APPENDIX 3C
SURFACE WATER
MONITORING DATA

Summary of 2023 Surface Water Monitoring Results

SW Monitoring Point	EC (µS/cm)			pH			SO4 (mg/L)			Turbidity (NTU)		
	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
CC1	2220	4280	3496	7.6	7.9	7.7	630	1580	1191	1.5	66.9	17.0
CC2	2210	3980	2842	7.7	8.2	8.0	629	1610	875	0.4	55.7	7.3
CC3	1730	2450	2105	7.9	8.6	8.2	506	875	672	1.0	31.8	9.6
WIL (U)*	737	2230	1076	6.9	8.0	7.3	48	655	178	9.2	116.0	43.0
WIL (U2)	738	2240	1104	6.7	8.2	7.3	28	649	109	5.5	76.2	32.5
WIL (PC)*	2300	2300	2300	8.0	8.0	8.0	571	571	571	31.4	31.4	31.4
WIL (NC)*	448	450	449	7.3	7.4	7.4	93	99	96	<0.1	<0.1	<0.1
WIL (D)	638	1890	1269	7.6	8.4	8.1	97	778	350	3.1	22.0	7.9
WIL (D2)*	682	1790	1246	7.8	8.3	8.0	127	588	340	2.3	15.1	4.5
WOL1	718.0	1820.0	1233.6	7.8	8.6	8.2	129.0	742.0	340.4	3.8	36.2	10.4
WOL2	1080.0	1550.0	1320.8	8.0	8.6	8.2	147.0	307.0	229.1	3.0	12.0	6.6

Notes: mg/L = micrograms per litre. mS/cm= micro-Siemens per centimetre. NTU = nephelometric turbidity units. *Dry

Summary of 2022 Surface Water Monitoring Results

SW Monitoring Point	EC (µS/cm)			pH			SO4 (mg/L)			Turbidity (NTU)		
	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
CC1	1870	3370	2917	7.6	8.0	7.8	551	1320	971	1.1	12.8	4.2
CC2	1170	4130	2465	7.7	8.2	8.0	319	1450	766	0.3	3.2	1.7
CC3	411	2060	1426	7.6	8.4	8.0	69	626	392	0.9	13.2	3.7
WIL (U)*	221	1510	667	6.9	7.6	7.2	5	448	138	7.3	24.9	14.8
WIL (U2)	210	1440	694	6.7	7.6	7.1	7	412	139	6.9	24.0	13.4
WIL (PC)*	432	1410	657	6.9	7.8	7.3	9	282	81	25.8	74.0	40.7
WIL (NC)*	396	3530	1208	7.0	8.0	7.3	34	1380	391	0.4	5.0	1.7
WIL (D)	497	3260	1418	7.5	8.3	7.9	47	1160	402	3.6	43.8	14.3
WIL (D2)*	527	2790	1410	7.6	8.0	7.9	67	917	387	2.6	12.4	7.6
WOL1	824.0	2760.0	1258.0	7.7	8.1	8.0	101.0	915.0	302.6	2.3	14.5	7.0
WOL2	609.0	1210.0	806.2	6.9	8.2	7.6	54.0	144.0	93.3	2.2	69.1	18.0

Notes: mg/L = micrograms per litre. mS/cm= micro-Siemens per centimetre. NTU = nephelometric turbidity units. *Dry

Summary of 2021 Surface Water Monitoring Results

SW Monitoring Point	EC (µS/cm)			pH			SO4 (mg/L)			Turbidity (NTU)		
	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
CC1	179.0	4880.0	2802.8	7.0	7.9	7.6	14.0	1740.0	884.9	2.1	366.0	80.4
CC2	3080.0	7870.0	5356.4	7.8	8.2	8.0	811.0	3000.0	1938.3	0.5	2.8	1.0
CC3	2090.0	3310.0	2508.6	8.3	8.7	8.4	593.0	1130.0	756.6	0.8	18.3	7.0
WIL (U)*	258.0	511.0	391.8	6.9	7.2	7.0	6.0	52.0	24.2	7.5	19.3	12.7
WIL (U2)	321.0	582.0	425.6	6.8	7.2	7.0	10.0	28.0	19.9	8.2	18.6	12.7
WIL (PC)*	304.0	633.0	490.6	6.8	7.2	7.0	7.0	32.0	19.4	10.1	1700.0	173.5
WIL (NC)*	343.0	609.0	477.8	6.8	7.7	7.3	51.0	89.0	66.5	1.1	164.0	35.1
WIL (D)	374.0	1330.0	606.9	7.2	7.7	7.5	34.0	317.0	102.3	1.6	13.3	5.1
WIL (D2)*	400.0	1340.0	600.3	7.3	8.0	7.7	40.0	319.0	107.4	1.6	8.8	3.6
WOL1	571.0	1670.0	1003.5	7.9	8.4	8.1	63.0	293.0	153.8	1.0	12.4	3.3
WOL2	469.0	2910.0	1526.8	7.5	8.0	7.9	51.0	471.0	241.9	0.8	11.6	3.2

Notes: mg/L = micrograms per litre. mS/cm= micro-Siemens per centimetre. NTU = nephelometric turbidity units. *Dry

Summary of 2020 Surface Water Monitoring Results

SW Monitoring Point	EC (µS/cm)			pH			SO4 (mg/L)			Turbidity (NTU)		
	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
CC1	262.0	1380.0	990.7	6.9	7.6	7.4	39.0	399.0	277.3	58.1	523.0	234.7
CC2	5850.0	8500.0	6786.7	7.8	8.2	8.0	2290.0	3080.0	2516.7	0.7	325.0	38.0
CC3	4330.0	4720.0	4592.5	8.5	8.6	8.5	1710.0	1960.0	1845.0	0.6	10.0	3.2
WIL (U)*												
WIL (U2)	388.0	4070.0	975.3	4.3	7.1	6.3	30.0	421.0	108.5	7.5	270.0	52.0
WIL (PC)*												
WIL (NC)*												
WIL (D)	311.0	2650.0	799.1	3.4	7.3	6.0	38.0	1150.0	250.9	5.9	30.5	20.4
WIL (D2)*												
WOL1	537.0	2420.0	1396.2	6.3	8.4	7.8	130.0	600.0	332.6	1.2	13.9	6.2
WOL2	1920.0	6740.0	2911.7	7.0	8.2	7.7	383.0	802.0	516.8	1.6	33.5	7.0

Notes: mg/L = micrograms per litre. mS/cm= micro Siemens per centimetre. NTU = nephelometric turbidity units. *Dry

Summary of 2019 Surface Water Monitoring Results

SW Monitoring Point	EC (µS/cm)			pH			SO4 (mg/L)			Turbidity (NTU)		
	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
CC1	432.0	697.0	564.5	7.3	9.1	8.2	56.0	102.0	79.0	663.0	2310.0	1486.5
CC2	3240.0	9910.0	7207.1	7.7	8.0	7.9	884.0	3760.0	2716.3	2.0	16.0	5.1
CC3	5850.0	5850.0	5850.0	7.9	7.9	7.9	2670.0	2670.0	2670.0	4.4	4.4	4.4
WIL (U)*	-	-	-	-	-	-	-	-	-	-	-	-
WIL (U2)	3840.0	5850.0	4428.3	3.6	6.3	4.2	287.0	578.0	400.3	0.9	45.0	11.2
WIL (PC)*	-	-	-	-	-	-	-	-	-	-	-	-
WIL (NC)*	-	-	-	-	-	-	-	-	-	-	-	-
WIL (D)	1440.0	6420.0	4192.9	4.0	7.4	6.7	521.0	1960.0	1273.3	9.7	95.2	44.4
WIL (D2)*	-	-	-	-	-	-	-	-	-	-	-	-
WOL1	1180.0	4780.0	2877.5	7.9	8.5	8.1	240.0	1510.0	752.5	0.8	5.2	3.3
WOL2	1690.0	5610.0	3545.8	7.0	8.2	7.5	311.0	808.0	641.4	1.7	43.7	16.1

Notes: mg/L = micrograms per litre. mS/cm= micro Siemens per centimetre. NTU = nephelometric turbidity units. *Dry

Summary of 2018 Surface Water Monitoring Results

SW Monitoring Point	EC (µS/cm)			pH			SO4 (mg/L)			Turbidity (NTU)		
	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
CC1	228.0	1280.0	491.7	6.70	7.60	7.23	19.0	384.0	84.2	20.0	5520.0	1321.9
CC2	364.0	7570.0	6262.4	7.60	8.10	7.92	67.0	3000.0	2379.7	1.4	499.0	57.1
CC3	40.0	40.0	40.0	7.80	7.80	7.80	4.0	4.0	4.0	141.0	141.0	141.0
WIL (U)	-	-	-	-	-	-	-	-	-	-	-	-
WIL (U2)	1790.0	4380.0	3441.8	3.50	7.40	6.03	80.0	446.0	58.5	5.1	159.0	58.5
WIL (PC)	-	-	-	-	-	-	-	-	-	-	-	-
WIL (NC)	239.0	383.0	319.1	6.70	7.50	7.28	41.0	100.0	66.3	0.4	2.8	1.4
WIL (D)	278.0	2020.0	669.7	5.20	8.00	6.92	20.0	553.0	134.7	1.3	288.0	44.3
WIL (D2)	236.0	569.0	386.3	4.20	7.80	6.84	33.0	204.0	80.9	1.6	396.0	104.3
WOL1	425.0	2150.0	1260.1	7.20	8.40	8.01	41.0	494.0	294.1	1.0	19.6	6.8
WOL2	1730.0	2850.0	2404.5	7.00	7.90	7.51	209.0	740.0	447.7	1.0	36.2	6.1

Summary of 2017 Surface Water Monitoring Results

SW Monitoring Point	EC (µS/cm)			pH			SO4 (mg/L)			Turbidity (NTU)		
	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
CC1	279.0	5380.0	2392.3	7.00	8.30	7.58	45.0	1790.0	787.0	4.4	1970.0	600.9
CC2	5470.0	8230.0	6306.0	7.70	8.30	7.99	1700.0	3170.0	2145.0	0.6	15.8	4.1
CC3	4100.0	4990.0	4520.0	8.30	8.50	8.40	1490.0	1920.0	1688.0	0.6	1.8	1.2
WIL (U)*	-	-	-	-	-	-	-	-	-	-	-	-
WIL (U2)	1360.0	3890.0	2851.7	5.40	8.00	6.58	13.0	121.0	20.9	2.4	70.8	20.9
WIL (PC)*	-	-	-	-	-	-	-	-	-	-	-	-
WIL (NC)	230.0	411.0	313.2	6.80	8.30	7.27	10.0	85.0	48.1	0.2	15.2	3.7
WIL (D)	248.0	1480.0	493.5	7.30	7.80	7.55	7.0	87.0	46.4	2.2	5.6	3.8
WIL (D2)	256.0	650.0	386.8	7.30	7.90	7.53	2.0	83.0	47.7	1.7	31.9	10.3
WOL1	336.0	1490.0	872.4	8.10	8.60	8.25	19.0	184.0	97.2	0.9	6.1	2.9
WOL2	1800.0	2950.0	2133.6	7.40	8.00	7.82	184.0	440.0	304.2	0.4	21.1	3.2

Notes: mg/L = micrograms per litre. mS/cm= micro Siemens per centimetre. NTU = nephelometric turbidity units. *Dry

Summary of 2016 Surface Water Monitoring Results

SW Monitoring Point	EC (µS/cm)			pH			SO_4 (mg/L)			Turbidity (NTU)		
	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
CC1	170.0	4470.0	2802.9	7.10	7.90	7.41	28.0	1710.0	978.9	4.6	6270.0	936.0
CC2	3020.0	7540.0	5036.3	7.50	8.00	7.84	920.0	2940.0	1738.8	0.5	26.4	5.0
CC3	80.0	4860.0	2771.7	7.40	8.40	8.18	8.0	1920.0	972.5	0.7	126.0	25.1
WIL (U)	520.0	950.0	632.0	6.20	7.40	6.94	13.0	83.0	36.8	5.8	43.5	21.2
WIL (U2)	440.0	4420.0	2140.0	6.50	7.60	7.04	14.0	102.0	34.8	3.3	153.0	34.8
WIL (PC)	260.0	1340.0	682.0	6.90	7.40	7.16	7.0	48.0	28.6	9.7	64.6	38.3
WIL (NC)	240.0	1650.0	560.8	7.10	7.80	7.39	8.0	265.0	64.5	8.6	201.0	54.2
WIL (D)	580.0	3030.0	1189.2	6.80	8.00	7.46	12.0	603.0	165.5	1.2	39.4	10.0
WIL (D2)	390.0	1840.0	796.1	6.90	8.10	7.50	9.0	466.0	159.1	3.9	323.0	43.8
WOL1	780.0	2220.0	1226.3	7.80	8.30	8.11	104.0	475.0	205.8	1.3	11.2	5.0
WOL2	740.0	3160.0	1693.3	7.20	8.00	7.56	97.0	650.0	303.1	0.9	70.7	15.3
SGC_1*	0	0	0	0	0	0	0	0	0	0	0	0

Notes: mg/L = micrograms per litre. mS/cm= micro Siemens per centimetre. NTU = nephelometric turbidity units. *Dry

Summary of 2015 Surface Water Monitoring Results

SW Monitoring Point	EC (µS/cm)			pH			SO_4 (mg/L)			Turbidity (NTU)		
	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
CC1	120.0	4380.0	2316.3	6.60	7.80	7.31	13.0	1660.0	237.7	3.3	13000.0	3415.4
CC2	350.0	5970.0	3591.4	7.30	7.90	7.67	1400.0	2290.0	1977.8	0.4	20.8	4.7
CC3	150.0	5130.0	2220.0	7.00	8.40	7.93	17.0	2100.0	946.0	1.2	359.0	93.7
WIL (U)	1650.0	7550.0	4306.7	4.80	6.80	5.93	38.0	146.0	99.0	7.4	263.0	77.0
WIL (U2)	790.0	5580.0	3353.8	5.60	7.40	6.71	22.0	118.0	41.9	1.5	158.0	41.9
WIL (PC)*	1170.0	6100.0	3256.3	6.80	7.90	7.23	3.0	42.0	16.0	1.8	222.0	90.4
WIL (NC)	410.0	3960.0	1987.1	6.60	7.80	7.31	4.0	106.0	43.0	1.2	1440.0	284.5
WIL (D)	340.0	5880.0	2713.0	7.10	8.10	7.67	29.0	607.0	253.2	2.6	363.0	63.1
WIL (D2)	500.0	6520.0	2457.5	7.50	8.20	7.73	16.0	693.0	148.4	7.5	557.0	113.2
WOL1	160.0	5540.0	2223.0	7.50	8.20	7.96	208.0	956.0	445.8	1.1	61.8	13.3
WOL2	400.0	5550.0	1830.0	7.30	7.80	7.54	262.0	822.0	532.8	0.6	486.0	53.9

Notes: mg/L = micrograms per litre. mS/cm= micro Siemens per centimetre. NTU = nephelometric turbidity units.

Summary of 2014 Surface Water Monitoring Results

SW Monitoring Point	EC (µS/cm)			pH			SO_4 (mg/L)			Turbidity (NTU)		
	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
CC1	610.0	5430.0	2055.7	7.10	9.20	8.00	120.0	1880.0	785.0	2.3	352.0	91.3
CC2	160.0	6590.0	4944.0	6.90	7.80	7.44	85.0	2520.0	1733.5	0.2	151.0	16.4
CC3	400.0	5260.0	3522.5	7.60	8.00	7.80	23.0	2100.0	1380.8	1.1	346.0	96.0
WIL (U)	980.0	1540.0	1260.0	6.00	7.10	6.55	70.0	174.0	122.0	3.2	30.0	16.6
WIL (U2)	1340.0	5970.0	2886.0	6.30	7.40	6.78	10.0	110.0	50.1	4.5	290.0	50.1
WIL (PC)	-	-	-	-	-	-	-	-	-	-	-	-
WIL (NC)	310.0	790.0	445.0	7.00	7.40	7.25	6.0	96.0	27.0	1.8	2410.0	664.4
WIL (D)	1520.0	6010.0	3728.3	6.90	8.40	7.68	205.0	1680.0	634.8	1.0	26.8	6.6
WIL (D2)	780.0	7550.0	3756.0	7.00	8.70	8.02	120.0	1670.0	932.4	0.8	42.7	11.7
WOL1	1870.0	3680.0	2582.5	7.00	8.90	8.13	434.0	1120.0	635.6	1.2	18.6	3.8
WOL2	1670.0	4060.0	2779.2	7.20	7.80	7.46	452.0	842.0	589.9	0.6	69.7	16.1

Notes: mg/L = micrograms per litre. mS/cm= micro Siemens per centimetre. NTU = nephelometric turbidity units. * Indicates no sample available during the schedule monitoring programme.

Summary of 2013 Surface Water Monitoring Results

SW Monitoring Point	EC (µS/cm)			pH			SO_4 (mg/L)			Turbidity (NTU)		
	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave	Min	Max	Ave
CC1	3150.0	5710.0	4568.5	6.9	8.2	7.9	828.0	3160.0	1647.0	0.4	1770	169.6
CC2	4380.0	6070.0	5040.0	7.4	8.1	7.7	1610.0	3110.0	2040.0	0.2	2.6	0.9
CC3	225.0	4890.0	3130.6	7.8	8.2	8.0	94.0	2270.0	1454.1	0.8	360.0	59.4
WIL (U)	448.0	1390.0	1065.0	6.5	7.0	6.8	7.0	63.0	38.1	1.5	74.5	26.5
WIL (U2)	413.0	4620.0	2165.5	6.3	7.6	6.7	4.0	89.0	47.4	6.1	473.0	62.8
WIL (PC)	395.0	1730.0	1158.0	6.7	7.1	6.9	31.0	186.0	93.8	5.2	148.0	47.6
WIL (NC)	340.0	930.0	510.0	7.4	7.9	7.7	5.0	140.0	59.6	2.2	4000	941.5
WIL (D)	1656.0	4200.0	2942.6	7.8	8.8	8.1	216.0	822.0	475.2	1.4	59.1	9.3
WIL (D2)	1500.0	4950.0	3051.6	7.8	8.1	7.9	217.0	1360.0	646.7	1.2	21.8	7.0
WOL1	1180.0	2710.0	1982.3	8.1	8.7	8.4	326.0	675.0	464.8	0.6	8.9	3.0
WOL2	1460.0	3150.0	2153.9	7.3	8.3	7.9	286.0	793.0	487.7	0.6	14.9	6.0

