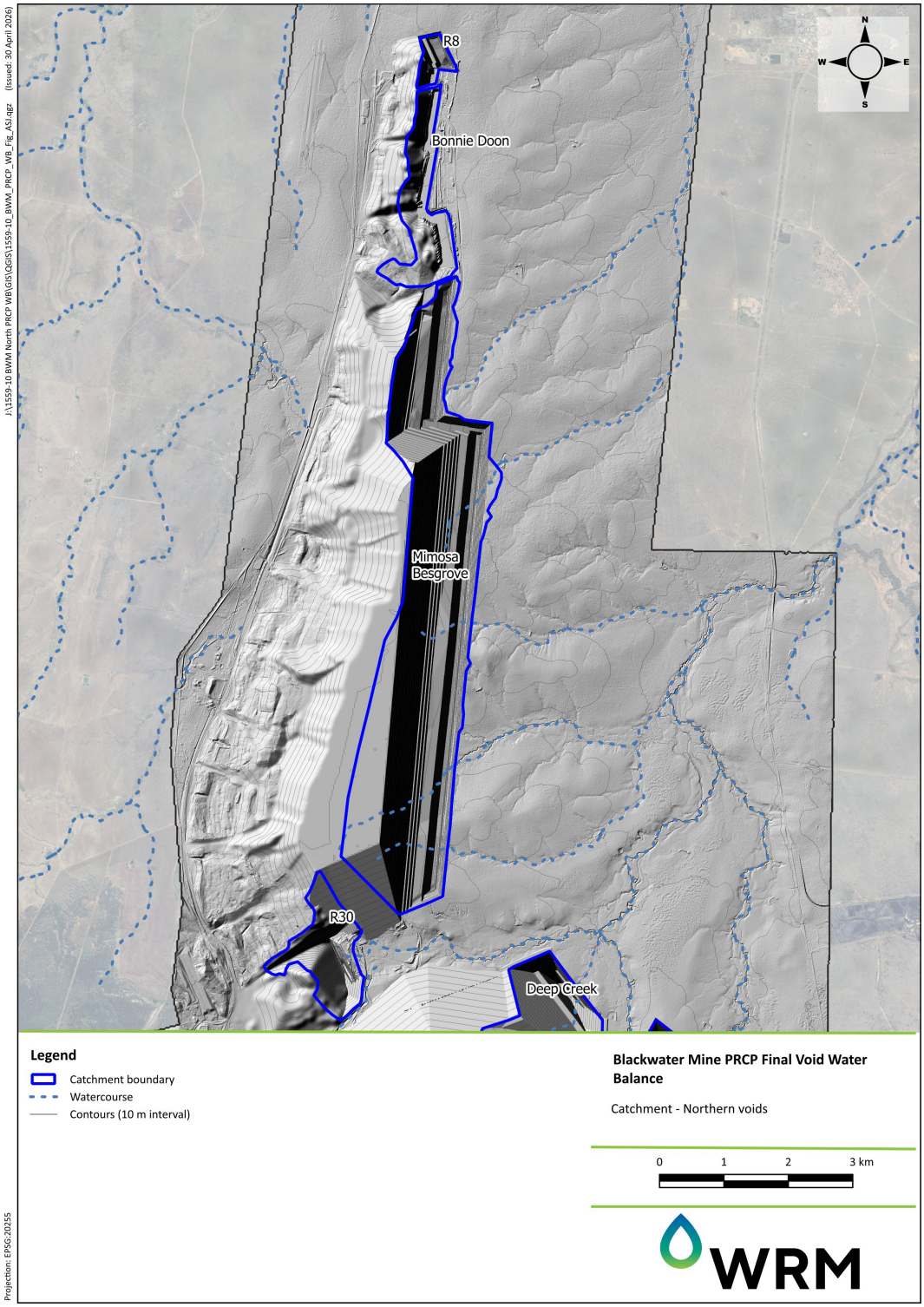

J:\1559-10 BWM North PRCP WB\GIS\QGIS\1559-10_BWM_PRCP_WB_Fig_ASI.qgz (Issued: 30 April 2026)
R8
Bonnie Doon
Mimosa
Besgrove
R30
Deep Creek
N
W
E
S
Legend
Catchment boundary
Watercourse
Contours (10 m interval)
Blackwater Mine PRCP Final Void Water Balance
Catchment - Northern voids
0
1
2
3 km
WRM
Projection: EPSG:20255