2023 Results for Surface Water Monitoring

a Sample Num	Sample Location	Sampling Date	Sampling Time	Acidity as CaCO3 mg/L	Aluminium mg/L	Arsenic mg/L	Barium mg/L	Bicarbonate Alkalinity as CaCO3 mg/L	Carbonate Alkalinity as CaCO3 mg/L	Conductivity @ 25oC µS/cm	Copper mg/L	Flow Rate	Hydroxide Alkalinity as CaCO3 mg/L	Iron mg/L	Lead mg/L	Manganese mg/L	Molybdenum mg/L	Nickel mg/L	pH pH Unit	Selenium mg/L	Strontium mg/L	Sulfate as SO4 -	Temperature °C	Total Alkalinity as CaCO3 mg/L	Turbidity NTU
ME2300 120001	CC_1	16-Jan-2023	1312									0													
ME2300 120002	CC_2	16-Jan-2023	1108	1	<0.01	0.001	0.038	285	<1	2210	0.001	1	<1	<0.05	<0.001	0.118	<0.001	0.003	7.9	<0.01	0.953	629	25	285	0.5
ME2300 120003	CC_3	16-Jan-2023	1045	<1	0.08	0.002	0.035	268	<1	1730	<0.001	1	<1	0.11	<0.001	0.322	<0.001	0.003	8.1	<0.01	0.71	506	25.5	268	2.4
ME2300 120004	WIL_U	16-Jan-2023	1403	<1	0.02	<0.001	0.074	269	<1	2230	<0.001	1	<1	1.04	<0.001	0.106	0.003	0.019	8	<0.01	0.641	655	27	269	9.2
ME2300 120005	WIL_U2	16-Jan-2023	1420	<1	<0.01	<0.001	0.071	272	<1	2240	<0.001	1	<1	0.61	<0.001	0.037	0.003	0.024	8.1	<0.01	0.643	649	28.5	272	5.5
ME2300 120006	WIL_NC	16-Jan-2023	1320	1	<0.01	<0.001	0.002	92	<1	448	<0.001	1	<1	<0.05	<0.001	0.021	0.002	0.012	7.6	<0.01	0.096	84	28.5	92	0.2
ME2300 120007	WIL_PC	16-Jan-2023	1345	2	0.88	0.004	0.109	303	<1	2300	<0.001	1	<1	1.9	<0.001	1.25	0.002	0.014	8	<0.01	0.676	571	29	303	31.4
ME2300 120008	WIL_D	16-Jan-2023	1227	<1	0.03	<0.001	0.057	198	<1	1810	<0.001	1	<1	0.33	<0.001	0.123	0.002	0.014	8.2	<0.01	0.547	478	29	198	3.1
ME2300 120009	WIL_D2	16-Jan-2023	1255	<1	0.01	<0.001	0.055	198	<1	1790	<0.001	1	<1	0.26	<0.001	0.051	0.002	0.013	8	<0.01	0.541	486	27.5	198	2.3
ME2300 120010	WOL_1	16-Jan-2023	1156	<1	0.05	<0.001	0.059	200	<1	1820	<0.001	1	<1	0.44	<0.001	0.176	0.002	0.014	8.1	<0.01	0.569	479	26.5	200	3.8
ME2300 120011	WOL_2	16-Jan-2023	1134	<1	0.05	<0.001	0.077	220	<1	1080	<0.001	1	<1	0.46	<0.001	0.07	0.001	0.001	8.1	<0.01	0.624	147	26.5	220	5.3
ME2300 120012	SGC_1	16-Jan-2023	1500																						
ME2300 331001	CC_1	15-Feb-2023	1330									0													
ME2300 331002	CC_2	15-Feb-2023	1035	3	<0.01	<0.001	0.035	327	<1	2450	<0.001	1	<1	<0.05	<0.001	0.129	<0.001	0.002	7.8	<0.01	0.988	718	21.5	327	0.6
ME2300 331003	CC_3	15-Feb-2023	959	2	0.11	<0.001	0.034	261	<1	1810	<0.001	1	<1	0.11	<0.001	0.152	<0.001	0.002	8.1	<0.01	0.718	533	23.5	261	2.2
ME2300 331004	WIL_U	15-Feb-2023	1416	6	0.02	<0.001	0.048	144	<1	892	<0.001	1	<1	3.71	<0.001	0.534	<0.001	0.008	7.2	<0.01	0.221	124	27	144	14.9
ME2300 331005	WIL_U2	15-Feb-2023	1440	5	0.01	<0.001	0.038	135	<1	754	<0.001	1	<1	2.82	<0.001	0.348	<0.001	0.008	7.4	<0.01	0.173	64	29.5	135	13.5
ME2300 331006	WIL_NC	15-Feb-2023	1343	6	<0.01	<0.001	0.001	88	<1	450	<0.001	1	<1	<0.05	<0.001	0.025	<0.001	0.007	7.3	<0.01	0.078	99	28.5	88	<0.1
ME2300 331007	WIL_PC	15-Feb-2023	1409									0													
ME2300 331008	WIL_D	15-Feb-2023	1234	2	0.1	<0.001	0.025	183	<1	1090	<0.001	1	<1	0.64	<0.001	0.064	0.001	0.005	8.1	<0.01	0.342	282	27.5	183	5
ME2300 331009	WIL_D2	15-Feb-2023	1309	2	0.09	<0.001	0.021	177	<1	1090	<0.001	1	<1	0.52	<0.001	0.079	0.002	0.004	7.9	<0.01	0.33	280	25.5	177	3.3
ME2300 331010	WOL_1	15-Feb-2023	1159	1	0.17	<0.001	0.034	194	<1	1200	<0.001	1	<1	0.82	<0.001	0.213	0.002	0.006	8.2	<0.01	0.381	303	26	194	6.2
ME2300 331011	WOL_2	15-Feb-2023	1129	1	0.05	<0.001	0.084	236	<1	1220	<0.001	1	<1	0.33	<0.001	0.131	<0.001	0.001	8	<0.01	0.667	200	25	236	3.7
ME2300 331012	SGC_1	15-Feb-2023	1500																						
ME2300 468001	CC_1	09-Mar-2023	1347									0													
ME2300 468002	CC_2	09-Mar-2023	1139	15	0.05	0.001	0.041	483	<1	2900	<0.001	0	<1	0.13	<0.001	2.16	<0.001	0.004	7.7	<0.01	1.18	701	18.5	483	1.1
ME2300 468003	CC_3	09-Mar-2023	1105	3	0.79	0.001	0.053	302	<1	2040	<0.001	1	<1	0.68	<0.001	0.255	<0.001	0.002	8.1	<0.01	0.763	528	19	302	31.8
ME2300 468004	WIL_U	09-Mar-2023	1455	7	0.03	<0.001	0.037	203	<1	942	<0.001	0	<1	2.85	<0.001	0.543	<0.001	0.007	7.3	<0.01	0.205	78	24.5	203	15.2
ME2300 468005	WIL_U2	09-Mar-2023	1510									0													
ME2300 468006	WIL_NC	09-Mar-2023	1404	3	<0.01	<0.001	0.001	72	<1	448	0.001	1	<1	<0.05	<0.001	0.026	<0.001	0.005	7.4	<0.01	0.079	93	26.5	72	<0.1
ME2300 468007	WIL_PC	09-Mar-2023	1434									0													
ME2300 468008	WIL_D	09-Mar-2023	1259	2	0.08	<0.001	0.022	190	<1	1030	<0.001	1	<1	0.61	<0.001	0.049	0.001	0.003	8	<0.01	0.279	207	22	190	7
ME2300 468009	WIL_D2	09-Mar-2023	1324	2	0.05	<0.001	0.017	159	<1	994	<0.001	1	<1	0.55	<0.001	0.082	0.001	0.004	8	<0.01	0.264	210	22.5	159	5.7
ME2300 468010	WOL_1	09-Mar-2023	1230	2	0.17	<0.001	0.028	181	<1	986	<0.001	1	<1	0.7	<0.001	0.098	0.001	0.003	8	<0.01	0.275	199	22	181	7.1
ME2300 468011	WOL_2	09-Mar-2023	1204	4	0.05	<0.001	0.103	288	<1	1550	<0.001	1	<1	0.25	<0.001	0.18	<0.001	0.001	8.1	<0.01	0.794	239	21	288	3

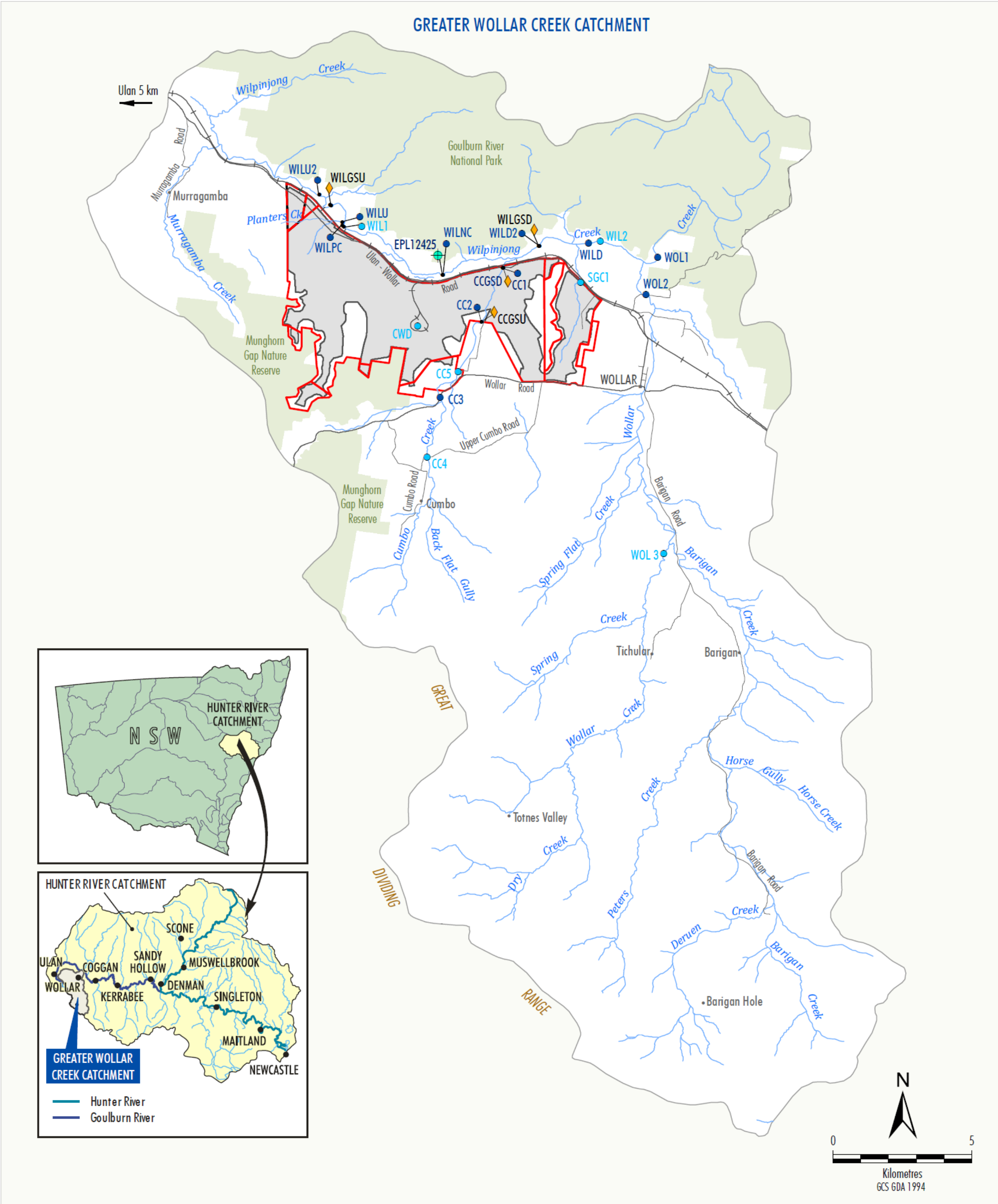
a Sample Num	Sample Location	Sampling Date	Sampling Time	Acidity as CaCO3 mg/L	Aluminium mg/L	Arsenic mg/L	Barium mg/L	Bicarbonate Alkalinity as CaCO3 mg/L	Carbonate Alkalinity as CaCO3 mg/L	Conductivity @ 25oC µS/cm	Copper mg/L	Flow Rate	Hydroxide Alkalinity as CaCO3 mg/L	Iron mg/L	Lead mg/L	Manganese mg/L	Molybdenum mg/L	Nickel mg/L	pH pH Unit	Selenium mg/L	Strontium mg/L	Sulfate as SO4 -	Temperature °C	Total Alkalinity as CaCO3 mg/L	Turbidity NTU
ME2300 468012	SGC_1	09-Mar-2023	1500																						
ME2300 671001	CC_1	11-Apr-2023	1235									0													
ME2300 671002	CC_2	11-Apr-2023	1009	2	<0.01	<0.001	0.066	277	<1	2940	<0.001	1	<1	<0.05	<0.001	0.138	<0.001	0.003	7.9	<0.01	1.28	843	12	277	0.4
ME2300 671003	CC_3	11-Apr-2023	939	8	0.2	<0.001	0.05	222	<1	2150	<0.001	1	<1	0.2	<0.001	0.08	<0.001	0.002	8.1	<0.01	0.852	580	13	222	2.6
ME2300 671004	WIL_U	11-Apr-2023	1425	4	0.03	<0.001	0.034	101	<1	852	<0.001	1	<1	3	<0.001	0.453	<0.001	0.016	7.1	<0.01	0.174	112	17	101	22.3
ME2300 671005	WIL_U2	11-Apr-2023	1445									0													
ME2300 671006	WIL_NC	11-Apr-2023	1249									0													
ME2300 671007	WIL_PC	11-Apr-2023	1419									0													
ME2300 671008	WIL_D	11-Apr-2023	1140	3	0.04	<0.001	0.039	172	<1	1600	<0.001	1	<1	0.42	<0.001	0.111	<0.001	0.005	7.9	<0.01	0.517	416	19	172	4.6
ME2300 671009	WIL_D2	11-Apr-2023	1215	2	0.02	<0.001	0.022	149	<1	1350	<0.001	1	<1	0.29	<0.001	0.069	<0.001	0.003	8	<0.01	0.391	355	16.5	149	2.7
ME2300 671010	WOL_1	11-Apr-2023	1104	2	0.05	<0.001	0.039	172	<1	1650	<0.001	1	<1	0.44	<0.001	0.09	<0.001	0.004	8.1	<0.01	0.524	438	15.5	172	4.1
ME2300 671011	WOL_2	11-Apr-2023	1040	<1	0.05	<0.001	0.075	216	<1	1200	<0.001	1	<1	0.69	<0.001	0.22	<0.001	<0.001	8.1	<0.01	0.522	176	14	216	6.4
ME2300 671012	SGC_1	11-Apr-2023	1500																						
ME2300 915001	CC_1	17-May-2023	1412									0													
ME2300 915002	CC_2	17-May-2023	1206	8	0.1	<0.001	0.069	299	<1	2800	<0.001	1	<1	0.06	<0.001	0.238	<0.001	0.002	8.2	<0.01	1.16	889	13.5	299	7
ME2300 915003	CC_3	17-May-2023	1126	2	0.05	<0.001	0.051	232	<1	2060	<0.001	1	<1	0.06	<0.001	0.093	<0.001	0.002	8.4	<0.01	0.799	658	13.5	232	1.7
ME2300 915004	WIL_U	17-May-2023	1443									0													
ME2300 915005	WIL_U2	18-May-2023	1041	6	0.02	<0.001	0.031	118	<1	738	<0.001	1	<1	1.38	<0.001	0.327	<0.001	0.005	8.2	<0.01	0.161	41	10	118	8.2
ME2300 915006	WIL_NC	17-May-2023	1421									0													
ME2300 915007	WIL_PC	17-May-2023	1437									0													
ME2300 915008	WIL_D	17-May-2023	1335	1	0.04	<0.001	0.026	178	<1	1310	<0.001	1	<1	0.38	<0.001	0.026	<0.001	0.002	8.3	<0.01	0.472	390	14	178	3.4
ME2300 915009	WIL_D2	17-May-2023	1403	2	0.03	<0.001	0.021	167	<1	1240	<0.001	1	<1	0.31	<0.001	0.036	<0.001	0.002	8.3	<0.01	0.44	382	13	167	3.2
ME2300 915010	WOL_1	17-May-2023	1312	2	0.06	<0.001	0.03	179	<1	1290	<0.001	1	<1	0.53	<0.001	0.066	<0.001	0.003	8.6	<0.01	0.474	388	13	179	5.2
ME2300 915011	WOL_2	17-May-2023	1235	1	0.08	<0.001	0.089	214	<1	1280	<0.001	1	<1	0.66	<0.001	0.191	<0.001	<0.001	8.6	<0.01	0.666	261	14	214	8.7
ME2300 915012	SGC_1	17-May-2023	1500																						
ME2301 015001	CC_1	02-Jun-2023	1300									0													
ME2301 015002	CC_2	02-Jun-2023	1038	14	0.01	<0.001	0.064	310	<1	2750	0.001	1	<1	<0.05	<0.001	0.112	<0.001	0.002	8.2	<0.01	1.17	912	10.5	310	1
ME2301 015003	CC_3	02-Jun-2023	1015	<1	0.04	<0.001	0.053	231	4	2120	<0.001	1	<1	<0.05	<0.001	0.075	<0.001	0.001	8.5	<0.01	0.867	778	10	235	1.5
ME2301 015004	WIL_U	02-Jun-2023	1328									0													
ME2301 015005	WIL_U2	02-Jun-2023	1335	15	0.04	<0.001	0.035	113	<1	761	<0.001	1	<1	2.12	<0.001	0.433	<0.001	0.005	7	<0.01	0.176	46	16	113	11.2
ME2301 015006	WIL_NC	02-Jun-2023	1307									0													
ME2301 015007	WIL_PC	02-Jun-2023	1318									0													
ME2301 015008	WIL_D	02-Jun-2023	1220	7	0.07	<0.001	0.026	206	<1	1300	<0.001	1	<1	0.36	<0.001	0.035	<0.001	0.003	8.4	<0.01	0.49	372	13	206	3.9
ME2301 015009	WIL_D2	02-Jun-2023	1244	6	0.04	<0.001	0.021	177	<1	1220	<0.001	1	<1	0.29	<0.001	0.031	<0.001	0.002	8.3	<0.01	0.448	356	13	177	2.6
ME2301 015010	WOL_1	02-Jun-2023	1146	5	0.07	<0.001	0.03	189	<1	1280	<0.001	1	<1	0.43	<0.001	0.061	<0.001	0.003	8.1	<0.01	0.488	382	13	189	4.6
ME2301 015011	WOL_2	02-Jun-2023	1118	<1	0.03	<0.001	0.088	209	5	1230	<0.001	1	<1	0.4	<0.001	0.131	<0.001	0.001	8.4	<0.01	0.691	245	11.5	214	4.7

a Sample Num	Sample Location	Sampling Date	Sampling Time	Acidity as CaCO3 mg/L	Aluminium mg/L	Arsenic mg/L	Barium mg/L	Bicarbonate Alkalinity as CaCO3 mg/L	Carbonate Alkalinity as CaCO3 mg/L	Conductivity @ 25oC µS/cm	Copper mg/L	Flow Rate	Hydroxide Alkalinity as CaCO3 mg/L	Iron mg/L	Lead mg/L	Manganese mg/L	Molybdenum mg/L	Nickel mg/L	pH pH Unit	Selenium mg/L	Strontium mg/L	Sulfate as SO4 - mg/L	Temperature °C	Total Alkalinity as CaCO3 mg/L	Turbidity NTU
ME2301 015012	SGC_1	02-Jun-2023	1500																						
ME2301 216001	CC_1	04-Jul-2023	1023									0													
ME2301 216002	CC_2	04-Jul-2023	1245	7	0.05	<0.001	0.061	249	<1	2870	<0.001	1	<1	<0.05	<0.001	0.304	<0.001	0.002	8	<0.01	1.2	891	11.5	249	1.9
ME2301 216003	CC_3	04-Jul-2023	1305	2	0.17	<0.001	0.046	198	<1	2130	<0.001	1	<1	0.15	<0.001	0.103	<0.001	0.001	8.2	<0.01	0.83	671	11.5	198	3.5
ME2301 216004	WIL_U	04-Jul-2023	1003									1													
ME2301 216005	WIL_U2	04-Jul-2023	942									0													
ME2301 216006	WIL_NC	04-Jul-2023	1018									0													
ME2301 216007	WIL_PC	04-Jul-2023	952									0													
ME2301 216008	WIL_D	04-Jul-2023	1108	1	0.11	<0.001	0.021	156	<1	1170	<0.001	1	<1	0.45	<0.001	0.06	<0.001	0.002	8	<0.01	0.383	319	10.5	156	7.2
ME2301 216009	WIL_D2	04-Jul-2023	1042	2	0.05	<0.001	0.021	162	<1	1230	<0.001	1	<1	0.33	<0.001	0.043	<0.001	0.002	7.8	<0.01	0.408	339	11	162	3.3
ME2301 216010	WOL_1	04-Jul-2023	1153	1	0.08	<0.001	0.023	156	<1	1180	<0.001	1	<1	0.43	<0.001	0.074	<0.001	0.002	8.1	<0.01	0.393	327	11	156	5.7
ME2301 216011	WOL_2	04-Jul-2023	1129	2	0.05	<0.001	0.079	177	<1	1170	<0.001	1	<1	0.48	<0.001	0.132	<0.001	<0.001	8	<0.01	0.597	208	10	177	6.6
ME2301 216012	SGC_1	04-Jul-2023	1500																						
ME2301 407001	CC_1	08-Aug-2023	1258	12	<0.01	<0.001	0.053	399	<1	3410	<0.001	0	<1	0.21	<0.001	0.086	<0.001	0.002	7.9	<0.01	1.74	966	13	399	1.5
ME2301 407002	CC_2	08-Aug-2023	1448	6	0.18	0.001	0.062	325	<1	2950	<0.001	1	<1	0.11	<0.001	0.777	0.001	0.004	8.2	<0.01	1.4	788	17.5	325	2.8
ME2301 407003	CC_3	08-Aug-2023	1511	<1	0.06	<0.001	0.042	259	11	2310	<0.001	1	<1	0.06	<0.001	0.143	<0.001	0.002	8.6	<0.01	0.959	662	16	270	1
ME2301 407004	WIL_U	08-Aug-2023	1040	17	0.2	0.003	0.054	81	<1	737	<0.001	0	<1	14.5	<0.001	0.852	<0.001	0.004	7.1	<0.01	0.146	51	11	81	116
ME2301 407005	WIL_U2	08-Aug-2023	957	39	0.01	<0.001	0.065	107	<1	1100	<0.001	1	<1	26.1	<0.001	2.1	<0.001	0.004	6.8	<0.01	0.258	46	12	107	76.2
ME2301 407006	WIL_NC	08-Aug-2023	1101									0													
ME2301 407007	WIL_PC	08-Aug-2023	1017									0													
ME2301 407008	WIL_D	08-Aug-2023	1233	2	0.17	<0.001	0.019	189	<1	1070	<0.001	1	<1	0.63	<0.001	0.059	<0.001	0.002	8.3	<0.01	0.341	272	13.5	189	3.6
ME2301 407009	WIL_D2	08-Aug-2023	1146	2	0.08	<0.001	0.017	172	<1	1080	<0.001	1	<1	0.45	<0.001	0.031	<0.001	0.002	8.3	<0.01	0.346	267	12	172	2.5
ME2301 407010	WOL_1	08-Aug-2023	1347	1	0.11	<0.001	0.021	178	<1	1060	<0.001	1	<1	0.49	<0.001	0.067	<0.001	0.002	8.3	<0.01	0.327	267	13.5	178	3.8
ME2301 407011	WOL_2	08-Aug-2023	1318	2	0.07	<0.001	0.09	201	<1	1280	<0.001	1	<1	0.64	<0.001	0.214	<0.001	<0.001	8.4	<0.01	0.659	233	13.5	201	4.6
ME2301 407012	SGC_1	08-Aug-2023	1500																						
ME2301 602001	CC_1	05-Sep-2023	1246	13	<0.01	<0.001	0.049	387	<1	3480	<0.001	1	<1	0.23	<0.001	0.144	<0.001	0.003	7.9	<0.01	1.6	1310	15.5	387	1.8
ME2301 602002	CC_2	07-Sep-2023	1040	5	0.04	0.001	0.056	368	<1	2920	<0.001	1	<1	<0.05	<0.001	1.63	<0.001	0.004	8.1	<0.01	1.25	900	13.5	368	2.1
ME2301 602003	CC_3	07-Sep-2023	954	2	0.59	<0.001	0.038	284	<1	2430	<0.001	1	<1	0.42	<0.001	0.392	<0.001	0.003	8.1	<0.01	0.984	744	13.5	284	16.6
ME2301 602004	WIL_U	05-Sep-2023	1158	16	0.08	0.003	0.049	82	<1	800	<0.001	1	<1	12	<0.001	0.752	<0.001	0.004	6.9	<0.01	0.142	48	14	82	80.6
ME2301 602005	WIL_U2	05-Sep-2023	1122	20	<0.01	<0.001	0.052	112	<1	883	<0.001	1	<1	9.73	<0.001	2.4	<0.001	0.006	6.7	<0.01	0.198	28	17	112	63.3
ME2301 602006	WIL_NC	05-Sep-2023	1226									0													
ME2301 602007	WIL_PC	05-Sep-2023	1148									0													
ME2301 602008	WIL_D	05-Sep-2023	1441	2	0.22	<0.001	0.019	160	<1	1040	<0.001	1	<1	0.63	<0.001	0.061	<0.001	0.003	8.2	<0.01	0.313	254	19	160	8.8
ME2301 602009	WIL_D2	05-Sep-2023	1358	2	0.07	<0.001	0.017	162	<1	1090	<0.001	1	<1	0.42	<0.001	0.028	<0.001	0.002	8	<0.01	0.324	266	18	162	3.6
ME2301 602010	WOL_1	05-Sep-2023	1532	1	0.13	<0.001	0.021	166	<1	1050	<0.001	1	<1	0.55	<0.001	0.09	<0.001	0.003	8.2	<0.01	0.319	252	16	166	7.2
ME2301 602011	WOL_2	05-Sep-2023	1504	2	0.1	<0.001	0.092	200	<1	1290	<0.001	1	<1	0.72	<0.001	0.309	<0.001	0.002	8.2	<0.01	0.652	216	18.5	200	11.1