Figure 2.1 Final void catchment/land uses – Northern voids

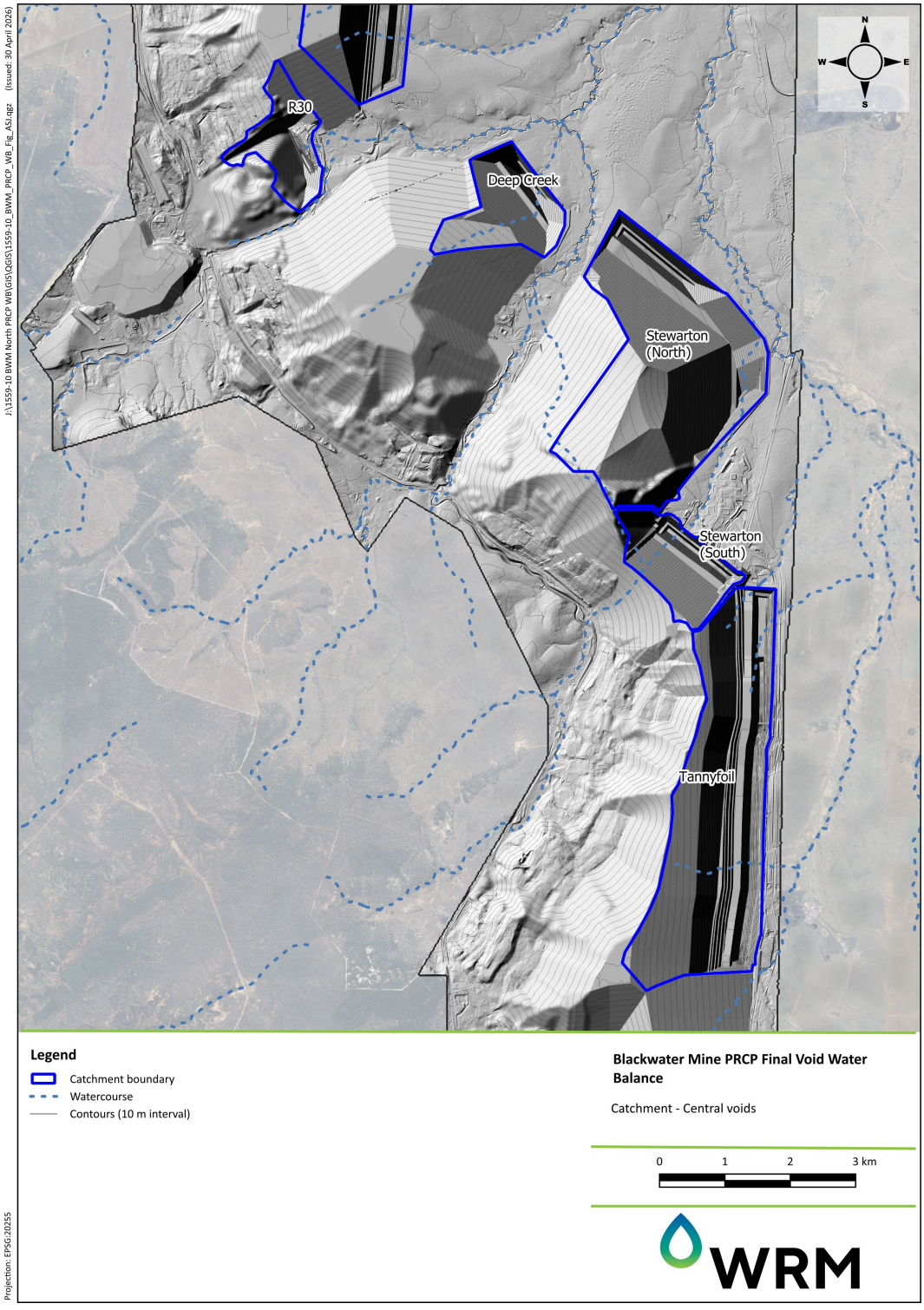


Figure 2.2 Final void catchment/land uses – Central voids

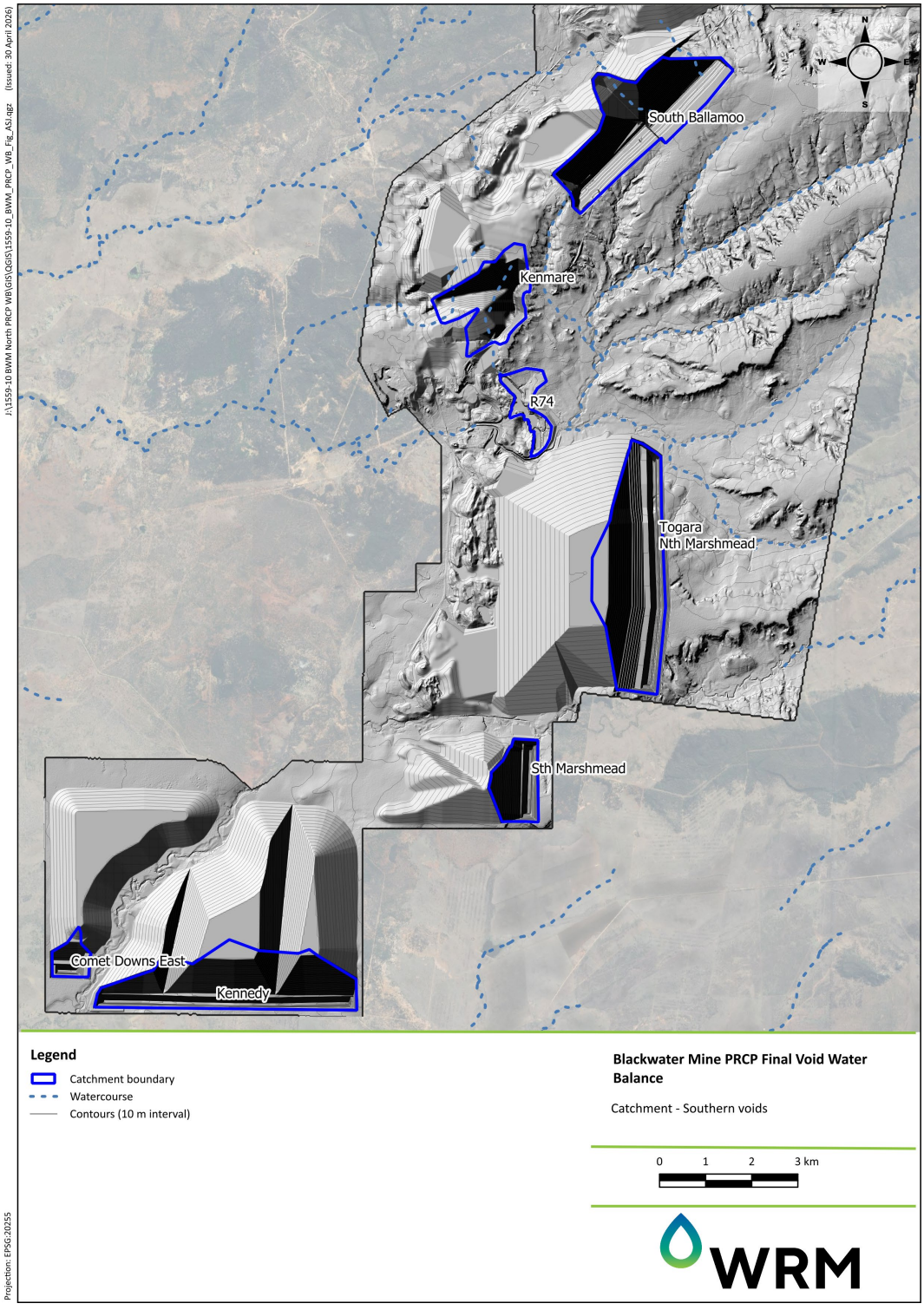


Figure 2.3 Final void catchment/land uses – Southern voids

Table 2.1 Final void geometries

Void	Floor level (mAHD)	Crest level (mAHD)	Depth (m)	Volume to crest (ML)	Surface area at crest (ha)
R8	109	175*	66	6,528	21
BD	150	175*	26	3,633	30.3
MB	24	200	176	374,878	597.2
R30	139	217	78	16,316	59.7
DC	52	202	150	54,895	109.4
ST-N	-4	204	208	302,582	380.1
ST-S	92	232	140	42,632	82.5
TF	115	237	122	160,141	303.2
SB	84	290	206	376,755	447.9
KM	161	297	136	51,258	116.4
R74	234	266	32	9,954	60.5
TNM	69	271	202	292,542	363.8
SM	108	270	162	74,727	112.8
KE	99	221	122	93,791	192.8
CDE	90	222	132	20,377	41.7

Note: * This value represents the internal crest level between R8 and BD

Note: # R8 and BD overflow to the receiving environment at 188mAHD

3 MODEL CONFIGURATION

3.1 MODELLING APPROACH

HydroBalance (2025 and 2026) assessed the long-term hydrological behaviour of these voids over a 1,000-year post-closure period using the GoldSim software platform.

The GoldSim model was used to simulate the water volume within the final void on a daily time-step. The volume of water in the voids was calculated at each time step as the sum of direct rainfall to the void surface, catchment runoff, and groundwater flux, less evaporation losses.

Key components of the model are summarised in the following sub-sections, including descriptions of key model inputs and assumptions.

3.2 CLIMATE DATA

The Australian Government Consistent Climate Scenarios (CCS) project was used to generate climate change adjusted rainfall and evaporation data, which transformed historical climate data from the period 1960 to 2024 (64 years). The CCS project provides climate projections as a daily time series across Australia on a 0.05-degree grid. The grid point closest to the centre of BWM was used for this assessment.

The Shared Socioeconomic Pathway SSP2-4.5 was selected as the emission pathway for the Intergovernmental Panel on Climate Change (IPCC) assessment report AR5, with a base case global warming sensitivity for the Year 2070. The Year 2070 was selected as it represents a general mid-point for the varying void commencement dates.