a Sample Num	Sample Location	Sampling Date	Sampling Time	Acidity as CaCO3 mg/L	Aluminium mg/L	Arsenic mg/L	Barium mg/L	Bicarbonate Alkalinity as CaCO3 mg/L	Carbonate Alkalinity as CaCO3 mg/L	Conductivity @ 25oC µS/cm	Copper mg/L	Flow Rate	Hydroxide Alkalinity as CaCO3 mg/L	Iron mg/L	Lead mg/L	Manganese mg/L	Molybdenum mg/L	Nickel mg/L	pH pH Unit	Selenium mg/L	Strontium mg/L	Sulfate as SO4 -	Temperature °C	Total Alkalinity as CaCO3 mg/L	Turbidity NTU
ME2301 602012	SGC_1	05-Sep-2023	1500																						
ME2301 806001	CC_1	05-Oct-2023	1000	18	0.07	0.001	0.069	362	<1	4090	<0.001	1	<1	0.52	<0.001	0.416	0.001	0.006	7.6	<0.01	2.16	1580	12.5	362	6.2
ME2301 806002	CC_2	05-Oct-2023	1250	11	0.81	0.002	0.126	273	<1	3980	0.003	1	<1	1.08	<0.001	3.1	0.002	0.008	8	<0.01	1.79	1610	18	273	55.7
ME2301 806003	CC_3	05-Oct-2023	1315	24	0.53	0.002	0.055	147	<1	2450	<0.001	1	<1	0.61	<0.001	1.84	0.001	0.006	8	<0.01	1.06	860	17	147	30.8
ME2301 806004	WIL_U	05-Oct-2023	925									0													
ME2301 806005	WIL_U2	05-Oct-2023	850	20	0.13	<0.001	0.075	126	<1	914	<0.001	1	<1	13	<0.001	4.35	<0.001	0.013	7	<0.01	0.224	38	12	126	55.6
ME2301 806006	WIL_NC	05-Oct-2023	940																						
ME2301 806007	WIL_PC	05-Oct-2023	928									0													
ME2301 806008	WIL_D	05-Oct-2023	1114	6	0.25	<0.001	0.036	168	<1	1280	<0.001	1	<1	0.85	<0.001	0.206	<0.001	0.006	8	<0.01	0.427	337	14	168	9.7
ME2301 806009	WIL_D2	05-Oct-2023	1046	5	0.15	<0.001	0.03	203	<1	1560	0.002	1	<1	0.67	<0.001	0.107	<0.001	0.006	8	<0.01	0.564	426	14	203	5.4
ME2301 806010	WOL_1	05-Oct-2023	1140	3	0.52	<0.001	0.025	141	<1	829	0.001	1	<1	1.08	<0.001	0.174	<0.001	0.004	8.1	<0.01	0.227	179	15	141	36.2
ME2301 806011	WOL_2	05-Oct-2023	1204	5	0.2	<0.001	0.111	230	<1	1510	<0.001	1	<1	1.11	<0.001	0.516	<0.001	0.002	8.1	<0.01	0.801	279	16	230	12
ME2301 806012	SGC_1	05-Oct-2023	1500																						
ME2302 015001	CC_1	06-Nov-2023	1150	11	0.34	<0.001	0.042	160	<1	2220	<0.001	1	<1	0.51	<0.001	0.245	<0.001	0.004	7.6	<0.01	0.978	630	19.5	160	8.5
ME2302 015002	CC_2	06-Nov-2023	1545	8	0.25	<0.001	0.1	205	<1	2490	<0.001	1	<1	0.24	<0.001	2.03	0.001	0.006	7.7	<0.01	1.11	740	27	205	7
ME2302 015003	CC_3	06-Nov-2023	1614	6	0.34	<0.001	0.087	139	<1	1920	<0.001	1	<1	0.3	<0.001	1.79	0.001	0.004	7.9	<0.01	0.791	875	27.5	139	11.6
ME2302 015004	WIL_U	06-Nov-2023	1105									0													
ME2302 015005	WIL_U2	06-Nov-2023	1015	9	0.04	<0.001	0.053	185	<1	1320	<0.001	0	<1	7.88	<0.001	1.9	<0.001	0.006	7.1	<0.01	0.33	33	20	185	35.8
ME2302 015006	WIL_NC	06-Nov-2023	1136																						
ME2302 015007	WIL_PC	06-Nov-2023	1111									0													
ME2302 015008	WIL_D	06-Nov-2023	1347	6	0.49	<0.001	0.052	141	<1	1890	<0.001	1	<1	1.17	<0.001	0.378	<0.001	0.007	7.6	<0.01	0.785	778	22.5	141	22
ME2302 015009	WIL_D2	06-Nov-2023	1310	5	0.39	<0.001	0.03	149	<1	1620	<0.001	1	<1	0.74	<0.001	0.136	<0.001	0.004	7.8	<0.01	0.636	588	20.5	149	15.1
ME2302 015010	WOL_1	06-Nov-2023	1445	6	0.48	<0.001	0.053	117	<1	1740	<0.001	1	<1	0.98	<0.001	0.406	<0.001	0.008	7.8	<0.01	0.72	742	19.5	117	29.3
ME2302 015011	WOL_2	06-Nov-2023	1412	3	0.21	<0.001	0.108	195	<1	1500	<0.001	1	<1	0.74	<0.001	0.297	<0.001	0.001	8.1	<0.01	0.752	307	23	195	8.6
ME2302 015012	SGC_1	06-Nov-2023	1500																						
ME2302 204001	CC_1	06-Dec-2023	1114	23	1.55	0.005	0.119	661	<1	4280	<0.001	1	<1	5.17	0.002	7.7	<0.001	0.011	7.7	<0.01	2.07	1470	24	661	66.9
ME2302 204002	CC_2	06-Dec-2023	1345									0													
ME2302 204003	CC_3	06-Dec-2023	1358									0													
ME2302 204004	WIL_U	06-Dec-2023	1028									0													
ME2302 204005	WIL_U2	06-Dec-2023	948	6	0.02	<0.001	0.05	175	<1	1230	<0.001	0	<1	2.95	<0.001	0.85	<0.001	0.007	7.3	<0.01	0.332	37	25.5	175	23.3
ME2302 204006	WIL_NC	06-Dec-2023	1050																						
ME2302 204007	WIL_PC	06-Dec-2023	1032									0													
ME2302 204008	WIL_D	06-Dec-2023	1228	2	0.16	<0.001	0.015	124	<1	638	<0.001	1	<1	1.14	<0.001	0.06	<0.001	0.002	7.8	<0.01	0.167	97	27.5	124	16.9
ME2302 204009	WIL_D2	06-Dec-2023	1148	2	0.06	<0.001	0.011	125	<1	682	<0.001	1	<1	0.76	<0.001	0.043	<0.001	0.002	7.9	<0.01	0.18	127	25	125	4.2
ME2302 204010	WOL_1	06-Dec-2023	1256	2	0.15	<0.001	0.019	136	<1	718	<0.001	1	<1	0.78	<0.001	0.065	<0.001	0.003	8.2	<0.01	0.196	129	29.5	136	11.2
ME2302 204011	WOL_2	06-Dec-2023	1321	3	0.08	0.001	0.101	286	9	1540	<0.001	1	<1	0.61	<0.001	0.439	<0.001	0.002	8	<0.01	0.861	238	29	295	4.9

a Sample Num	Sample Location	Sampling Date	Sampling Time	Acidity as CaCO3 mg/L	Aluminium mg/L	Arsenic mg/L	Barium mg/L	Bicarbonate Alkalinity as CaCO3 mg/L	Carbonate Alkalinity as CaCO3 mg/L	Conductivity @ 25oC µS/cm	Copper mg/L	Flow Rate	Hydroxide Alkalinity as CaCO3 mg/L	Iron mg/L	Lead mg/L	Manganese mg/L	Molybdenum mg/L	Nickel mg/L	pH pH Unit	Selenium mg/L	Strontium mg/L	Sulfate as SO4 -	Temperature °C	Total Alkalinity as CaCO3 mg/L	Turbidity NTU
ME2302 204012	SGC_1	06-Dec-2023	1500																						

Surface Water Monitoring Locations



LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- Approved/Existing Open Cut and Contained Infrastructure Area #

WCPL Monitoring

- WCPL Gauging Station
- EPL 12425 Licensed and Monitoring Point
- Active Surface Water Monitoring Site
- Historical Surface Water Monitoring Site

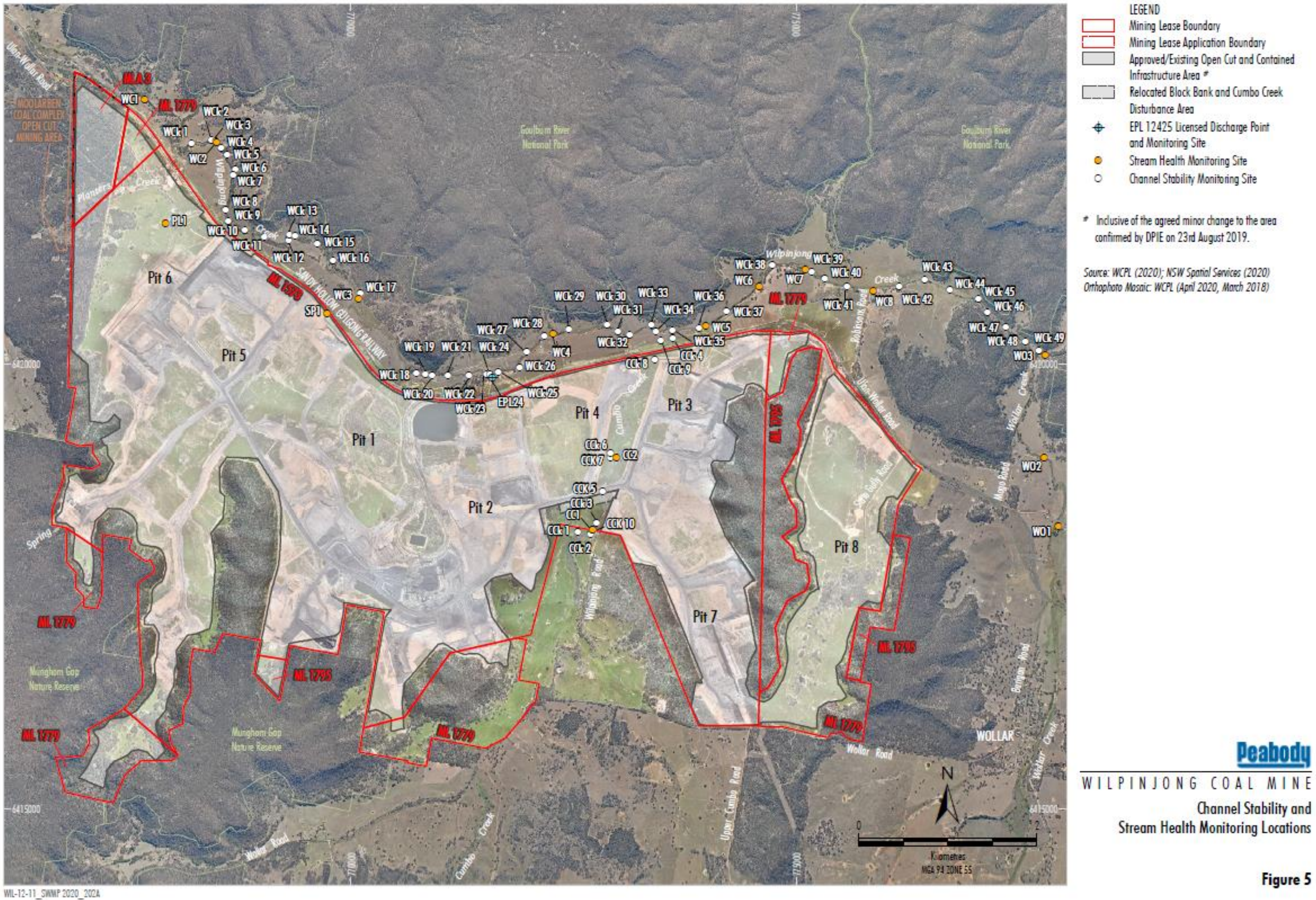
Inclusive of the agreed minor change to the area confirmed by DPIE on 23rd August 2019.

Source: WCPL (2020); After DIPNR (2003); DPI Water (2015); NSW Spatial Services (2020)

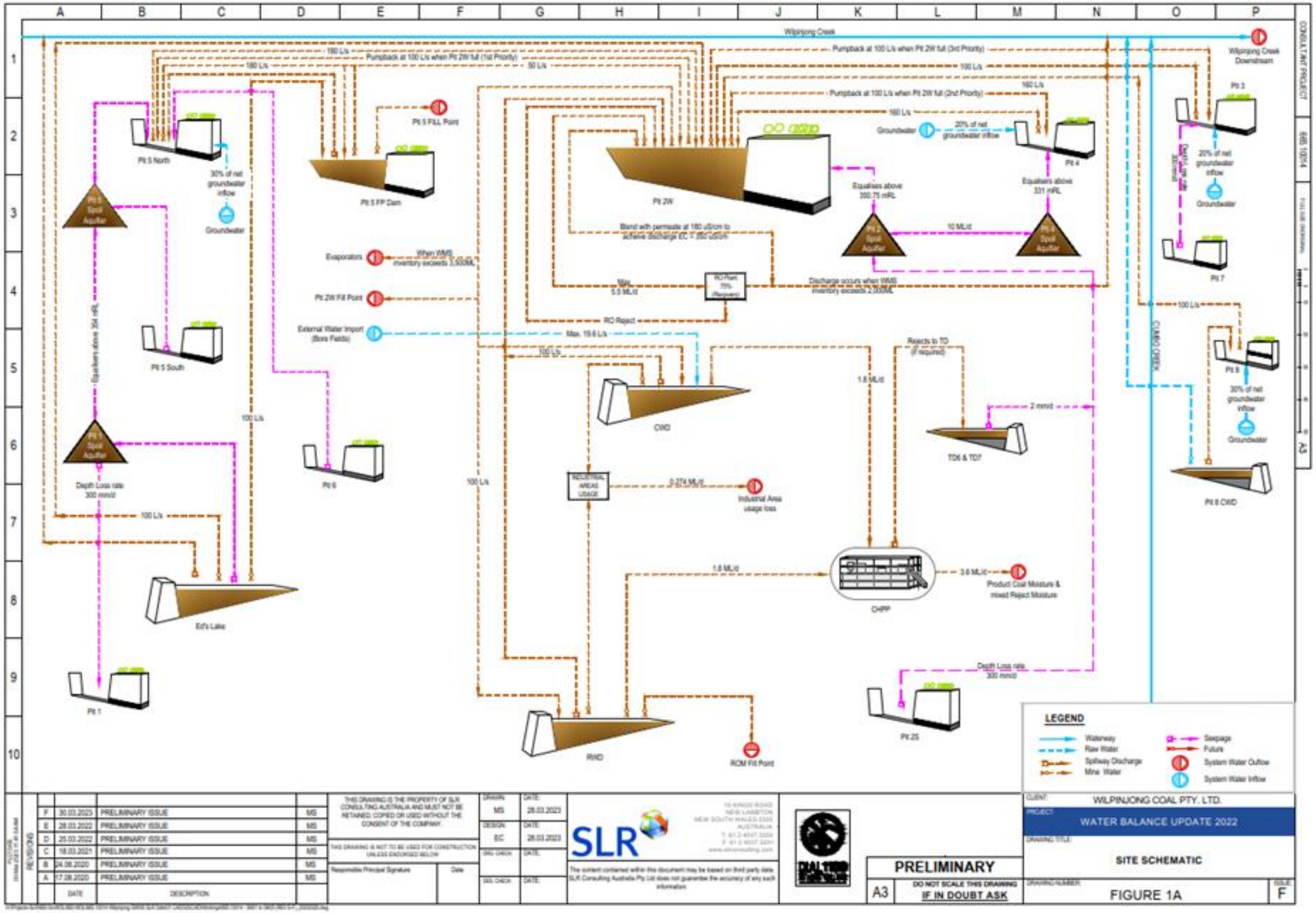
WILPINJONG COAL MINE

Wilpinjong Coal Mine
Surface Water Monitoring Network

Channel Stability & Stream Health Monitoring Locations



Water Balance Model Schematic



Water Management Performance Measures

A summary of the water management performance measures was undertaken by WCPL as they related to the Development Consent SSD-6764 (1 January 2023 to 31 December 2023)

Assessment of Water Management Performance Measures for 2023

Feature	Performance Measure	Complied with Performance Measure (Yes/No)	Comments/Actions
General	Maintain separation between clean, dirty and mine water management systems. Minimise the use of clean water on site. Design, install, operation and maintain water management systems in a proper and efficient manager.	Yes	Refer to Site Water Balance (Section 7.7) Refer to Estimate Groundwater Take (Section 7.2) Refer to Surface Water Results (Section 7.6)
Clean water diversion and storage infrastructure	Maximise as far as reasonable and feasible the diversion of clean water around disturbed areas on site.	Yes	Refer to Erosion and Sediment Control (Section 7.5)
Sediment dams	Design, install and/or maintain sediment dams to ensure no discharges to surface waters, except in accordance with an EPL or in accordance with Section 120 of the POEO Act.	Yes	Refer to Erosion and Sediment Control (Section 7.5) Refer to Water Treatment Facility (Section 7.8)
Mine water storages	Design, install and/or maintain mine water storage infrastructure to ensure no discharge of untreated mine water off-site. Discharge treated mine water in accordance with an EPL or in accordance with Section 120 of the POEO Act.	No*	Refer to Site Water Balance (Section 7.7) Refer to Surface Water Results (Section 7.6) Refer to Water Treatment Facility (Section 7.8) * Refer to Section 11.1
Wilpinjong, Cumbo and Wollar Creeks	No greater impact than predicted for the development for water flow and quality.	Yes	Refer to Surface Water Results (Section 7.6) Refer to Stream Health (Section 7.9)
Aquatic, riparian and groundwater dependent ecosystems	Negligible environmental consequences beyond those predicted for the development.	Yes	Refer to Surface Water Results (Section 7.6) Refer to Stream Health (Section 7.9)
Flood mitigation measures*	Ensure all open cut pits, CHPP, coal stockpiles and main mine facilities areas exclude flows for all flood events up to and including the 1 in 100 year ARI. All final voids designed to exclude all flood events up to include the PMF event.	Yes	The Wilpinjong Coal Mine open cuts are located outside the extent of flooding from Wilpinjong Creek in the 1 in 1,000 AEP design flood. Flood mitigation works for open cut infrastructure in the vicinity of Cumbo Creek are already being implemented at the Wilpinjong Coal Mine and have been designed to a 1 in 100 AEP flood protection (WRM Water and Environment, 2015).
Overburden, CHPP Reject and Tailings	Design, install and maintain emplacements to prevent or minimise the migration of pollutants due to seepage.	Yes	Waste rock emplacements and coal reject management in accordance with the MOP
Chemical and hydrocarbon storage	Chemical and hydrocarbon products to be stored in bunded areas or structures in accordance with relevant Australian Standards.	No	Chemical and hydrocarbon products stored in bunded areas in accordance with relevant Australian Standards (refer to IEA 2021)

Notes: * Consistent with Condition 29, Schedule 3 of Development Consent (SSD-6764), WCPL have maintained all open cut pits, CHPP, coal stockpiles and main mine facilities areas so that they exclude flows for all flood events up to and including the 1 in 100 year ARI. The final voids would be designed to exclude all flood events up to the probable maximum flood.

Surface Water Reports 2023

Wilpinjong Coal Mine

Annual Review 2023 – Surface Water Compliance

Wilpinjong Coal Pty Ltd

1434 Ulan-Wollar Road WILPINJONG, NSW, 2850

Prepared by:

SLR Consulting Australia

Level 1, The Central Building, UoW Innovation Campus, North Wollongong NSW 2500, Australia

SLR Project No.: 665.v10014.02010

28 March 2024

Revision: 2.0

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
2.0	28 March 2024	E Watts	A Skorulis, A Basson	A Basson
1.0	25 March 2024	E Watts	A Skorulis, A Basson	A Basson

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Wilpinjong Coal Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

Executive Summary

This report documents the analysis and data considered for the review of flow and water quality trends at Wilpinjong Creek, Wollar Creek and Cumbo Creek near the Wilpinjong Coal Mine (WCM) to fulfil the surface water reporting requirements for the WCM 2023 Annual Review. The report is presented in three sections:

1. An overview of the volume and quality of discharge from the site under EPL 12425 including:
    - Previously approved operational discharge from EPL Point 24 and EPL Point 30; and
    - The approved discharge of excess mine water (EMW) under emergency provisions to watercourses adjacent to WCM on 1 January 2023 only.
2. Analysis of flow and quality data from the Wilpinjong Creek and Cumbo Creek gauging stations, considering long-term rainfall trends, and licenced discharge from WCM.
3. Assessment of electrical conductivity (EC), pH, and turbidity observations at Wilpinjong, Cumbo and Wollar Creeks during 2023 in respect to baseline data (pre-mining as defined in the Surface Water Management Plan (SWMP)) as well as Water Quality Impact Assessment Criteria for downstream monitoring sites within Cumbo and Wilpinjong Creeks, as defined in the current SWMP.

Discharge under EPL12425 from EPL Point 24 (the RO Plant) and EPL Point 30 (Pit 8 Clean Water Diversion (CWD) Dam) occurred within the stipulated discharge limits throughout 2023. It is noted that discharge from EPL Point 30 only occurred on 1 January 2023 as part of emergency provisions.

Analysis of continuous data at the WCM gauging stations in 2023 indicated generally low flow conditions at Cumbo Creek and Wilpinjong Creek gauging sites in response to below average rainfall throughout 2023. Reviews assessing the influence of EMW discharge in late 2022 and on 1 January 2023, have shown resultant water quality observations are within the natural variation ranges, and that any influence was observed to be local and short-term.

Within the reporting period, two Wilpinjong Creek downstream monitoring locations (WIL-D and WIL-D2) recorded exceedances of water quality monitoring criteria (pH upper limit). It is noted that the pH observations exceeding the upper trigger level for downstream Wilpinjong Creek may be within the normal range for pH at these locations. The 80th percentile pH from baseline data for these downstream sites is pH 7.9, which is above the established trigger level of pH 7.7.

It is recommended that further studies are undertaken to confirm an appropriate updated trigger level at the downstream Wilpinjong Creek locations. These studies would involve additional analysis of flow volumes and water chemistry of Wilpinjong Creek, Cumbo Creek, neighbouring catchments, and mine water storages, as well as a review of the potential impacts of a raised pH trigger level by a suitably qualified aquatic ecologist.

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Tables in Text

Figures in Text

Acronyms and Abbreviations

µS/cm	Micro-Siemens per centimetre
mg/L	milligrams per litre
pH	pH unit
ML	megalitres
NTU	Nephelometric Turbidity Units
WCM	Wilpinjong Coal Mine
MC	Moolarben Coal
SWMP	Surface Water Management Plan
EPL	Environmental Protection Licence
LDP	Licenced Discharge Points
RO	Reverse Osmosis
EMW	Excess Mine Water
BOM	Bureau of Meteorology
TSS	Total Suspended Solids

1.0 Introduction

1.1 Background

This report contains the analysis and information required for the 2023 Annual Review of flow and water quality trends at Wilpinjong Creek, Wollar Creek and Cumbo Creek near Wilpinjong Coal Mine (WCM). It serves as a supplementary document to the review of hydrogeological data conducted by SLR Consulting Pty Ltd (SLR) for the 2023 Groundwater Annual Review and 2022-23 Water Year Licensing Audit. This report presents information on the following items:

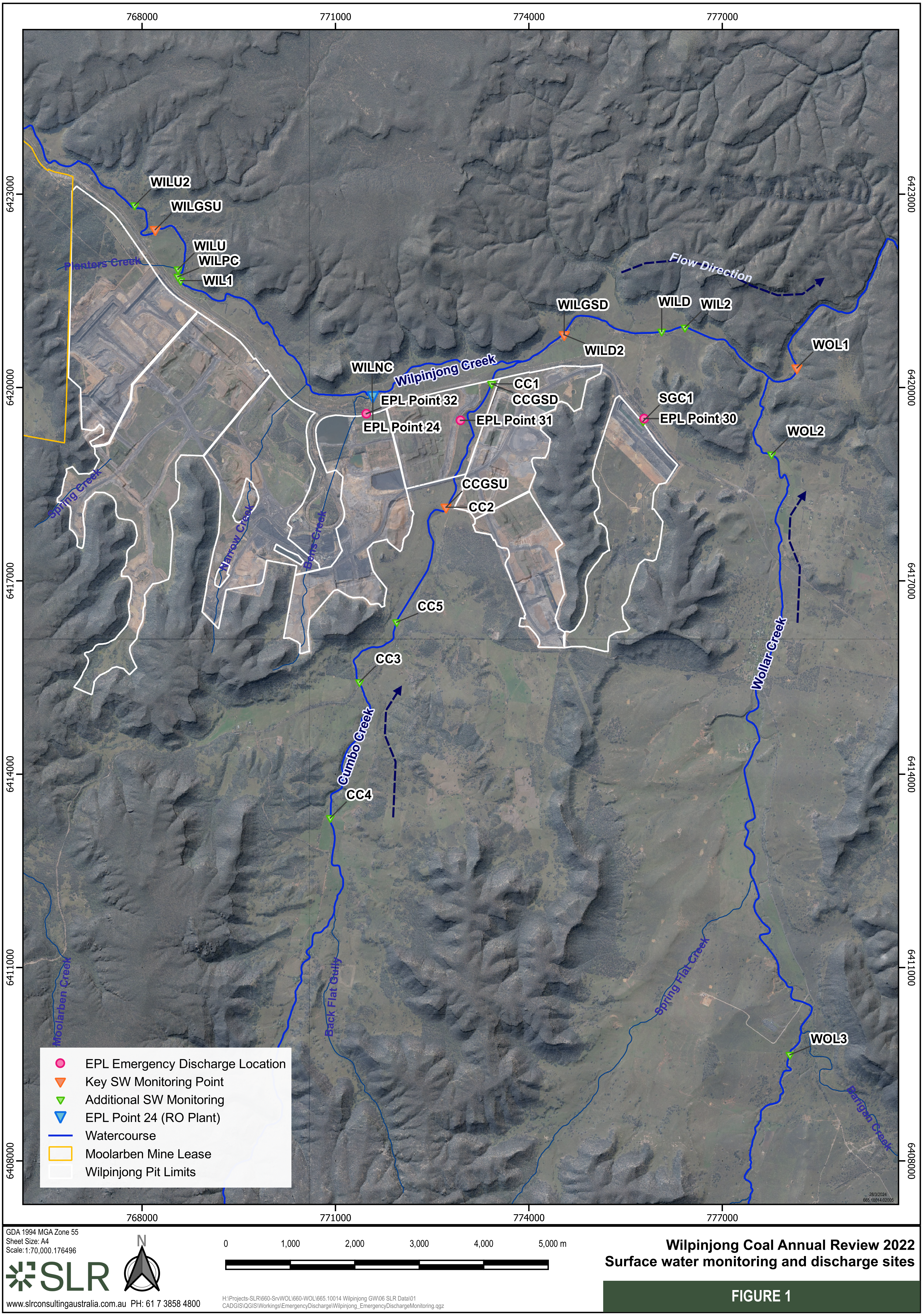
1. An overview of local climatic conditions experienced during 2023.
2. An overview of the volume and quality of water discharged from WCM during 2023 at the Licenced Discharge Points (LDPs) permitted under the Wilpinjong Coal Pty Limited (WCPL) Environmental Protection Licence (EPL) EPL12425.
3. Cause-and-effect analysis of data from the Wilpinjong Creek upstream (WILGSU) and downstream (WILGSD), and Cumbo Creek upstream (CCGSU) gauging stations, compared to the long-term rainfall trend and discharge from WCM and other regional mines.
4. Assessment of key water quality criteria at the local creeks during the 2022-2023 water year in respect to the baseline data (pre-mining, as defined in the Surface Water Management Plan (SWMP)), as well as Water Quality Impact Assessment Criteria for downstream monitoring sites within Cumbo and Wilpinjong Creeks, also defined in the current SWMP.

The Wilpinjong surface water quality monitoring, flow gauging stations and discharge locations are presented in **Figure 1**.

1.2 Works undertaken in 2023

The following groundwater works were commissioned by WCM and undertaken in 2023 in line with the recommendations of previous Annual Reviews and requests from the Department of Planning and the Environment, and to maintain the monitoring network:

- Completion of a mine water discharge assessment (pertaining to the Dec 2022/Jan 2023 EPL Emergency Water Discharge) (SLR, 2023a).
- Completed the 2022 annual compliance reporting for groundwater (SLR, 2023b).
- A pH trigger exceedance investigation was conducted relating to exceedances observed at Wilpinjong Creek downstream sites SLR (2023c).
- Monthly review of surface water quality data to assess compliance with trigger levels (April – December 2023). Reporting and detailing of actions taken following any observed trigger exceedances and providing this to the regulator in monthly intervals.



Wilpinjong Coal Annual Review 2022
Surface water monitoring and discharge sites

FIGURE 1

2.0 Climate

Table 1 displays the monthly and annual rainfall records across 2016-2023 compared to the long-term averages at the Wollar (Barrigan St) BOM station. The annual total rainfall recorded in 2023 was 515.5 mm, which equates to 87% of the long-term average of 593.1 mm, representing a slightly below average rainfall year.

Table 2 presents the rainfall observed at the on-site rainfall gauge during 2023. Overall, rainfall recorded on-site at WCM is slightly lower than at the Wollar BOM station with a total for 2023 of 477.6 mm.

Variation in annual rainfall is a key influence on surface water flow and can influence water chemistry.

Table 1 BOM rainfall station 062032 - recent monthly and annual rainfall vs long term average (mm)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual +
Avg	**67.2**	**62.2**	**55.1**	**39.3**	**37.0**	**43.7**	**42.9**	**41.1**	**41.7**	**52.1**	**57.0**	**60.9**	**593.1**
2016	101.2	10.4	21.4	3.0	67.0	114.2	82.4	44.0	181.2	74.2	41.0	36.2	**776.2**
2017	13*	31.0	127.0	19.0	24.4	12.0	1.4	25.6	2.0	30.0	62.6	86.4	**421.4**
2018	13.4	66.2	41.4	47.0	12.6	22.0	6.5	25.5	51.0	48.5	44.4	117.6	**496.1**
2019	72.0	5.0	110.5	0.0	20.0	6.0	4.0	10.0	23.0	7.0	30.0	6.0	**293.5**
2020	37.0	151.0	110.2	118.0	35.0	31.3	86.0	36.0	75.7	128.0	21.5	149.3	**979.0**
2021	43.8	107.0	157.5	2.5	11.0	82.0	68.2	21.0	45.0	72.0	183.0	134.0	**927.0**
2022	169.0	17.0	139.5	65.0	38.0	14.5	109.0	100.5	94.5	126.0	85.0	31.0	**989.0**
2023	49.0	28.5	55.0	43.5	4.0	30.5	24.0	39.0	16.5	42.5	97.5	85.5	**515.5**

*No rainfall recorded at Wollar (Barrigan St). Rainfall from Bylong (Glenview) – 062107 used.

+Orange shading represents below average rainfall years whilst blue shading represents above average rainfall years.

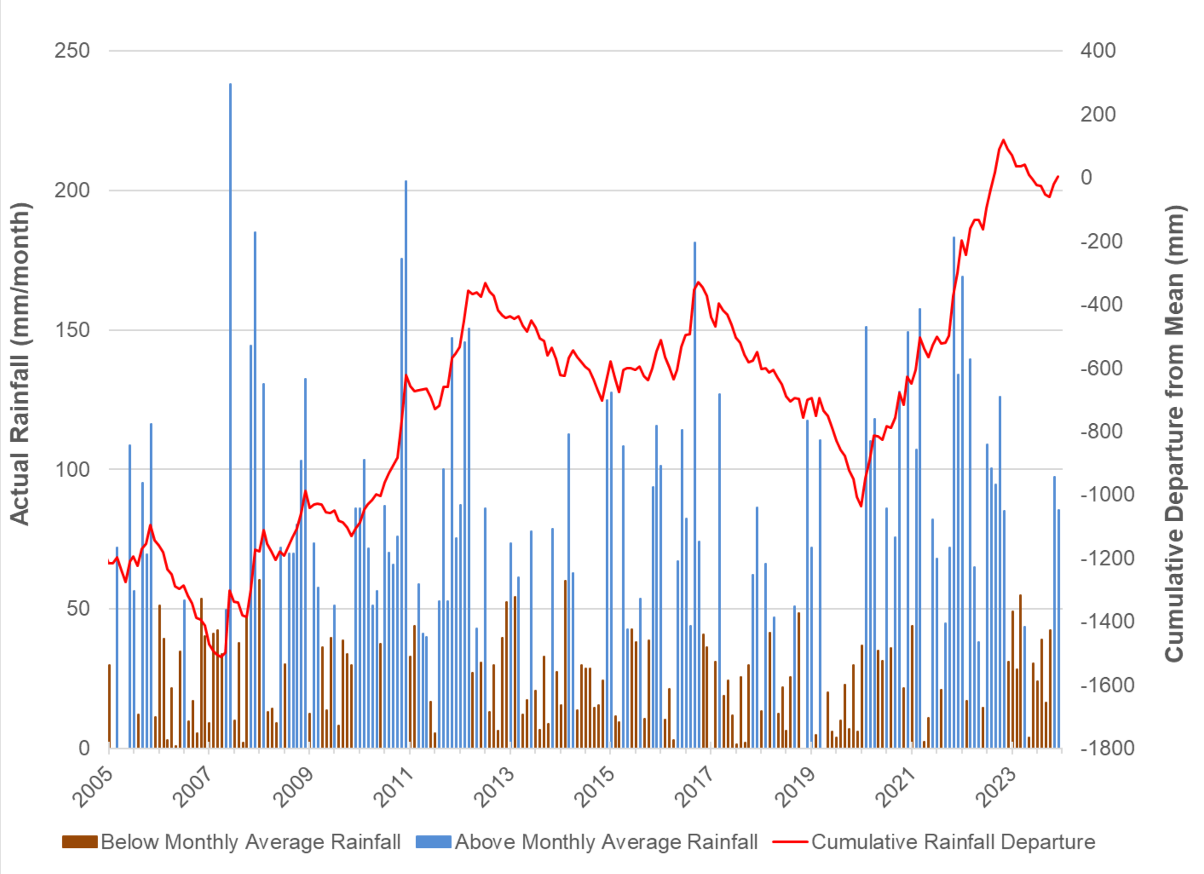
Table 2 Wilpinjong site rainfall data 2023

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2023	48.6	24.6	64.6	47.8	2.8	28.8	23.2	29.6	18.0	36.2	94.0	59.4	**477.6**

The cumulative rainfall departure (CRD) shows trends in actual rainfall over time relative to the long-term average and provides a historical record of relatively wet and dry periods. A positive slope in the CRD indicates periods of above average rainfall, while a negative slope indicates periods of below average rainfall. A level trace indicates rainfall conditions are equal to average rainfall conditions.

The CRD from the Wollar (Barrigan St) BOM station **Figure 2**, for the calendar years 2020 to 2022 WCM reflect the above average rainfall conditions, as indicated by a sharp upward trend in the CRD. However, in 2023 a decline in the CRD is observed, given the lower-than-average annual rainfall conditions. The last two months in 2023 again see an increase in CRD consistent with higher rainfall in November and December, although it is noted that the WCM site rainfall gauge recorded ~25 mm less rain than at Wollar in December (**Table 2**), lower than the Wollar long term average.

Figure 2 Monthly rainfall and Cumulative Rainfall Departure



3.0 Discharge Quantity and Quality

The following sections present a summary of the licenced discharge of water from WCM under emergency and normal EPL discharge provisions.

3.1 Emergency Discharge

During the previous reporting period (2022), due to the ongoing above average rainfall conditions and the high potential for an uncontrolled off site water discharge, WCM was granted two licence variations for the following periods by the NSW Environmental Protection Authority (EPA) to discharge excess mine water (EMW) to Wilpinjong Creek:

- WCM discharge to Wilpinjong Creek and Cumbo Creek was permitted and occurred between 31 October 2022 and 25 November 2022 at three locations (EPL Points 30, 31, 32) with a total combined permissible discharge limit of 71 ML/day.
- In addition, discharge to Wilpinjong Creek was permitted and occurred between 15 December 2022 and 1 January 2023 at two locations (EPL Points 30 and 32) with a total combined permissible discharge of 20 ML/day. The decrease in allowable daily discharge volume was proposed by WCM given the reduction in natural flow within the receiving environment following a short period of drier conditions.

16.4 ML was discharged within the reporting period for this annual review (2023) with the second period of emergency discharge ceasing at 5pm 1 January 2023. The potential influences of this discharge on surface water quality have been considered in this review but are not explicitly discussed in this report. Detailed reporting on the emergency discharge in late 2022 and early 2023 was previously conducted by SLR (2023a).

3.2 Licenced Discharge

Under EPL 12425, WCM is allowed to discharge water from site to Wilpinjong Creek from the following locations (see **Figure 1**):

- **EPL Point 24** - Product water from the RO treatment plant is discharged to Wilpinjong Creek. The daily discharge limit from the RO Plant is 6.5 ML/day. The EPL stipulates required monitoring of electrical conductivity (EC), pH, oil and grease, turbidity, and total suspended solids (TSS).
- **EPL Point 30** – Discharge from the Pit 8 clean water diversion (CWD) dam to the downstream reach of Slate Gully Creek before it enters Wilpinjong Creek. There is no daily discharge limit and the EPL reflects Wilpinjong Coal's position that the water quality (i.e., measured as turbidity) from the Pit 8 CWD dam is generally equal to or better than the receiving water in Wilpinjong Creek.

The following sections provide further detail on the EPL conditions at these discharge points, and an overview of the quality and volume of water discharged in 2023. The quality of discharged water will contribute to water quality observations in Wilpinjong Creek and may be relevant when assessing surface water compliance for 2023.