SSP2-4.5 assumes that global development and environmental policies will continue along their current trajectories, and represents a moderate path where social, economic and technological trends do not shift markedly from historical patterns. It leads to moderate greenhouse gas emissions and radiative forcing of 4.5 W/m^2 by 2100.

The climate data was selected according to the following climate sensitivity and climate change model composites:

- Climate warming sensitivity assumed to fall in the medium category; and
- The representative future climate cluster was selected as HP, which represents a high level of global warming.

The 64 years of historical climate data adjusted rainfall and evaporation data was looped to create a long-term (1,000-year) climate sequence.

Figure 3.1 shows the long -term monthly averages for the rainfall data and pan evaporation.

Pan evaporation has been converted to Morton's Lake (mLake) and Morton's Wet (mWet) evapotranspiration to account for evapotranspiration losses from the pit lake and catchment as follows:

- Pan evaporation to mLake factor: 0.883 – applied to the evaporation acting on the surface of the pit lake.
- Pan evaporation to mWet factor: 0.845 – applied to the evaporation.

3.3 CATCHMENT RUNOFF

3.3.1 Catchment areas

The final landform catchment area was delineated from the final landform surface provided by BWM. The land use of the void floor has been characterised as spoil. Figure 2.1 to Figure 2.3 show the catchment boundary adopted for the final void water balance. The catchment and land use values (HydroBalance, 2025 and 2026) are provided in Table 3.1.

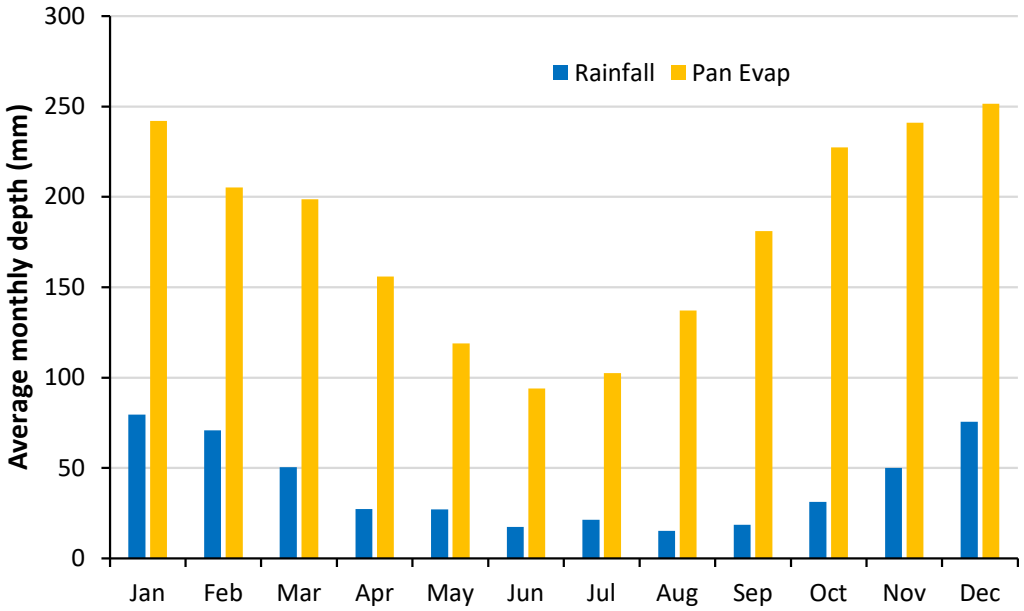


Figure 3.1 Distribution of monthly CCS rainfall and pan evaporation (1960 - 2024) [HydroBalance, 2026]

Table 3.1 Final void catchment and land use areas

Void	Contributing Catchment (ha)			
	Undisturbed	Spoil	Rehabilitated spoil	Total
R8	33.7	22	21.8	77.5
BD	98.1	84.1	184.4	366.6
MB	39.1	596.5	622.4	1258
R30	0	24.1	149.2	173.3
DC	0	52.9	167.3	220.2
ST-N	0	195.2	678.1	873.3
ST-S	0	50.9	150.3	201.2
TF	0	388.1	458.6	846.7
SB	0	365	267.4	632.4
KM	0	146.1	236	382.1
R74	10.1	58.3	112.9	181.3
TNM	7.4	458	249.1	714.5
SM	0	119.4	80.3	199.7
KE	0	188.6	481.1	669.7
CDE	8.9	27.7	69.4	106

3.3.2 AWBM parameters

Table 3.2 shows the adopted rainfall runoff parameters for each catchment land use. Catchment runoff was modelled using the Australian Water Balance Model (AWBM). The long-term volumetric runoff coefficient (Cv) for each land use calculated using the parameters is also shown.

Table 3.2 Adopted AWBM rainfall runoff parameters

Parameter	Natural	Spoil	Rehab (& partial rehab)	Tailings	Hardstand/ pit	Disturbed
C1 (mm])	30	100	20	5	10	10
C2 (mm)	180	200	120	15	40	60
C3 (mm)	250	300	180	25	50	100
A1	0.134	0.134	0.134	0.134	0.3	0.3
A2	0.433	0.433	0.433	0.433	0.4	0.4
A3	0.433	0.433	0.433	0.433	0.3	0.3
C_{av}	190.2	229.9	132.6	18.0	34.0	57.0
BFI	-	0.8	0.35	-	-	-
K_{base}	-	0.98	0.98	-	-	-
K_{surf}	-	0.1	0.1	-	-	-
Cv (%)	4.2	1.6	6.5	32.2	23.3	18.2

Notes: C1/C2/C3 – Surface storage capacities
A1/A2/A3 – Partial area fraction
C_{av} – Catchment averaged surface storage capacity
BFI – Baseflow index
K_{base} – Baseflow recession constant
K_{surf} – Surface flow recession constant
C_v – Long-term coefficient of runoff

Cv for spoil is low, reflecting high infiltration of rehabilitated spoil. Infiltration from spoil was accounted for in the groundwater inflows as described in Section 3.3.3.

3.3.3 Groundwater inflows

Groundwater inflows into the 15 voids were provided by SLR (2026) as a time series over the 1,000-year simulation. Seepage interaction between spoil and voids was included in the groundwater flow rates to simulate the groundwater table based on the estimated void water levels. The hydrological behaviour of the voids was simulated iteratively to achieve convergence with the predicted groundwater flow rates and void water levels.

SLR (2026) confirms that the residual voids form evaporative sinks and that void water levels stabilise (reach equilibrium) below the regional groundwater table.

4 FINAL VOID RESULTS

4.1 OVERVIEW

The final voids were modelled using the assumptions outlined in Section 3 and the results are outlined in Section 4.2. In addition, analysis of the final void behaviour for extreme rainfall events was undertaken as outlined in Section 4.3.

4.2 FINAL VOID MODEL RESULTS

The final void modelled water levels for the 15 voids are presented in Figure 4.1 to Figure 4.15. The following is of note regarding this result:

- Ramp 8 (R8) void stabilises at an average water level of approximately 146.5 mAHD at around 200 years post-mining. This is 28.5 m below the level at which R8 would overflow to Bonnie Doon (175 mAHD) and 41.5 m below the pit crest level (188 mAHD). The internal overflow level between Ramp 8 and Bonnie Doon (175 mAHD) is not reached under average conditions, and no inter-void spill is expected.
- Bonnie Doon (BD) void stabilises within an average water level of approximately 154.5 mAHD at around 150 years post-mining. This is 20.5 m below the overflow level to R8 (175 mAHD) and 33.5 m below the pit crest level (188 mAHD), indicating no overtopping occurs.
- Mimosa/Besgrove (MB) void stabilises within around 200 years post-closure at an average water level of approximately 83.7 mAHD, which is 116.3 m below the pit crest level (200 mAHD).
- Ramp 30 (R30) void stabilises within around 150 years post-closure at an average water level of approximately 143.3 mAHD, which is 73.7 m below the pit crest level (217 mAHD).
- Deep Creek (DC) void stabilises within around 300 years post-closure at an average water level of approximately 134.5 mAHD, which is 67.5 m below the pit crest level (202 mAHD).
- Stewarton North (ST-N) void stabilises within around 200 years post-closure at an average water level of approximately 74.0 mAHD, which is 130.0 m below the pit crest level (204 mAHD).
- Stewarton South (ST-S) void stabilises within around 100 years post-closure at an average water level of approximately 103.9 mAHD, which is 128.1 m below the pit crest level (232 mAHD).
- Tannyfoil Creek (TF) void stabilises within around 250 years post-mining at an average water level of approximately 144.7 mAHD, which is 92.3 m below the pit crest level (237 mAHD).
- South Ballamoo (SB) void stabilises within around 300 years post-mining at an average water level of approximately 141.5 mAHD, which is 148.5 m below the pit crest level (290 mAHD).
- Kenmare (KM) void stabilises within around 150 years post-mining at an average water level of approximately 218.0 mAHD, which is 79.0 m below the pit crest level (297 mAHD).
- Ramp 74 (R74) void stabilises within around 100 years post-mining at an average water level of approximately 234.1 mAHD, which is 31.9 m below the pit crest level (266 mAHD), indicating no overtopping occurs.
- Togara North/Marshmead (TNM) void stabilises within around 300 years post-mining at an average water level of approximately 165.7 mAHD, which is 105.3 m below the pit crest level (271 mAHD).
- South Marshmead (SM) void stabilises within around 300 years post-mining at an average water level of approximately 171.1 mAHD, which is 98.9 m below the pit crest level (270 mAHD).
- Kennedy (KE) void stabilises within around 400 years post-mining at an average water level of approximately 166.4 mAHD, which is 54.6 m below the pit crest level (221 mAHD).
- Comet Downs East (CDE) void stabilises within around 450 years post-mining at an average water level of approximately 191.2 mAHD, which is 30.8 m below the pit crest level (222 mAHD), indicating no overtopping occurs.

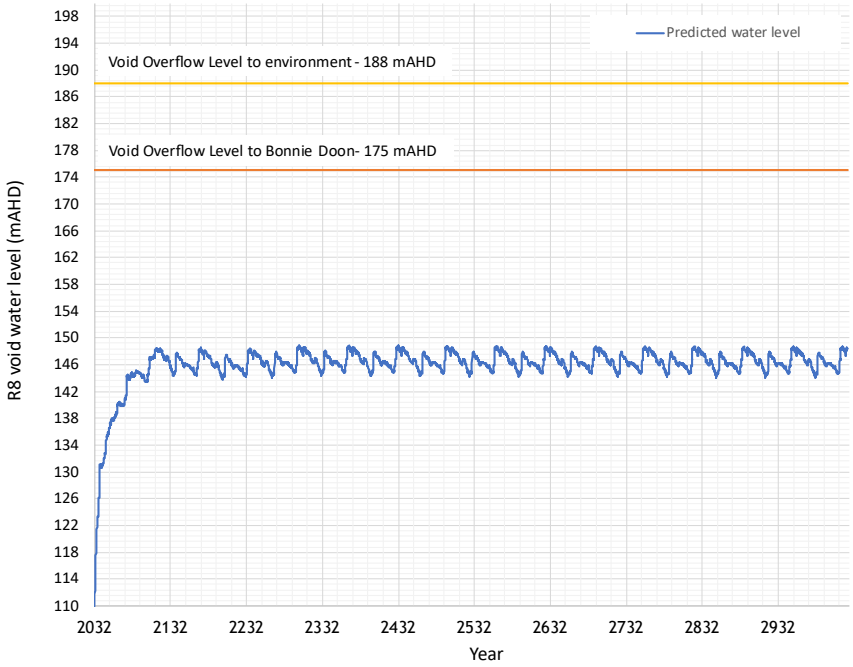


Figure 4.1 Ramp 8 void - long-term predicted void water level (HydroBalance, 2026)

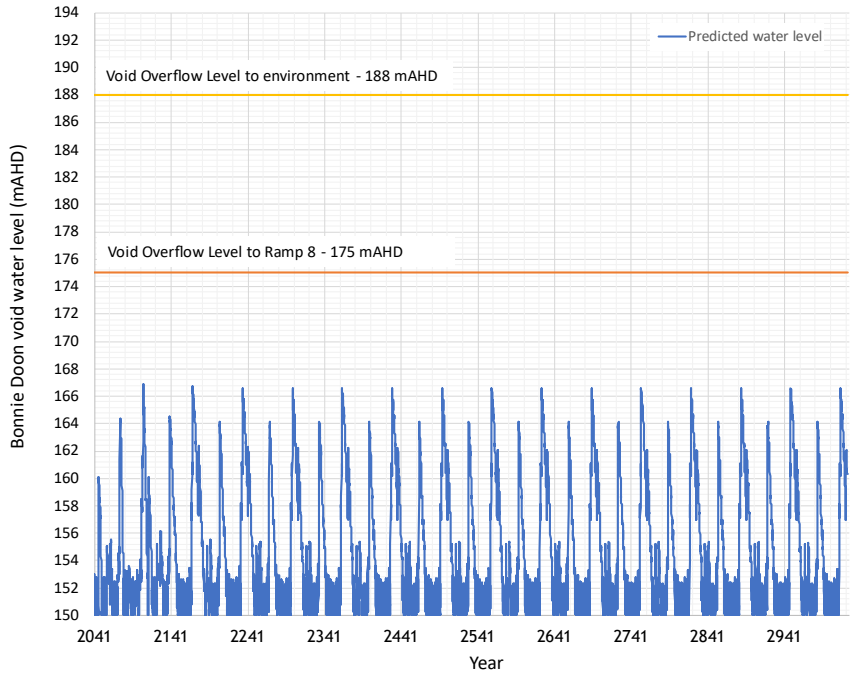


Figure 4.2 Bonnie Doon void - long-term predicted void water level (HydroBalance, 2026)