3.2.1 EPL Point 24 – RO Plant

WCM was historically approved to discharge up to 5 ML/day via the RO plant at EPL Point 24, which treats water from the on-site water retention dams. On 10 October 2022, EPL 12425 was updated to increase the discharge limit at EPL Point 24 to 6.5 ML/day. EPL 12425 specifies limits for the quality and monitoring frequency of water that may be discharged from this location (**Table 3**).

Table 3 EPL Point 24 – RO Plant Discharge Limits

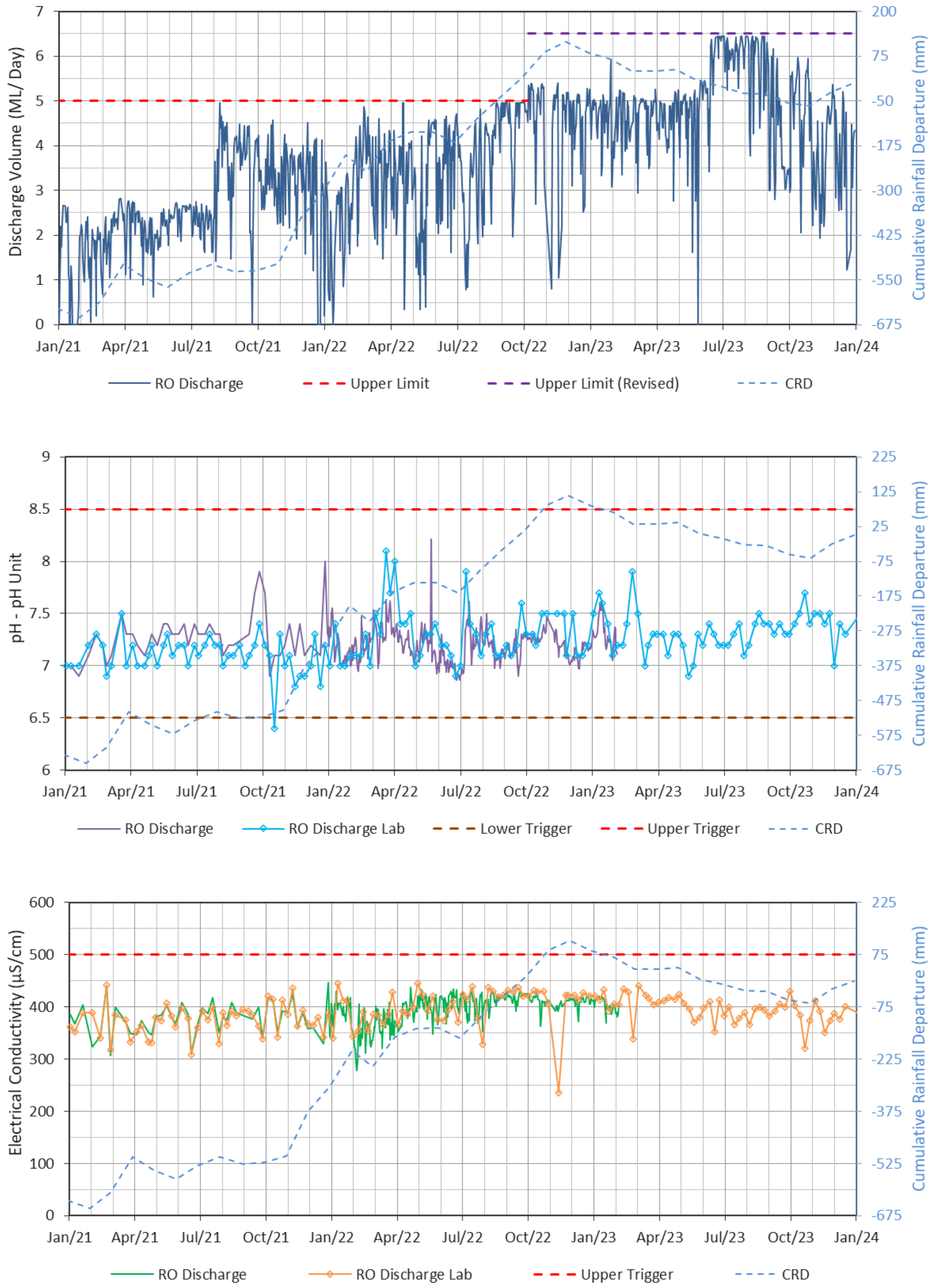
Parameter	Unit of Measurement	Required Monitoring Frequency	Limit
EC	µS/cm	Continuous during discharge	500
Oil and Grease	mg/L	Weekly during any discharge	10.0
pH	pH unit	Continuous during discharge	6.5 – 8.5
TSS	mg/L	Weekly during any discharge	50
Discharge Vol.	ML	Continuous during discharge	6.5

The recent recorded discharge volumes and associated water quality (EC and pH) from the RO plant are presented in **Figure 3**, which presents daily mean values for discharge from continuous monitoring alongside the weekly laboratory samples (RO Discharge Lab) for EC and pH. The monitoring and reporting against EPL Point 24 limits (**Table 3**) in 2023 are summarised in **Table 4.**

Table 4 EPL Point 24 – 2023 monitoring

EPL Reporting Freq.	Comment	
	Monitoring Freq	Water Quality Limits
12x monthly reports completed in 2023	Parameters requiring continuous monitoring were collected 100% of the time from January to November 2023. December 2023 reporting indicates parameters collected 84% of the time. January to May 2023 reporting indicated five samples for Oil and Grease and TSS were collected per month. June to December reporting indicates zero samples were collected per month. Data provided to SLR for this review indicates that Oil and Grease and TSS samples were collected at the required frequency throughout 2023, including in months where zero samples were reported.	EPL Point 24 limits are not exceeded for any analytes during 2023, also noting that the maximum TSS observation in 2023 was 2 mg/L, which is less than historical observations at WCM surface water monitoring sites.

Figure 3 RO Plant discharge volume and quality in 2023



3.2.2 EPL Point 30 - Pit 8 CWD dam

WCM discharges surface water run-off captured above mining operations at EPL Point 30. This area above the mining operations is referred to as the Pit 8 clean water diversion (CWD) dam. The turbidity value measured in the discharge at EPL Point 30 should not exceed the turbidity value measured at the Wilpinjong Creek upstream gauging station (WILGSU). The water discharged from EPL Point 30 is captured rainwater and should therefore have a water quality (i.e. turbidity) that is equal to or better than the turbidity of the receiving water in Wilpinjong Creek. When there is no flow within Wilpinjong Creek at the upstream gauging station the value of turbidity measured at EPL Point 30 must not exceed 50 Nephelometric Turbidity Units (NTU), which is a ‘limit’ recommended in the ‘Blue Book’ (*Soils and Construction Volume 1 – Managing Urban Stormwater* – Landcom, 2004).

Discharge from EPL Point 30 occurred only on 1 January 2023 as part of the emergency provisions. 4.9 ML was released on this day.

4.0 In-Stream Monitoring Data Review

Flow rates and water quality (pH and EC) are monitored continuously from two sites on Wilpinjong Creek (WILGSU and WILGSD) and one site on Cumbo Creek (CCGSU).

The locations of the gauging stations on Wilpinjong Creek are shown in **Figure 1**. The upstream site (WILGSU) is located northwest of WCM. The downstream site (WILGSD) is northeast of WCM, downstream of the RO Plant and downstream of the confluence of the Wilpinjong and Cumbo creeks. The Cumbo Creek upstream gauging station (CCGSU) is located approximately 400 m to the east of Pit 2 and approximately 800 m upstream of Pit 4 which is now used for water storage and rehabilitation (**Figure 1**). Flow/discharge, EC, and pH are all monitored at these locations.

Real-time flow and water quality data was provided up to 11 December 2023.

4.1 Surface Water Flow

The following section presents and discusses daily flow data from the three continuous surface water monitoring gauges on Wilpinjong Creek (WILGSU and WILGSD) and Cumbo Creek (CCGSU). Observed flow trends are reviewed against rainfall data from the local rainfall station (Wollar, 062032) and discharge volumes throughout 2023.

The two Wilpinjong Creek gauging stations have been recording since January 2012. The catchment area reporting to the upstream site (WILGSU) is 86 km^2 while the downstream site has a catchment area of 216 km^2. CCGSU on Cumbo Creek has been recording data since August 2015. **Figure 4** shows the flow data at these sites in late 2022 and 2023 in comparison to the RO Plant discharge rate (EPL Point 24).

During 2023, flow at CCGSU fluctuated between <0.01 and 35 ML/day in response to rainfall events, with the highest flow events recorded on 4 and 5 November. CCGSU was observed to flow for most of the year except for three brief periods in March, November, and December.

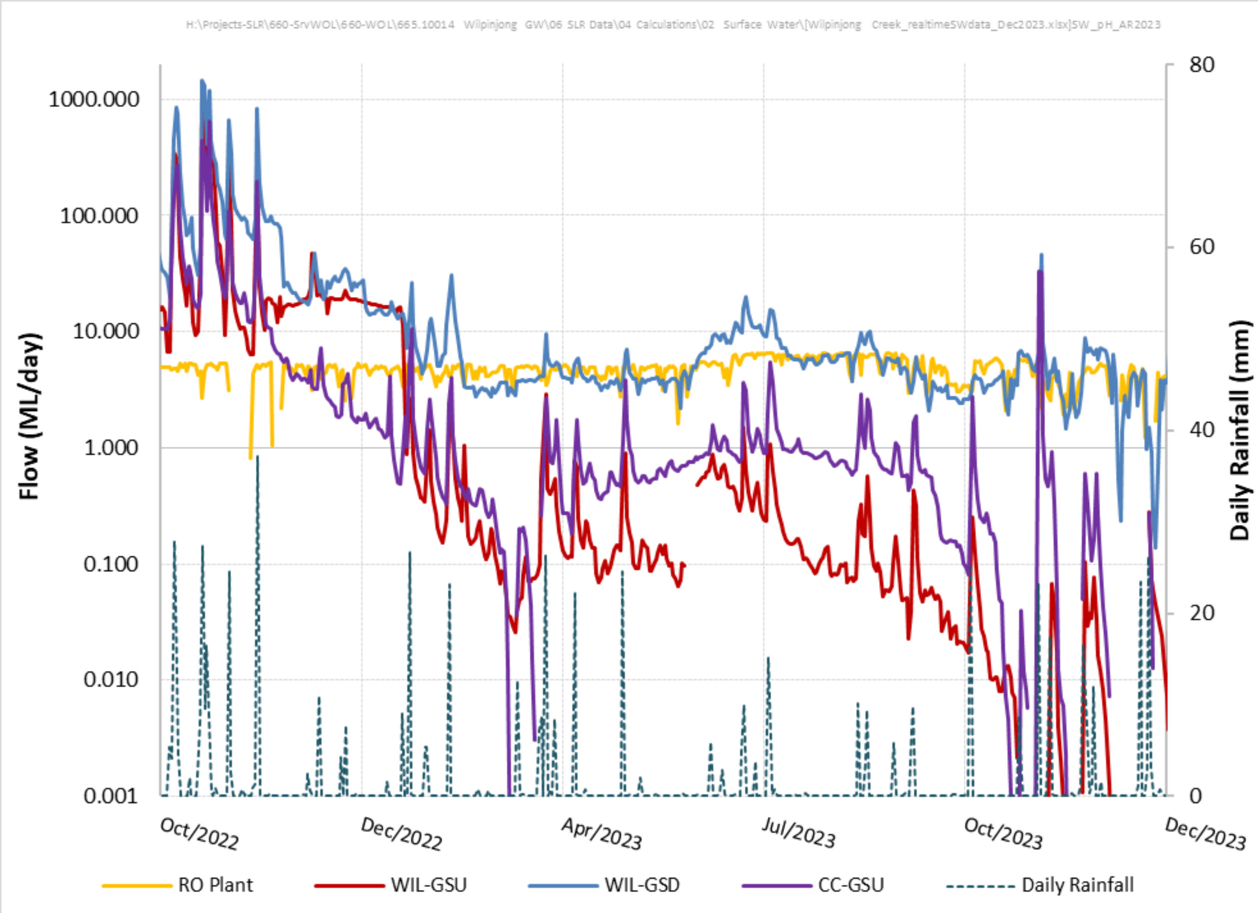
In 2023, flow at WILGSU ranged between <0.01 and 19 ML/day, whilst WILGSD had slightly higher flows at 0.2 to 47 ML/day, with flow rates at WILGSD directly influenced by RO Plant discharge volumes (**Section 3.2.1**)

Table 5 presents the calculated daily mean discharge rates at WILGSU, WILGSD and CCGSU for each year since 2013. The average daily flow rate of all creek monitoring points increased from 2019 through 2022 with all sites showing a reduction in daily averages for the 2023 reporting period.

Table 5 Calculated daily mean flow rate at Wilpinjong and Cumbo Creeks

Monitoring Location	Average Daily Flow Rate (ML/day)										
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
WILGSU	0.16	0.03	0.24	2.8	0.002	0	0	5.2	5.1	25.8	1.1
WILGSD	0.27	0.22	0.39	5.7	5.9	0.73	0.008	6.0	10.0	70.0	6.3
CCGSU	No data		0.14	1.6	0.6	0.4	0.1	0.9	2.1	20.4	0.95

Figure 4 Continuous flow monitoring records (Oct 22 – Dec 23)



4.2 Water Quality

Water quality is monitored continuously at WILGSU, WILGSD and CCGSU, with a multi parameter water meter (sonde) measuring EC, pH (and temperature, which is not provided or assessed here).

4.2.1 Electrical Conductivity

EC monitoring data at WILGSU, WILGSD and CCGSU are provided in **Figure 5** and are generally influenced by the following factors:

- WILGSU is most strongly influenced by the rainfall trend, with limited contribution identified from groundwater (baseflow). EC at WILGSU is therefore generally low (~1,000 to 2,000 µS/cm) and relatively consistent, with a minor inverse response to the rainfall trend (lower rainfall results in an increase in EC) likely resulting from increased evaporation and lower contribution of fresh water in periods of low rainfall.
- Flow at WILGSD is influenced by upstream flow from both Wilpinjong and Cumbo Creeks as well as the RO Plant discharge, which all have different EC values. EC at WILGSD is therefore variable and related to the primary source of flow at any point in time.
- Flow at CCSGU is likely to have a persistent groundwater contribution that is sourced from weathered Permian Coal Measures. In 2023, observations of EC are in the range between 3,000 and 5,000 µS/cm but historically have been observed higher

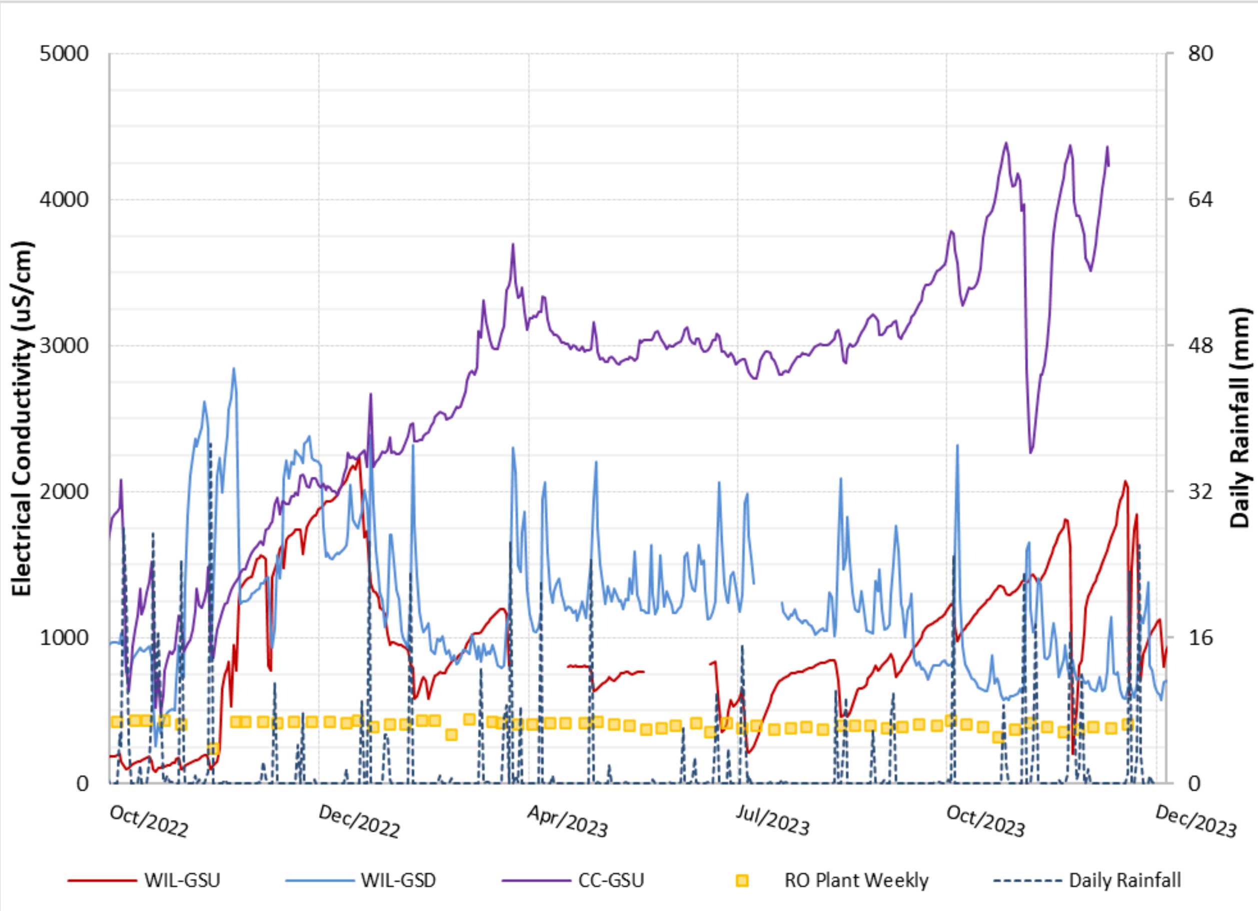
than 8,000 µS/cm. Declines in EC are observed following large rainfall events, due to dilution effects.

In 2023 continuous monitoring at Cumbo Creek (CCGSU) shows an increasing EC trend (from 2,000 µS/cm to ~4,000 µS/cm). This is a change in trend from 2022, where a decreasing trend was observed and attributed to the above average annual rainfall in that year. A rapid decrease in EC is observed over 5 to 13 November and correlates with the higher flow events in this Creek (see **Section 4.1**). The EC quickly stabilises to levels prior to this event. These EC responses are observed historically in CCGSU, with large rainfall events causing rapid decreases in EC concentration.

Both WILGSU and WILGSD displayed generally stable EC levels across 2023 of around 750 µS/cm upstream and 1,250 µS/cm downstream, with short-term fluctuations linked to changing flow conditions (controlled by rainfall and in WILGSD case, RO discharge).

The late 2022 increase in EC at Wilpinjong Creek WILGSU and WILGSD was a response to the EMW discharge from Moolarben Coal Mine and WCM respectively as part of permitted emergency discharge provisions (see **Section 3.0**). EC at both locations is observed to decline to normal levels in early 2023 after approved emergency discharges ceased.