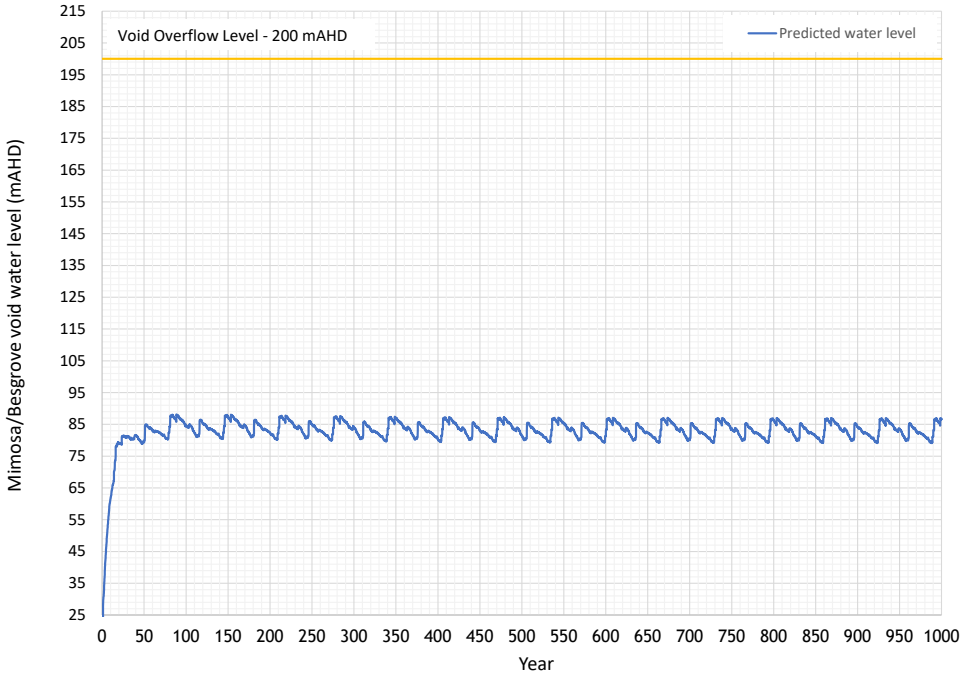


Figure 4.3 Mimosa/Besgrove void – long term predicted final void water level (HydroBalance, 2026)

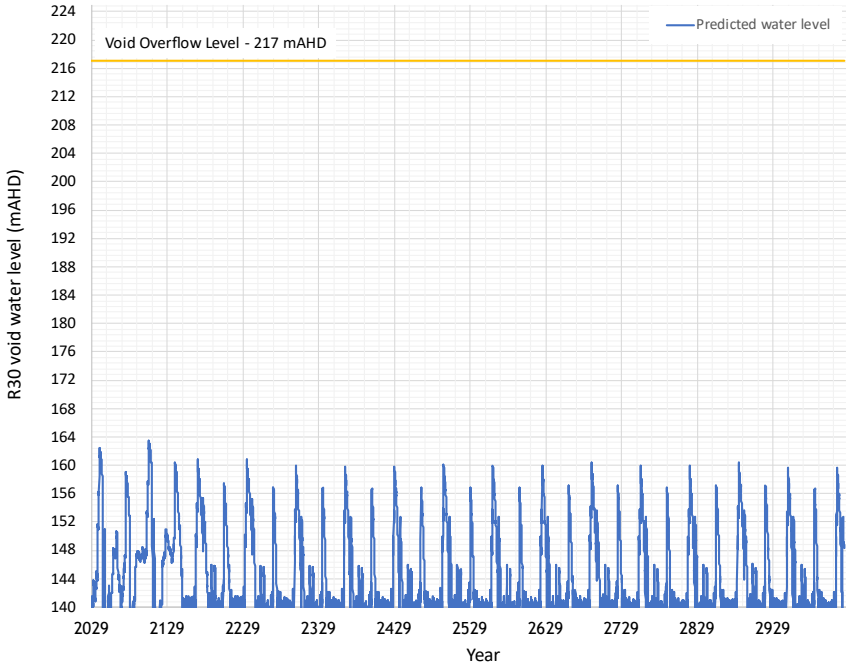


Figure 4.4 Ramp 30 void – long term predicted final void water level (HydroBalance, 2026)

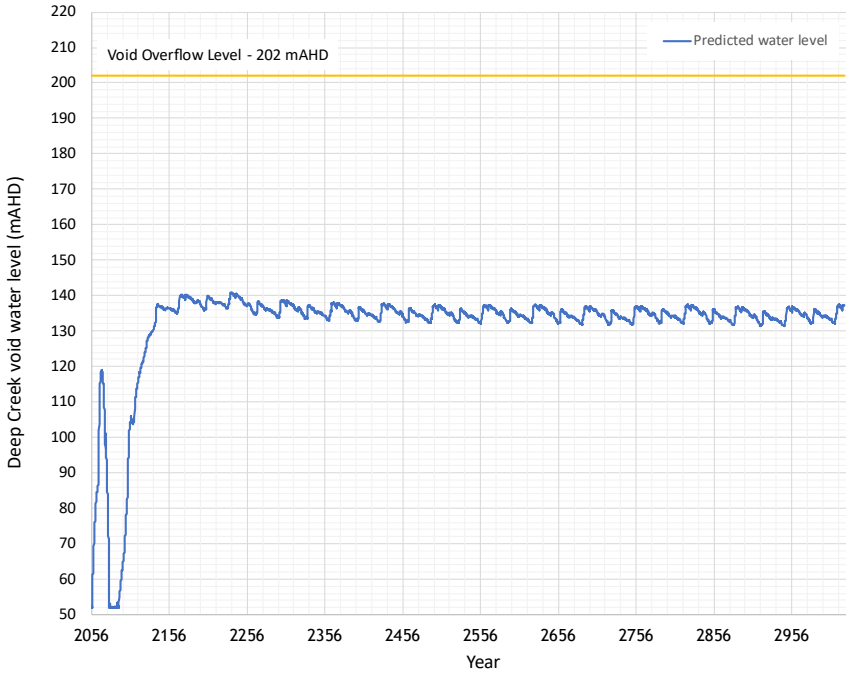


Figure 4.5 Deep Creek void – long term predicted final void water level (HydroBalance, 2026).

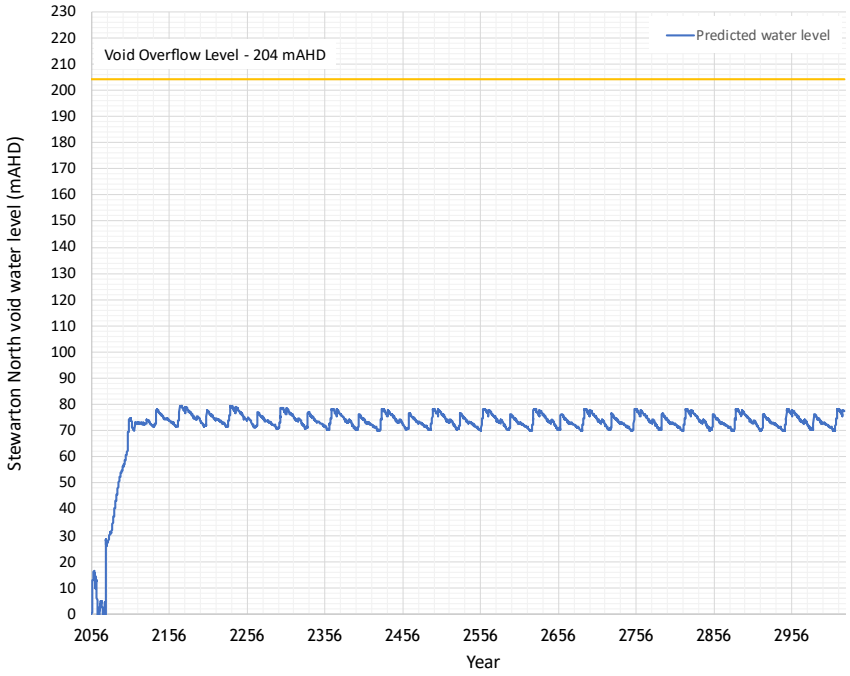


Figure 4.6 Stewarton North void – long term predicted final void water level (HydroBalance, 2026)

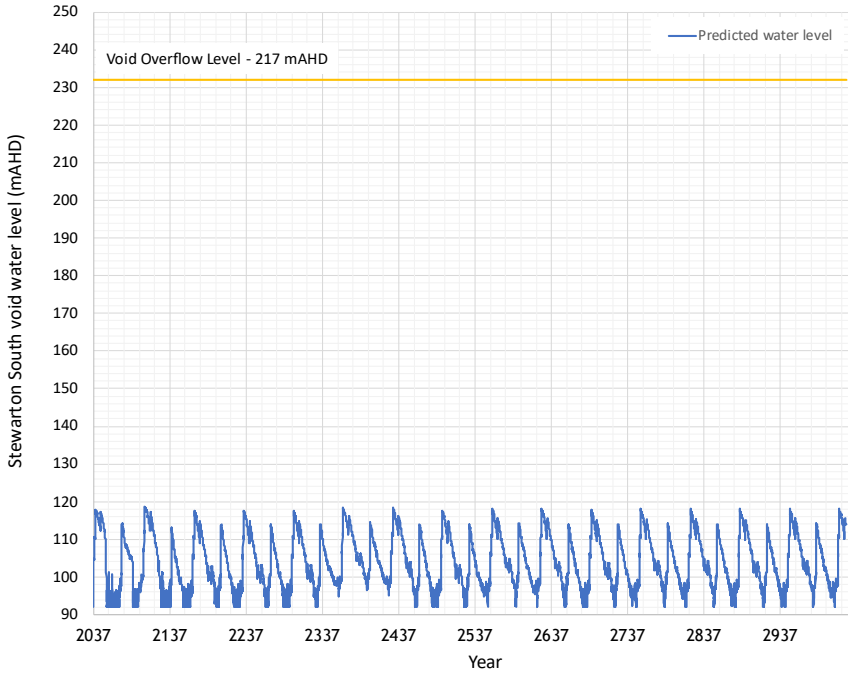


Figure 4.7 Stewarton South void – long term predicted final void water level (HydroBalance, 2026)

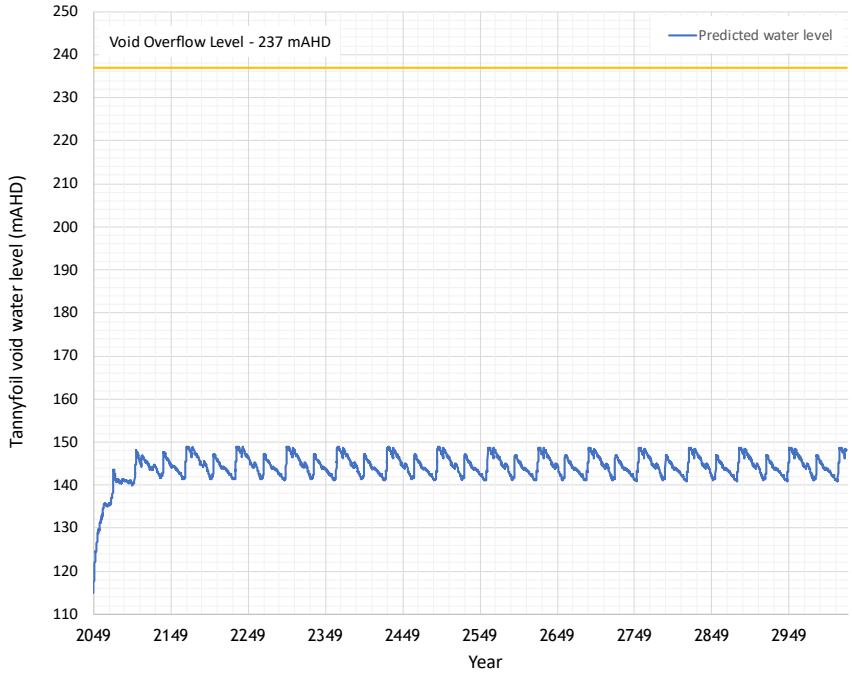


Figure 4.8 Tannyfoil Creek void - long-term predicted void water level (HydroBalance, 2026)

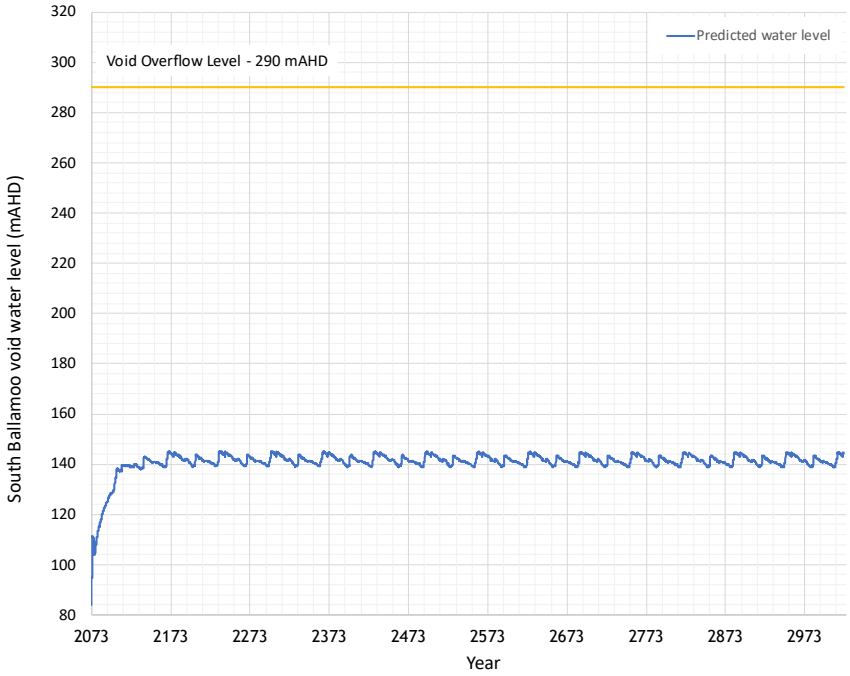


Figure 4.9 South Ballamoo void - long-term predicted void water level (HydroBalance, 2026)