Figure 5 Continuous EC monitoring at WCM

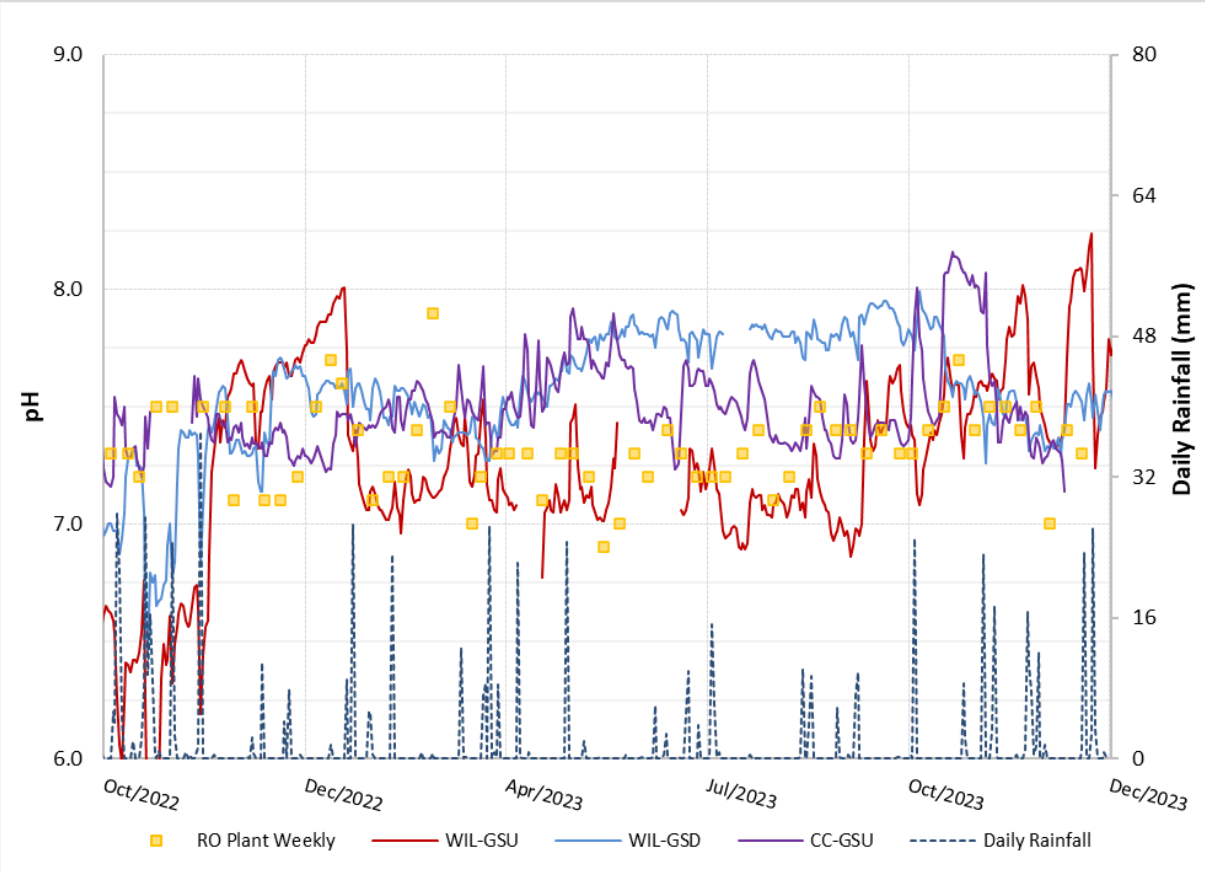


4.2.2 pH

pH at CCGSU is generally consistent throughout 2023, with pH around pH 7.0 to 8.0, showing minor decreases following periods of higher rainfall, which has lower pH (**Figure 6**).

pH at both gauging stations on Wilpinjong Creek are different by about 1 pH unit and show some correlation to periods of rainfall (declining with higher rainfall periods). For most of 2023 the pH levels in Wilpinjong Creek show some variability that appears linked with periods of high rainfall. WILGSD varies from pH 7.2 to 8.0 and WILGSU varies from pH 6.7 to 8.1.

Figure 6 Continuous pH monitoring



5.0 Water Quality Analysis

The following sections review the surface water quality data from monitoring sites specified in Section 8 of the Surface Water Management Plan (WCPL, 2017). This has been conducted with respect to the 20th and 80th percentile baseline monitoring data (**Table 6**) (which was collected from 2004 to 2009, prior to the commencement of mining) and water quality impact assessment criteria (trigger levels), where defined (**Table 7**).

Section 5.1 provides an assessment of the 2023 water quality observations with respect to the impact assessment criteria, while **Sections 5.2** to **5.6** comment on the 2023 observations with respect to the baseline water quality data.

Table 6 Summary of Baseline Water Quality Data – Local Creeks (WCPL, 2017)

Monitoring Site/Guideline		pH	EC (µS/cm)	Turbidity (NTU)
ANZECC (2000) Guideline Trigger Value	**Protection of Aquatic Ecosystems**	6.5-8.0	30-350	2-25
	Primary Industries (Livestock Drinking Water)	6-9	950	-
Wilpinjong Creek Upstream (Sites WIL-U2, WIL-U, WIL 1, WIL-PC)	Average	7	2,435	20
	Minimum	5.7	450	6
	Maximum	9	12,190	41
	No. Samples	49	49	5
	80th percentile	**7.7**	**4,066**	**24**
	20th percentile	**6.9**	**-**	**-**
Wilpinjong Creek Downstream (Sites WIL-NC, WIL-D2, WIL 2, WIL-D)	Average	8	3,531	22
	Minimum	6.7	680	4
	Maximum	9	7,450	70
	No. Samples	55	55	9
	80th percentile	**7.9**	**5,166**	**28**
	20th percentile	**7.4**	**-**	**-**
Cumbo Creek Upstream (Sites CC2, CC3, CC4, CC5)	Average	8	5,303	11
	Minimum	6.8	100	5
	Maximum	9	10,500	24
	No. Samples	70	70	15
	80th percentile	**8.2**	**6,750**	**16**
	20th percentile	**7.4**	**-**	**-**
Cumbo Creek Downstream (Site CC1)	Average	8	6,231	43
	Minimum	6.7	540	17
	Maximum	9	10,470	94
	No. Samples	27	27	6

Monitoring Site/Guideline		pH	EC (µS/cm)	Turbidity (NTU)
	80th percentile	**8.2**	**7,510**	**77**
	20th percentile	**7.52**	**-**	**-**
Wollar Creek (Sites WOL 1, WOL 2, WOL 3)	Average	8	2,311	16
	Minimum	6.5	90	2
	Maximum	8.4	6,540	37
	No. Samples	90	90	20
	80th percentile	**8.0**	**3,460**	**25**
	20th percentile	**7.4**	**-**	**-**

Where trigger levels are defined (**Table 7**) the review will identify any exceedances during 2023 and provide preliminary analysis.

Table 7 Water Quality Impact Assessment Criteria (WCPL, 2017)

Creek	Monitoring Site	Parameter	Trigger
Wilpinjong Creek (Downstream)	WIL_NC, WIL_D2, WIL_D, WIL_2	EC	If recorded value at the monitoring site is greater than **3,440 µS/cm** for 3 consecutive readings
		Turbidity	If recorded value at the monitoring site is greater than **24 NTU** for 3 consecutive readings
		pH (lower)	If recorded value at the monitoring site is less than **6.9 pH** for 3 consecutive readings
		pH (upper)	If recorded value at the monitoring site is greater than **7.7 pH** for 3 consecutive readings
Cumbo Creek (Downstream)	CC1	EC	If recorded value at the monitoring site is greater than **7,510 µS/cm** for 3 consecutive readings
		Turbidity	If recorded value at the monitoring site is greater than **77 NTU** for 3 consecutive readings
		pH (lower)	If recorded value at the monitoring site is less than **7.5 pH** for 3 consecutive readings
		pH (upper)	If recorded value at the monitoring site is greater than **8.2 pH** for 3 consecutive readings

[1] Trigger is only considered to have been exceeded if the recorded value at a monitoring site is greater than (or less than for lower pH Trigger) all values from the upstream monitoring sites sampled on the same day. In the event that a single result is recorded above/below the 80th/20th percentile value, WCPL will undertake a preliminary investigation to ascertain whether the result was caused by an obvious anomaly or whether further testing is required.

5.1 Assessment with respect to SWMP (WCPL, 2017) water quality triggers

Table 8 identifies Water Quality Impact Assessment Criteria defined in the SWMP (WCPL, 2017) that have been exceeded during 2023. This assessment, in line with the SWMP (WCPL, 2017) has only considered triggers to be exceeded under the following circumstances:

- *Trigger is only considered to be exceeded if recorded value at the monitoring site is greater than (or less than for lower pH trigger) for 3 consecutive readings.*
- *Trigger is only considered to have been exceeded if the recorded value at monitoring site is greater than (or less than for lower pH Trigger) all values from the upstream monitoring sites sampled on the same day.*

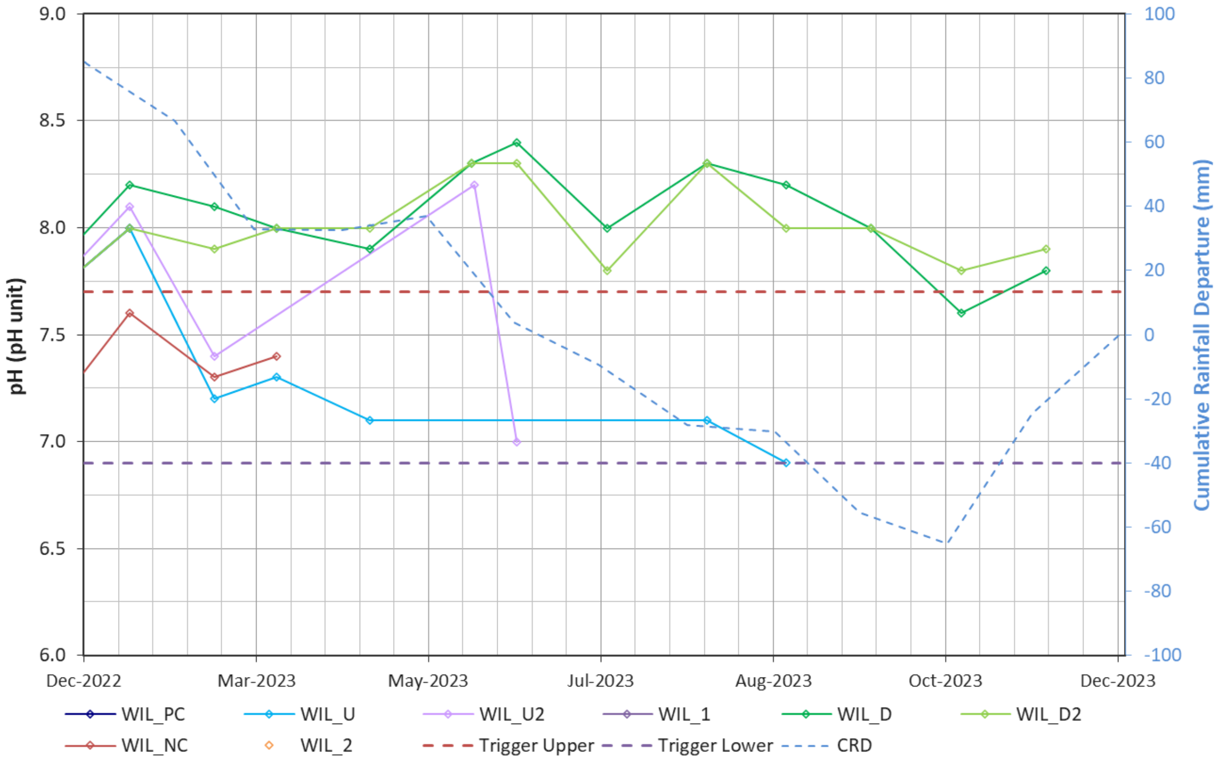
Table 8 Exceedances of Water Quality Impact Assessment Criteria (WCPL, 2017)

Creek	Site	Parameter	Trigger	Exceedance during 2022	Summary of Exceedance
Wilpinjong Creek (Downstream)	WIL-NC, WIL-D2, WIL-D, WIL-2	EC	3,440 µS/cm	No	
		Turbidity	24 NTU	No	
		pH (lower)	6.9 pH	No	
		pH (upper)	7.7 pH	Yes	11 consecutive observations above the upper pH trigger, and above upstream pH observations at WIL-D2 during 2023. 10 consecutive observations above the upper pH trigger at WIL-D during 2023. See **Section 5.3.1.1** and **Figure 7**.
Cumbo Creek (Downstream)	CC1, CC-1-30m-up, CC-GS-D	EC	7,510 µS/cm	No	
		Turbidity	77 NTU	No	
		pH (lower)	7.5 pH	No	
		pH (upper)	8.2 pH	No	

During the 2023 assessment period, the identified trigger exceedances were related to upper pH trigger exceedances at Wilpinjong Creek (Downstream), as observed at WIL-D2 and WIL-D.

A review of possible and plausible drivers of this trigger exceedance is provided in **Section 5.3.1.1** while **Figure 7** shows time-series pH observations at all Wilpinjong Creek compliance monitoring sites to help show when and how often the trigger was exceeded in 2023. pH observations at WIL-D were under the upper pH trigger level in November 2023 (pH 7.6 observed), which has reset the trigger exceedance criteria at this site. It is noted that the December 2023 observation is again above the trigger level (pH 7.8), but this does not yet constitute a trigger exceedance. The January 2023 observation at WIL_D2 is also below the WIL_U2 pH observation and is not considered to be in exceedance of the trigger level in this month.

Figure 7 Wilpinjong Creek pH at compliance monitoring locations



5.2 Wilpinjong Creek Upstream

The creek area defined as Wilpinjong Upstream (WCPL, 2017) is assessed using monitoring data from sites WIL-U2, WIL-U, WILGSU and WIL-PC (**Table 6**). These sites are located along Wilpinjong Creek near the north western edge of the current and proposed WCM mining activity (**Figure 1**).

5.2.1 pH

pH observations at the Wilpinjong Creek Upstream monitoring sites during 2023 are relatively stable and near neutral, with pH at all sites ranging from pH 6.7 to 8.2. The higher pH (observed early in 2023) is thought to be related to the approved discharge of excess mine water from Moolarben Coal which is upstream (SLR, 2023a). This elevated pH does not persist throughout 2023.

Rainfall, and subsequent flow conditions are considered to be the primary drivers of fluctuations in the pH observations at upstream Wilpinjong Creek monitoring sites.

5.2.2 Electrical Conductivity

EC observations at Wilpinjong Creek Upstream monitoring sites have shown considerable variation between 2006 and 2023 (<1,000 µS/cm to 6,000 µS/cm). EC is more elevated in historical observations (>4,000 µS/cm) at WIL-U, WIL-U2, and WIL-PC, and are observed to occur simultaneously with fresher observations at WIL-GS-U (~2,000 µS/cm). More saline observations earlier in the monitoring record may indicate some component of groundwater flow from the underlying Permian coal measures. Mining of the Ulan Seam within these coal measures at WCM and adjacent Moolarben will depressurise the coal measures to some extent and may reduce the more saline contribution to Wilpinjong Creek.

A notable freshening at all Wilpinjong Creek Upstream sites occurs in late 2020 to the end of 2022 (generally <750 µS/cm), in response to above average rainfall conditions. An increase in EC (to ~1,000 µS/cm) is observed during the low rainfall and flow period of 2023 (**Section 4.1**). The observed increase in EC in early 2023 is likely related to the discharge of excess mine water from Moolarben Coal Mine further upstream under emergency provisions. EC observations at Wilpinjong Creek Upstream monitoring sites are well below the 80th percentile baseline (4,066 µS/cm) for all of 2023.

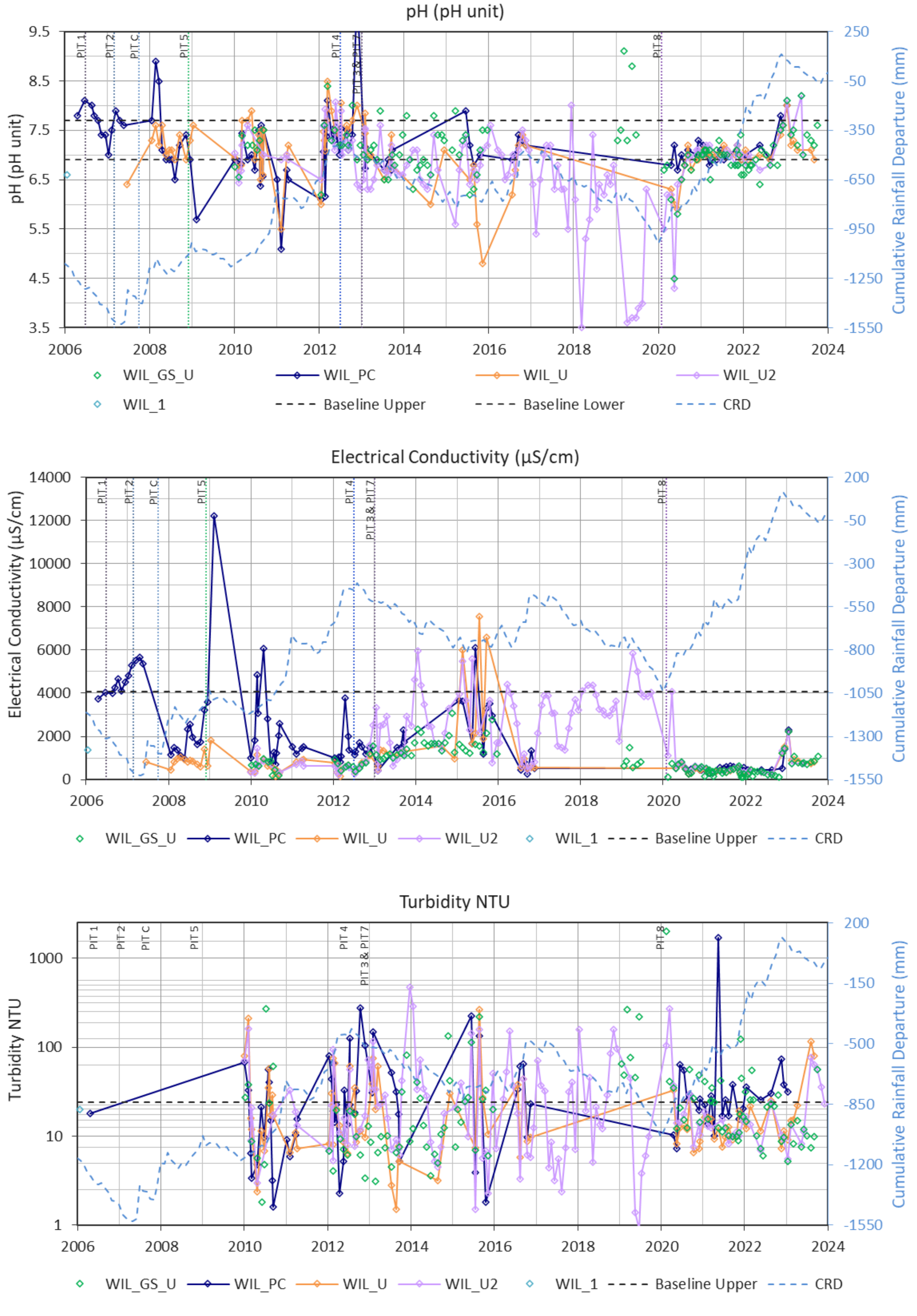
5.2.3 Turbidity

Turbidity observations at Wilpinjong Creek Upstream monitoring sites continuously fluctuate between 2010 and 2023, with observations ranging from 5 – 2,000 NTU and are above the 80th percentile baseline monitoring value (24 NTU) for around half of the observations. Turbidity observations with higher values generally appear to be associated with periods of below average rainfall.

Initial peaks in 2020 (100 – 1,000 NTU at WIL-GS-U and WIL-U2) are likely related to an increased load of fine sediment being flushed down Wilpinjong Creek after low and no flow conditions since 2017. While more consistent flow conditions in 2021 to 2023 have likely resulted in the more stable turbidity observations. During 2023, turbidity observations ranged from 5.2 – 80.6 NTU.

Flow conditions (influenced by rainfall trends) are considered to be the primary drivers of turbidity observations at Upstream Wilpinjong Creek monitoring sites. If no influence of operations from WCM or upstream Moolarben can be attributed to turbidity observations consistently reporting above the 80th percentile baseline value, future reviews, or updates of the SWMP could consider updating the baseline period to better capture fluctuations under normal conditions.

Figure 8 Time-series water quality for Wilpinjong Creek Upstream



5.3 Wilpinjong Creek Downstream

The creek reach defined as Wilpinjong Creek Downstream (WCPL, 2017) is assessed against water quality trigger levels at sites WIL-NC, WIL-D2, WIL-D and WIL-GS-D (**Table 7**). These sites are located along Wilpinjong Creek, adjacent to, or just downstream of the WCM mining operations and confluence with Cumbo Creek (for sites other than WIL-NC) (**Figure 1**). The full series of available data is shown in **Figure 9.**

5.3.1 pH

During 2023, pH observations at Wilpinjong Creek Downstream monitoring sites are above the upper trigger level (pH 7.7) for the majority of measurements at WIL-D and WIL-D2. A period of elevated pH is observed at Wilpinjong Creek Upstream monitoring sites in early 2023, but pH observations at either WIL-D or WIL-D2 are higher than these observations, therefore breaching the upper pH trigger level as defined in the SWMP (WCPL, 2017) (**Table 7**).

WIL-NC stayed compliant, though it is noted that water quality analysis was not conducted from April 2023 onwards. Time series pH observations for 2023 at all compliance monitoring locations on Wilpinjong Creek are presented in **Figure 7**, above.

These pH exceedances at Wilpinjong Creek Downstream monitoring sites were documented and assessed by SLR (2023c) consistent with requirements of the surface water Trigger Action Response Plan (TARP) (Peabody, 2017 – Table 15).