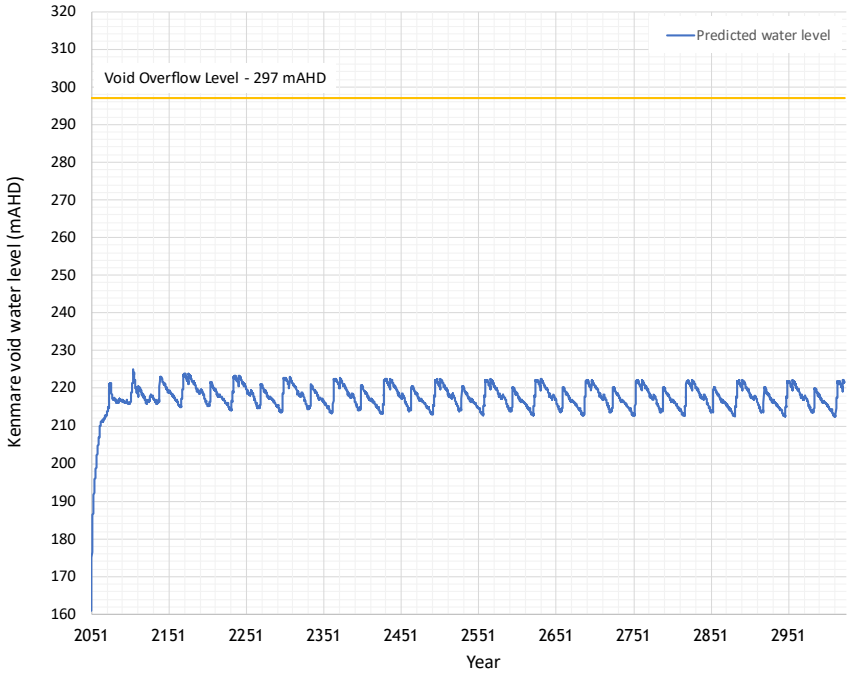


Figure 4.10 Kenmare void - long-term predicted void water level (HydroBalance, 2026)

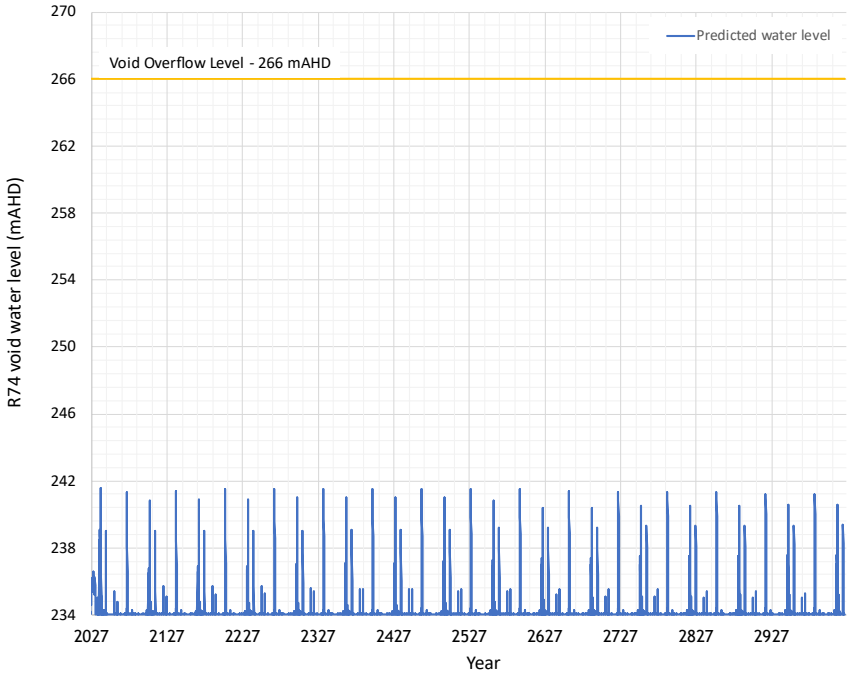


Figure 4.11 Ramp 74 void - long-term predicted void water level (HydroBalance, 2026)

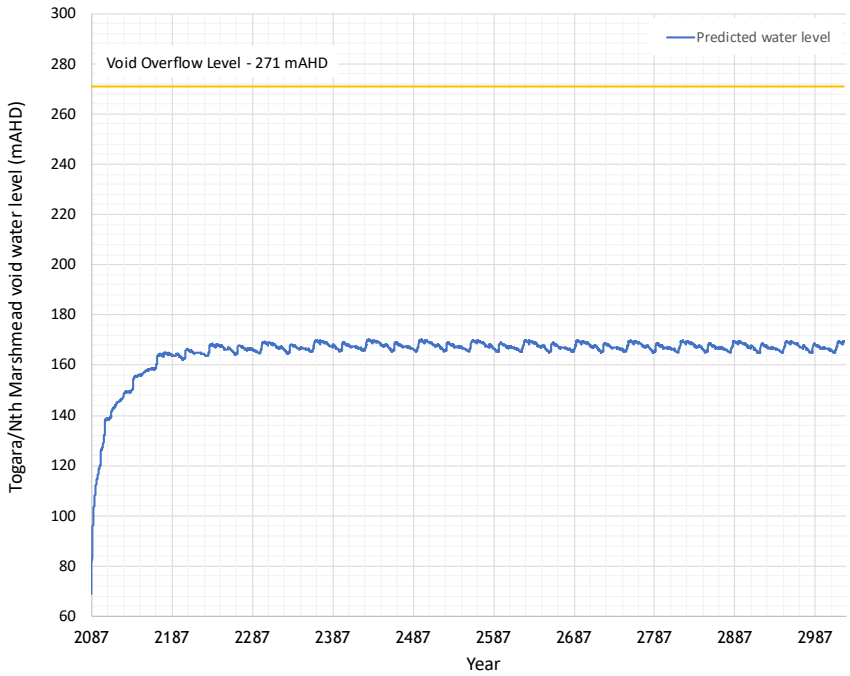


Figure 4.12 Togara North/Marshmead void - long-term predicted void water level (HydroBalance, 2026)

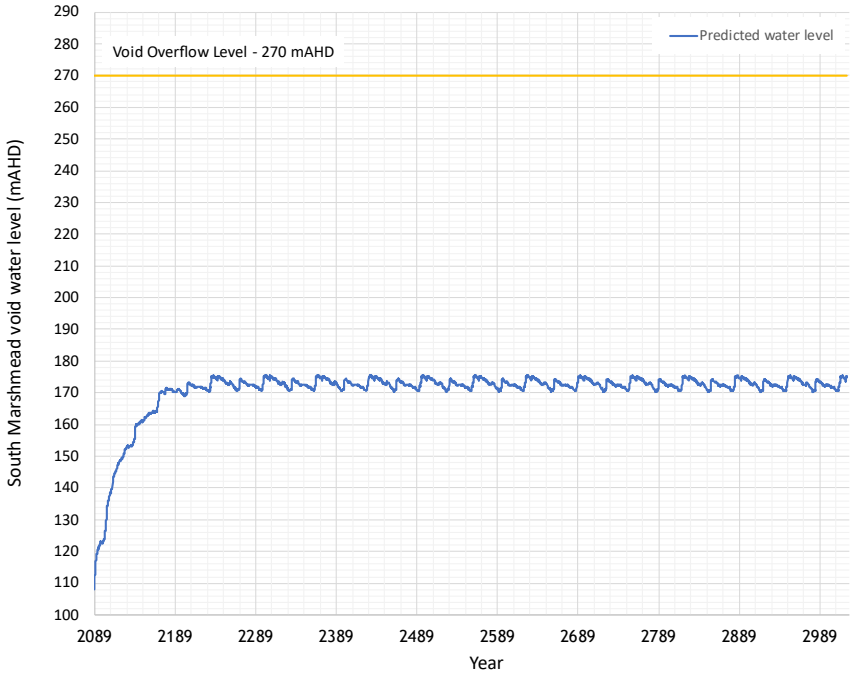


Figure 4.13 South Marshmead void - long-term predicted void water level (HydroBalance, 2026)