5.3.1.1 Trigger Exceedance

The following points provide an evaluation of the pH trigger exceedance and consider whether it is likely related to WCM operations. These points draw on the detailed trigger investigation undertaken in SLR (2023c):

- Higher pH surface water is naturally occurring in the Wilpinjong area (Cumbo Creek and Wollar Creek). pH at downstream Wilpinjong Creek is also generally higher than upstream. Historical observations from 2007 and 2013/14 are also above pH 8.
- Discrepancy was identified between real-time datasets and manual (monthly or rain event) pH observations. Variations in these datasets increase uncertainty when evaluating data and identifying potential mining effects.
- Cumbo Creek is likely influencing the water signature of Wilpinjong Creek (downstream of the confluence) and is likely contributing bicarbonate alkalinity to Wilpinjong Creek. Higher bicarbonate alkalinity is linked to higher pH at Wilpinjong (SLR, 2023c).
- There is no clear evidence of elevated levels in site water storages which could result in the seepage of mine water to Wilpinjong Creek. However, this possibility should remain a consideration.
- Higher pH surface water is present locally, outside the influence of WCM operations. The exceedance is therefore unlikely to pose a threat to the health of local ecosystems. Observations in 2023 of pH 8.6 at upstream Wollar Creek (WOL2), and ~pH 8.5 at upstream Cumbo Creek (CC-3) are consistent with available historical data.

As specified in the last surface water annual review and SLR Trigger Exceedance assessment (2023c), baseline pH data collected for downstream Wilpinjong Creek sites have a 20th percentile value of pH 6.9 and an 80th percentile value of pH 7.9 (**Table 6**). Thus, under normal conditions, pH observations are expected to be higher than pH 7.9, around

20% of the time, meaning a trigger level of pH 7.7 may be too low to meaningfully indicate a potential Wilpinjong Coal mining effect that justifies further investigation.

SLR (2023c) recommends further studies develop an appropriate updated trigger level at downstream Wilpinjong Creek. These studies would involve additional analysis of flow volumes and water chemistry of Wilpinjong Creek, Cumbo Creek, neighbouring catchments, and mine water storages, as well as a review of the potential impacts of a raised pH trigger level by a suitably qualified aquatic ecologist. It is understood that these studies will be completed in 2024 and new trigger levels adopted in an updated SWMP.

5.3.2 Electrical Conductivity

As discussed in **Section 4.2**, EC observations at Wilpinjong Creek Downstream monitoring sites are influenced by upstream flow from Wilpinjong Creek, flow from Cumbo Creek, discharge permissible under EPL 12425, and some contribution of groundwater baseflow. This has resulted in higher EC observations in periods of low flow, which is attributed to greater contributions from baseflow or Cumbo Creek flow. Also observed are longer periods of consistently low EC observations from 2016 to 2018 attributed to fresh RO Plant discharge.

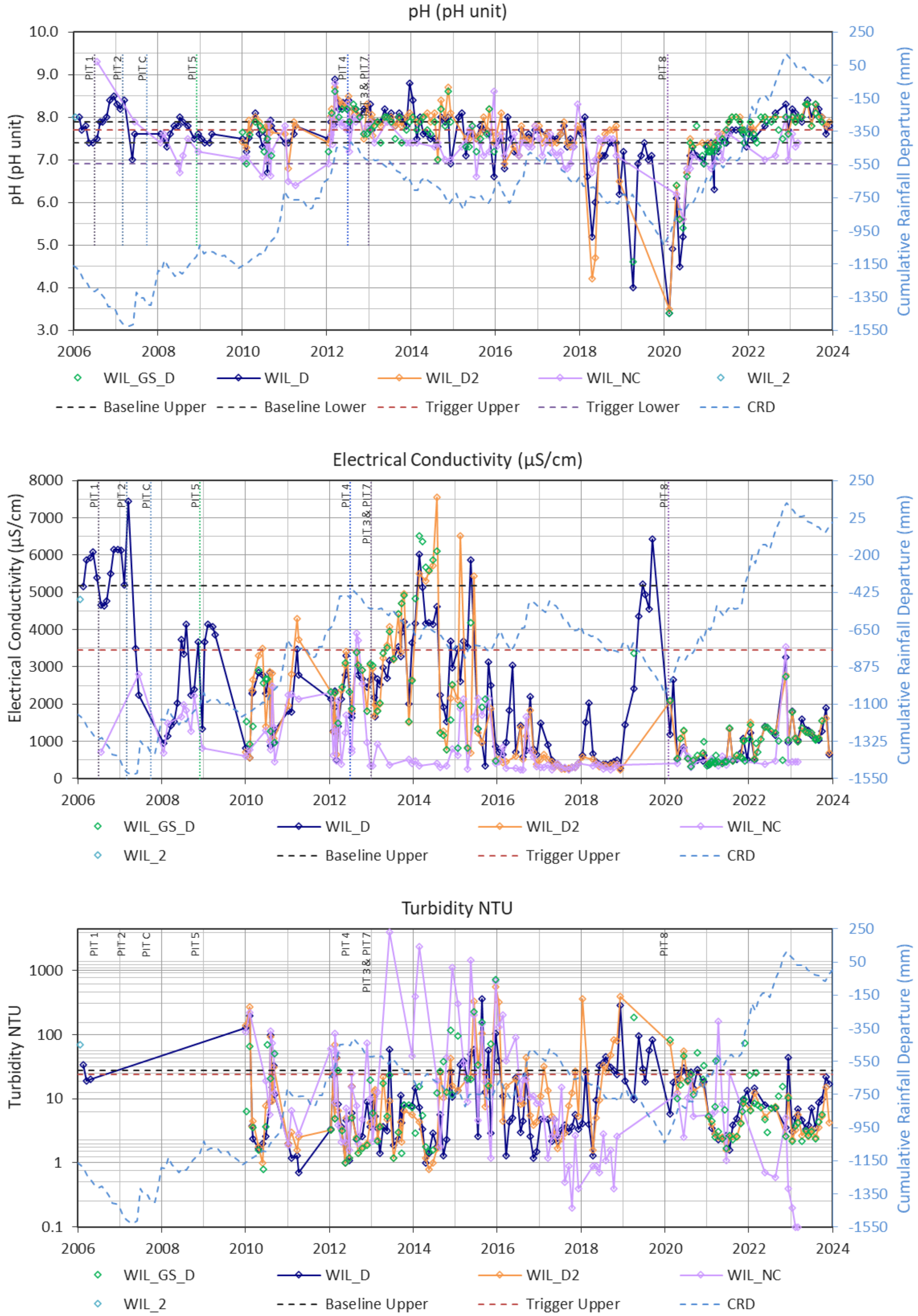
In late 2022 (November), EC increased at all Wilpinjong Creek downstream monitoring locations, which is most likely related to higher EC water being discharged to Wilpinjong Creek under emergency provisions. The observed increase did not persist, with EC over 2023 reducing from these late 2022 observations and has been consistently below the trigger level.

5.3.3 Turbidity

Turbidity observations at monitoring sites in the Wilpinjong Creek downstream sites show some variability from 2010 to 2023 (1-1,000 NTU) (**Figure 9**), with a minor inverse relationship to the rainfall trend.

During 2023, turbidity observations at Wilpinjong Creek Downstream monitoring sites are consistently below the 80th percentile baseline (28 NTU) and trigger level (24 NTU) .

Figure 9 Time-series water quality for Wilpinjong Creek Downstream



5.4 Cumbo Creek Upstream

The creek reach defined as Cumbo Creek Upstream (WCPL, 2017) is assessed using monitoring data from sites CC2, CC3, CC-GS and CC-GS-U (**Table 6**). These sites are located along Cumbo Creek to the south of WCM (**Figure 1**).

5.4.1 pH

pH observations at Cumbo Creek Upstream have been relatively stable from 2015 through 2023 and range from pH 7.7 – 8.6. The most upstream site, CC-3, has reported observations of around pH 8.5 over 2015-2023 while CC-2 and CC-GS-U were closer to pH 8. During early 2023, pH observations at CC-2 and CC-GS-U were recorded within the 20th and 80th percentile baseline value whilst CC-3 showed more alkaline readings during the May to August monitoring rounds; this is consistent with observations since 2015. pH observations through the remainder of 2023 in CC-3 generally fell between the 20th (pH 7.4) and 80th (pH 8.2) percentile baseline values.

5.4.2 Electrical Conductivity

EC observations at Cumbo Creek Upstream show considerable variation between 2015 and 2023 (<1,000 µS/cm to ~10,000 µS/cm) but are generally brackish to saline. Freshening may occur following increases in the long-term rainfall trend as is seen in late 2016, and again from mid-2021 to the end of 2022, with the inverse observed in periods of low rainfall. During 2023 EC observations showed an increasing EC trend with the decreasing rainfall trend with a freshening observed in the November 2023 monitoring round when rainfall and high flow events occurred. Observations at all sites were consistently below the 80th percentile baseline (6,750 µS/cm).

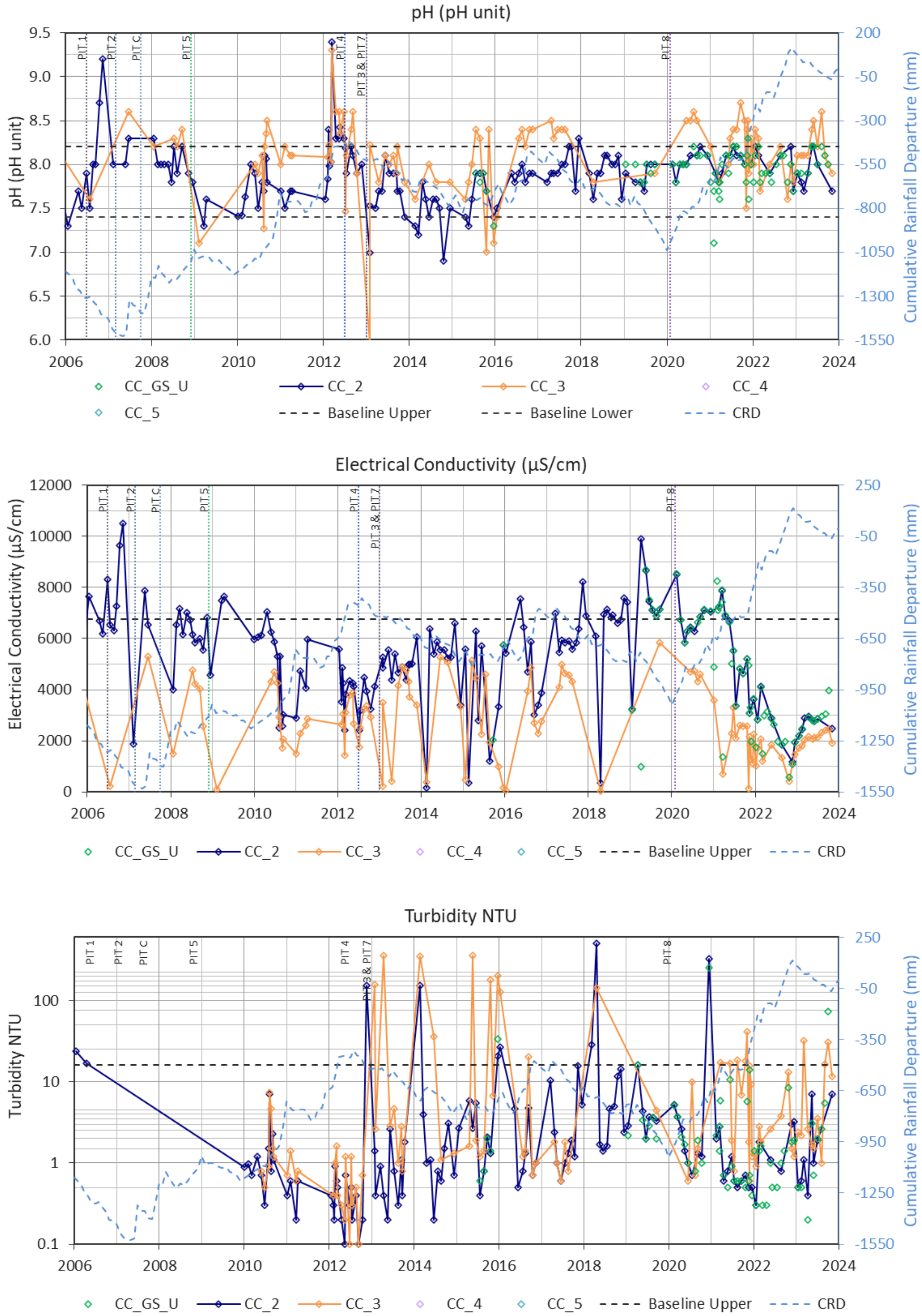
A combination of rainfall, subsequent flow and ongoing baseflow contributions are considered to be the primary drivers of EC observations at Cumbo Creek monitoring sites.

5.4.3 Turbidity

Turbidity observations at Cumbo Creek Upstream monitoring sites from 2015 to 2023 were generally below the 80th percentile baseline value for data collected from 2004 to 2009 (16 NTU). Higher values (1,000-10,000 NTU), which are not clearly linked with the rainfall trend, occurred throughout 2015 and in early-2018. During this reporting period, all monitored upstream sites showed turbidity observations above the baseline value in the October monitoring round. CC-3 also shows turbidity observations above the baseline value in March and September monitoring rounds with decreases to background values observed between.

It is noted that CC-3 is located south of WCM, adjacent to Wollar Road. It is possible that additional runoff from Wollar Road, or livestock activity near this location could be contributing to the higher turbidity observations at CC-3 compared with CC-2 and CC-GS-U.

Figure 10 Time-series water quality for Cumbo Creek Upstream



5.5 Cumbo Creek Downstream

The creek reach defined as Cumbo Creek Downstream is assessed against water quality trigger levels at site CC1, CC-GS-D, and CC-1-(up 30 m) (**Table 7**). These sites are located close to the confluence of the Wilpinjong and Cumbo Creeks and are near the northern extent of the WCM mining operations (**Figure 1**). No samples were taken at the alternate downstream Cumbo Creek site, CC-1-(up 30 m) during 2023. Access can be unsafe to this site, and sampling is frequently unsuccessful due to a lack of observable surface flow. It is therefore, not considered further in this analysis. In addition, measurements from CC-1 and CC-GS-D were only taken from August onwards as no-flow conditions were indicated from January to July 2023.

5.5.1 pH

From 2015 to early 2019, pH observations at Cumbo Creek Downstream monitoring sites were consistently below the trigger level defined in the SWMP (WCPL, 2017) at a level of around pH 7 (**Figure 11**). They were also generally lower than pH observations from Cumbo Creek Upstream monitoring sites (**Figure 10**).

Throughout 2023 both monitoring sites, CC-1, and CC-GS-D, were within the pH trigger levels (pH 7.5-8.2) at the Cumbo Creek downstream sites.

5.5.2 Electrical Conductivity

EC observations at Cumbo Creek Downstream monitoring sites show considerable variation from 2015 through 2023 (<1,000 µS/cm to ~6,400 µS/cm) but have not recorded an observation above the trigger level since 2015 (7,510 µS/cm).

During 2023, EC observations at Cumbo Creek Downstream monitoring sites are well below the trigger level (7,510 µS/cm) with readings between <2,000 and 4,500 µS/cm.

5.5.3 Turbidity

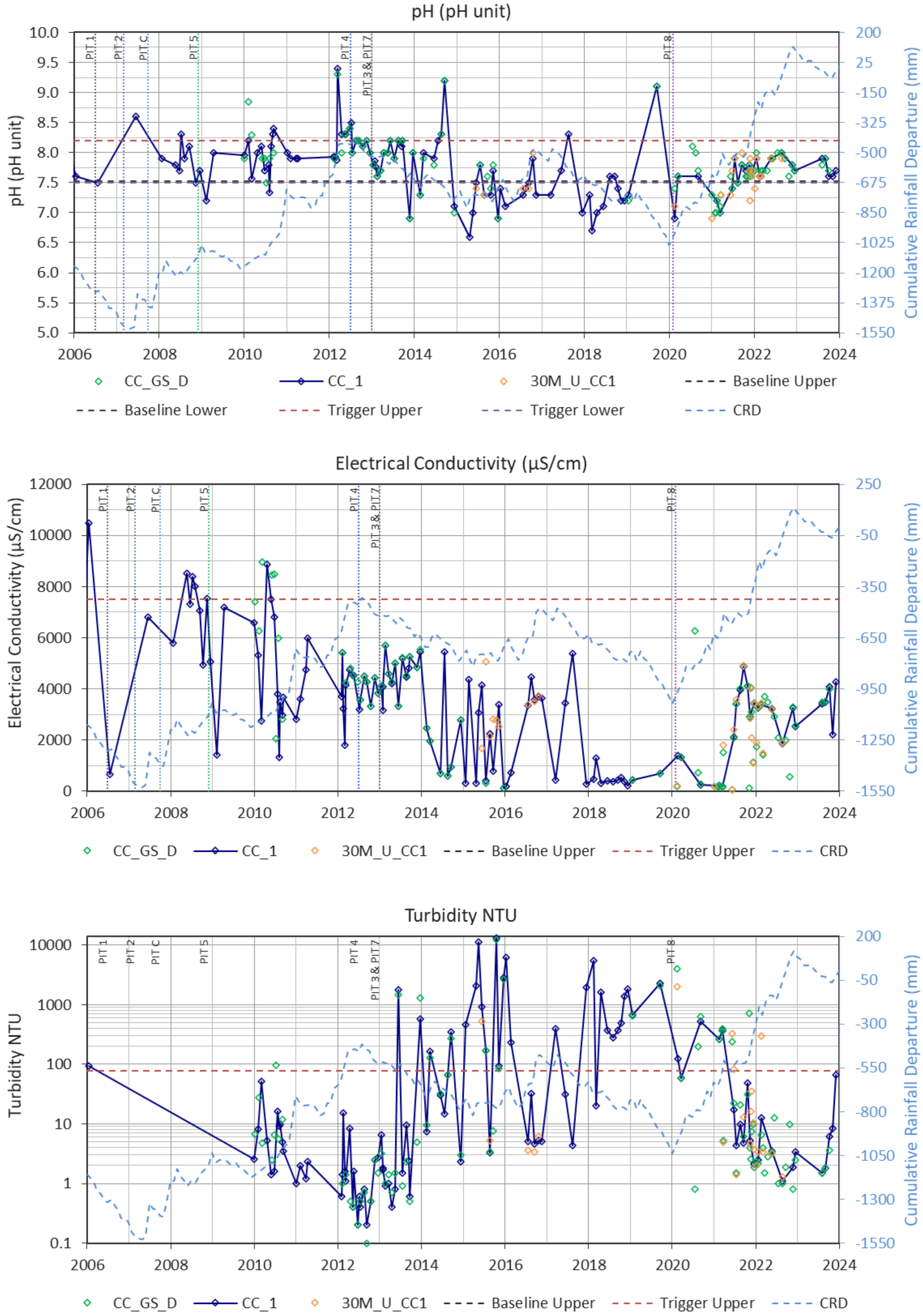
All turbidity observations at Cumbo Creek Downstream monitoring sites in 2023 were below the trigger level (77 NTU).

The following comments are made regarding water sampling at downstream Cumbo Creek sites:

- Previous investigations of surface water quality at WCM (SLR, 2021 and SLR, 2020) have identified the public Ulan-Wollar Road to be a potential source of sediment at CC-1 and CC-GS-D monitoring sites. Sediment deposition is also noted at this location in aerial imagery from 2021. It is difficult to separate potential WCM impacts on Cumbo Creek from those caused by runoff from Ulan-Wollar Road.
- CC-1 and CC-GS-D are near each other and often sample the same analytes on the same date.

Sampling methodology of the downstream water quality sites at Cumbo Creek could be updated to consider the potential influence of Ulan-Wollar Road on water quality observations at the time of sampling. When flow is observed at sites downstream of Ulan-Wollar Road, runoff contribution from Ulan-Wollar Road should be checked, noted on sampling sheets, and photographed at the time of sampling. This will help evaluate the contribution of runoff from the road on the collected water sample.

Figure 11 Time-series water quality for Cumbo Creek Downstream



5.6 Wollar Creek

Wollar Creek is assessed using monitoring data from sites WOL1 and WOL2 (**Figure 1**). The sites are located along Wollar Creek to the east and south of WCM, with WOL1 located downstream of the confluence between Wilpinjong and Wollar Creeks. The Wollar Creek monitoring sites are located approximately 5 km from the current extent of the WCM mining activity.

5.6.1 pH

pH observations at Wollar Creek have been relatively stable from 2015 through 2023. WOL-1 and WOL-2 observations have been marginally higher than the 80th percentile value (pH 8.0), with a range of pH 7.8 to 8.6 in WOL-1 and pH 8.0 to 8.4 seen in WOL-2.

The observations at both sites are generally consistent with observations from previous years though WOL-2 has shown a general increase in pH over time, with 2023 values higher than previously observed.

5.6.2 Electrical Conductivity

EC observations at both Wollar Creek monitoring locations show some influence from rainfall as well as baseflow from more saline groundwater.