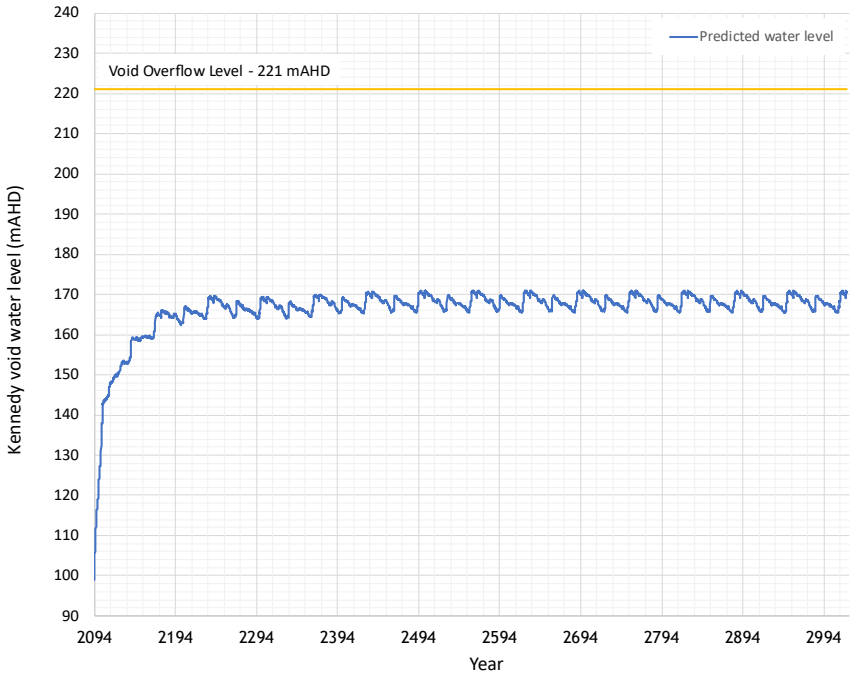


Figure 4.14 Kennedy void - long-term predicted void water level (HydroBalance, 2026)

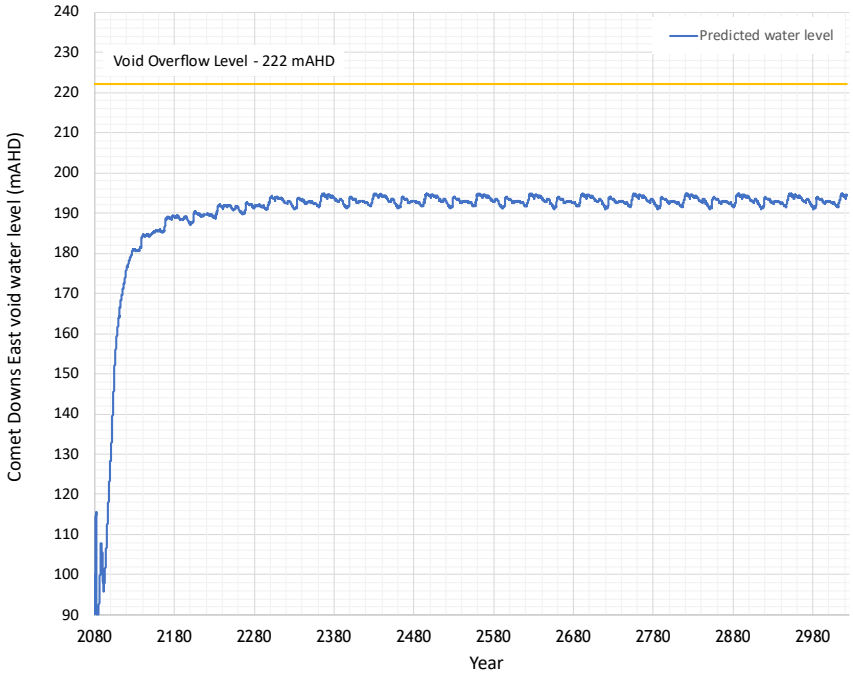


Figure 4.15 Comet Downs East void - long-term predicted void water level (HydroBalance, 2026)

4.3 EXTREME STORM EVENT WATER STORAGE

4.3.1 Method

An assessment of the impact of extreme storm events on the water levels in the final voids has been undertaken. The potential for discharge of void water during a large storm was assessed for the 1 in 1,000 AEP (or 0.1% AEP) 72-hour (3 day) design storm. The method assumes initial water levels are consistent with the average modelled long-term water levels.

Design rainfall depths for the above events were estimated using standard procedures in Australian Rainfall and Runoff (ARR) (Ball et al., 2019). The runoff generated from the storm events has been conservatively calculated assuming 100% of runoff reports to the voids (i.e. no losses) from the surface catchment reporting to the voids.

4.3.2 Results

The results of the storm event analysis are presented in Table 4.1. These results show that, even during extreme short duration storm events, the pit crest would not be overtopped for any of the final voids.

Table 4.1 Storm event modelling results

Void	Runoff Volume (ML)	Water level increase (m)	Final volume (ML)	Final level (mAHD)	Pit crest level (mAHD)	Freeboard (m)
R8	221	2.2	2,180	148.7	188*	39.3
BD	1,045	5.3	1,430	159.8	188*	21.2

Void	Runoff Volume (ML)	Water level increase (m)	Final volume (ML)	Final level (mAHD)	Pit crest level (mAHD)	Freeboard (m)
MB	3,585	4.4	25,763	88.1	200	111.9
R30	494	19.3	892	162.6	217	54.4
DC	628	2.6	9,741	137.1	202	64.9
ST-N	2,489	4.5	59,120	78.5	204	125.5
ST-S	573	11.6	732	115.5	232	116.5
TF	2,413	3.6	11,023	148.3	237	88.7
SB	1,802	2.8	14,952	144.3	290	145.7
KM	1,089	3.5	6,152	221.5	297	75.5
R74	517	10.2	795	244.3	266	21.7
TNM	2,036	2	39,873	167.7	271	103.3
SM	569	2.9	10,211	174.0	270	96.0
KE	1,909	2.4	26,516	168.8	221	52.2
CDE	302	1.8	10,334	193.0	222	29.0

Note: * This value represents the internal crest elevation between Ramp 8 and BD

5 SUMMARY AND CONCLUSIONS

A GoldSim water balance model was developed to assess the long-term water level behaviour at the proposed BWM final voids. The proposed BWM final landform includes 15 residual voids, all of which are designated as NUMAs. The final voids were modelled for a 1,000-year period following mine closure.

The final void model results for BWM void show the following:

- All voids reach an equilibrium within 100 to 500 years after closure.
- The modelled water level for all 15 voids is below the pit void overflow levels, and there are no modelled spills to the receiving environment for any voids over the 1,000-year simulation.

The extreme storm event assessment demonstrates that, even if the voids received inflows from a 0.1% AEP 72-hour storm event (with zero losses), they would not overflow to the receiving environment.

The assessment demonstrates that the risk of surface overtopping to the receiving environment from the 15 voids is extremely low. All voids function as terminal evaporative sinks, consistent with groundwater modelling outcomes (SLR, 2026).

6 REFERENCES

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