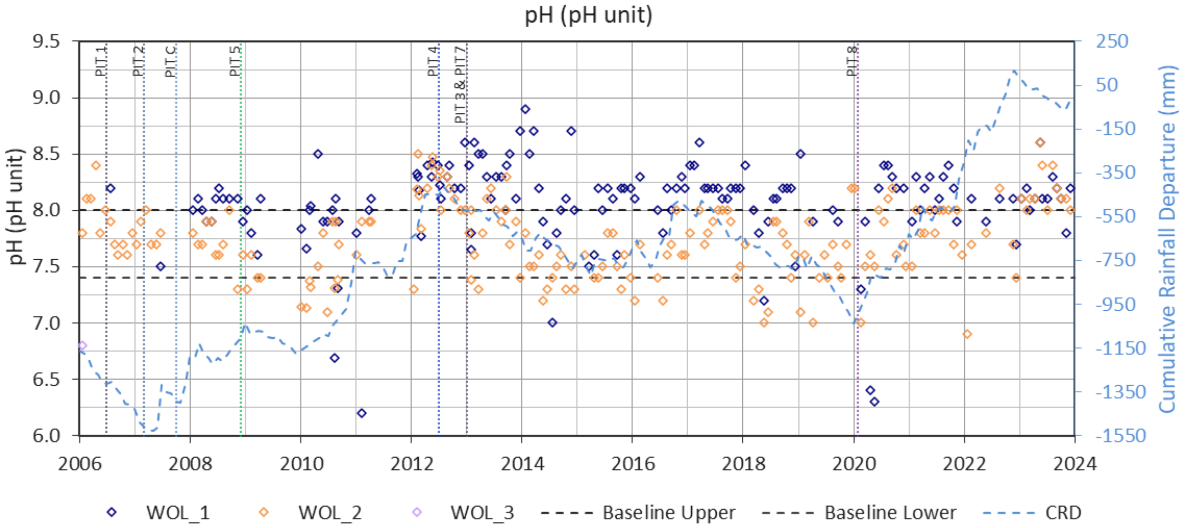
In 2023, below average rainfall caused an increase in salinity in Wollar Creek. However, all EC observations are below the 80th percentile baseline values (<3,500 µS/cm) throughout 2023.

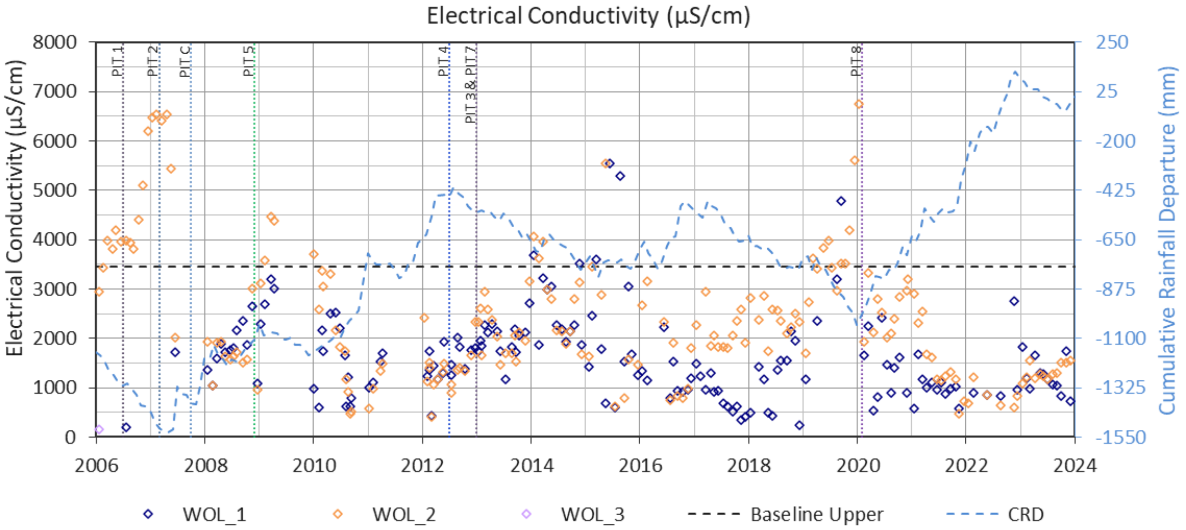
5.6.3 Turbidity

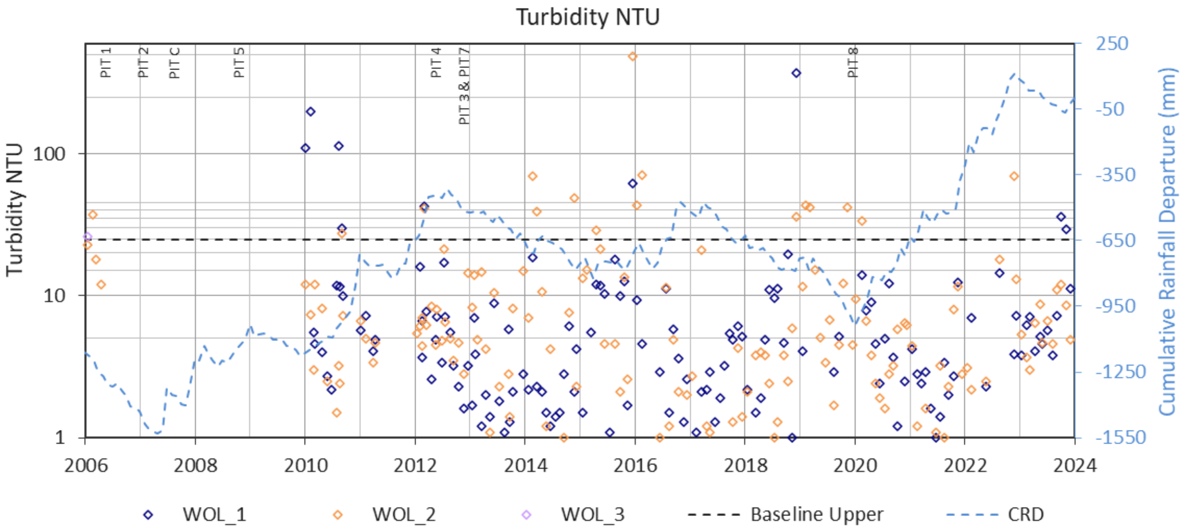
Turbidity observations at Wollar Creek monitoring sites have been relatively stable from 2015 through 2023 and have generally been recorded below the 80th percentile of baseline data collected from 2004-2009 (25 NTU).

Turbidity observations during 2023 at Wollar Creek monitoring sites were below the 80th percentile baseline (25 NTU) aside from two observations at WOL-1 (October and November 2023), potentially linked to the increase in rainfall over these two months. Overall, NTU readings for 2023 are consistent with the observed trend for the entire monitoring period (2015-2023).

Figure 12 Time-series water quality for Wollar Creek







6.0 Conclusions and Recommendations

Analysis of the available surface water data in 2023 indicates a lower-than-average rainfall influenced flow and water quality conditions. The only TARP exceedances experienced in 2023 are that associated with high pH in the Wilpinjong Creek Downstream monitoring locations.

SLR has completed the preliminary investigation of the pH trigger exceedances within the WCM surface water monitoring network (SLR, 2023c) at Wilpinjong Creek downstream sites, consistent with the trigger action response plan (TARP) for surface water quality (SWMP Table 15 – WCPL, 2017). The investigation evaluated whether each trigger exceedance was directly caused by or predominantly as a result of activities being undertaken by, or directly as a result of the mine. SLR (2023b).

Recommendations have been provided to WCPL regarding additional investigation into the drivers of the observed water quality changes to evaluate whether there is risk of material harm to the surface water ecosystems. Updated findings will look to identify appropriate values have been recommended to include additional analysis of flow volumes and water chemistry of Wilpinjong Creek, Cumbo Creek, and neighbouring catchments as well as a review of the potential impacts of a raised pH trigger level by a suitably qualified aquatic ecologist (SLR, 2023b).

If no influence of operations from WCM or upstream Moolarben can be attributed to water quality observations at surface water monitoring locations, future reviews, or updates of the SWMP could consider updating the baseline data periods to better capture fluctuations under normal conditions.

7.0 References

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Making Sustainability Happen

Wilpinjong Creek Surface Water pH Trigger Exceedance Investigation

Wilpinjong Coal Mine

Wilpinjong Coal Pty Ltd

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Wilpinjong
NSW 2850

Prepared by:

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SLR Project No.: 665.10014.02407

26 October 2023

Revision: 3.0

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
1.0	7 September 2023	K Selvaratnam	A Basson, M Thienenkamp	A Basson
2.0	13 October 2023	K Selvaratnam	A Basson, M Thienenkamp	A Basson
3.0	26 October 2023	K Selvaratnam	A Basson, M Thienenkamp	A Basson

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Wilpinjong Coal Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

Executive Summary

Exceedances of the Wilpinjong Creek (Downstream) pH upper trigger value (7.7 pH) have been observed at the Wilpinjong Creek (Downstream) sites of WIL_D2 and WIL_D from mid-2021.

A review of the exceedances of this trigger value, during the reporting period of 1 June 2021 to 4 July 2023, was undertaken to identify the plausible and possible causes of the exceedances.

The reporting period of 1 June 2021 to 4 July 2023 was selected as this period reflects the time when elevated pH levels were initially observed (June 2021) and the availability of data at the time of study commencement (June 2023).

The review found that the plausible and possible causes of the exceedances of the Wilpinjong Creek (Downstream) pH (upper) trigger value are:

- Emergency discharge of EMW (temporary influence).
- Cumbo Creek influencing the water signature of Wilpinjong Creek (Downstream).
- Cumbo Creek contributing bicarbonate alkalinity to Wilpinjong Creek (Downstream).
- Potential mine water seeping from Pit 2 to Wilpinjong Creek (unlikely, but not excludable as a potential contributing cause).
- Higher pH surface water within the broader catchment, beyond the influence of WCM activities, indicates the possibility of natural variation also contributing. High rainfall conditions in late 2022 may have resulted in the migration of stagnant surface waters which may have contributed to elevated pH levels across the catchment.

On this basis, it is likely that a combination of factors caused the exceedance of the Wilpinjong Creek (Downstream) pH (Upper) trigger value and it is unlikely that the observed pH exceedances were directly caused by, or predominantly the result of, WCM mining activities.

The study found that it is unlikely that material harm to the surface water ecosystem has occurred. Given that higher pH surface water is naturally present locally, beyond the influence of WCM activities, the pH exceedances at Wilpinjong Creek (Downstream) are unlikely to have posed a threat to the health of local and downstream ecosystems.

Additionally, it is noted that the Wilpinjong Creek (Downstream) pH (upper) trigger value was selected equal to the Wilpinjong Creek (Upstream) baseline 80th percentile pH value (i.e., 7.7), which was lower than the 80^{th} percentile Wilpinjong Creek (Downstream) value. Conceptually, it is expected that Cumbo Creek, and other minor drainages, may influence the water quality of Wilpinjong Creek (Downstream). Therefore, it seems inappropriate that the Wilpinjong Creek (Downstream) pH (upper) trigger value is the same as the Wilpinjong Creek (Upstream) pH (upper) trigger value.

The use of an inappropriate trigger value may have contributed to over-reporting of exceedances of the Wilpinjong Creek (Downstream) pH (upper) trigger level.

It is recommended that the original Wilpinjong Creek (Downstream) pH (upper) trigger level of pH 7.7 be reviewed and adjusted to a more appropriate value.

Further studies would be required to determine an appropriate trigger level. These studies would involve additional analysis of flow volumes and water chemistry of Wilpinjong Creek, Cumbo Creek, and neighbouring catchments as well as a review of the potential impacts of a raised pH trigger value by a suitably qualified aquatic ecologist.

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1.0 Introduction

1.1 Background

The Wilpinjong Coal Mine (WCM) is owned and operated by Wilpinjong Coal Pty Limited (WCPL), a wholly owned subsidiary of Peabody Energy Australia Pty Ltd (Peabody). The Mine is an existing open cut coal mining operation situated approximately 40 kilometres (km) north-east of Mudgee, near the Village of Wollar, in central New South Wales (NSW). The mine produces thermal coal products which are transported by rail to domestic customers for use in electricity generation, and to port for export.

SLR Consulting Australia Pty Ltd (SLR) have been commissioned by WCPL to investigate the pH levels of Wilpinjong Creek and the exceedances of the pH (Upper) trigger observed at the Wilpinjong Creek (Downstream) monitoring sites of WIL_D and WIL_D2 since July 2021.

Surface water impact trigger values for WCM are outlined in the Wilpinjong Coal Surface Water Management Plan (SWMP) (Peabody, 2017). The SWMP defines Water Quality Impact Assessment Criteria for downstream water quality. In the event that the pH trigger level is exceeded, the Trigger Action Response Plan (TARP) for surface water quality will be implemented (Peabody, 2017).

The WCM surface water monitoring network is presented in **Figure 1** and the impact trigger values and conditions for pH is summarised in **Table 1**.

Figure 1 WCM Surface Water Monitoring Network (Peabody, 2017)

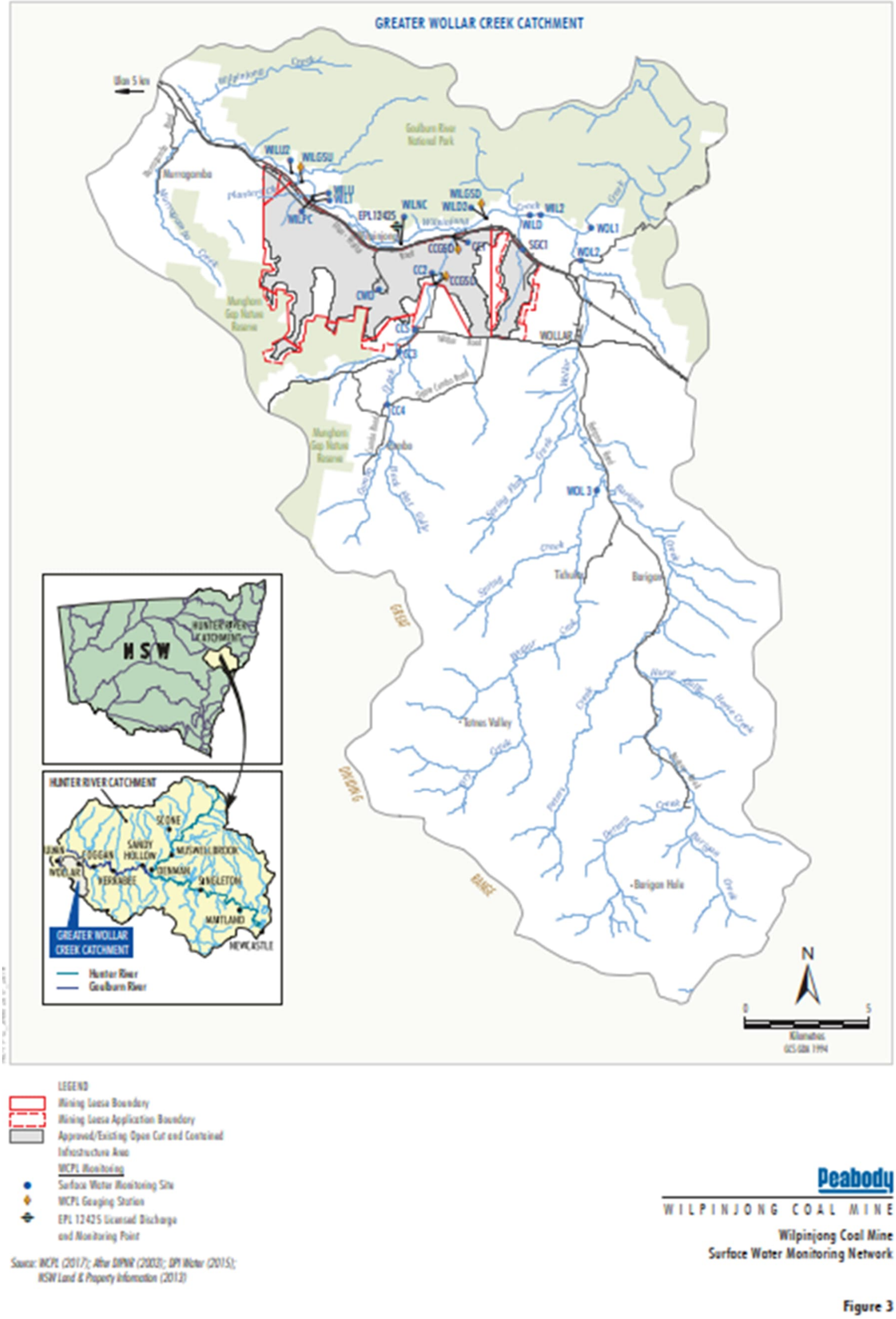


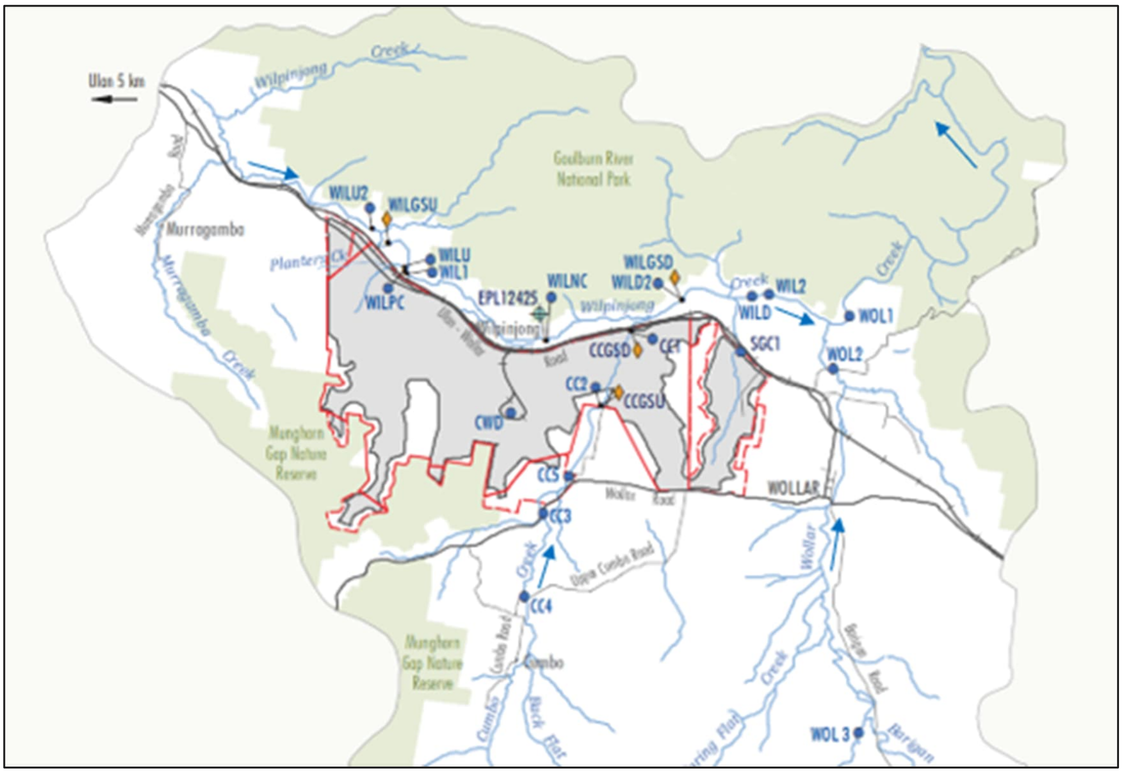
Table 1 Water Quality (pH) Impact Assessment Criteria (adapted from Peabody, 2017)

Monitored Creek	Monitoring Site	Parameter	Trigger Value	Trigger[1]	20th/80th Percentile Values[2]
Wilpinjong Creek (Downstream)	WIL_NC WIL_D2 WIL_D WIL_2	pH (lower)	6.9 pH	If recorded value at the monitoring site is less than 6.9 pH for 3 consecutive readings.	7.4 pH
		pH (upper)	7.7 pH	If recorded value at the monitoring site is greater than 7.7 pH for 3 consecutive readings.	7.9 pH
Cumbo Creek (Downstream)	CC1	pH (lower)	7.5 pH	If recorded value at the monitoring site is less than 7.5 pH for 3 consecutive readings.	7.52 pH
		pH (upper)	8.2 pH	If recorded value at the monitoring site is greater than 8.2 pH for 3 consecutive readings.	8.2 pH

[1]Trigger is only considered to have been exceeded if the recorded value at monitoring site is greater than (or less than for lower pH Trigger) all values from the upstream monitoring sites sampled on the same day. In the event that a single result is recorded above/below the 80th/20th percentile value, WCPL will undertake a preliminary investigation to ascertain whether the result was caused by an obvious anomaly or whether further testing is required.
[2]Baseline Water Quality Data per Table 8 SWMP (Peabody, 2017)

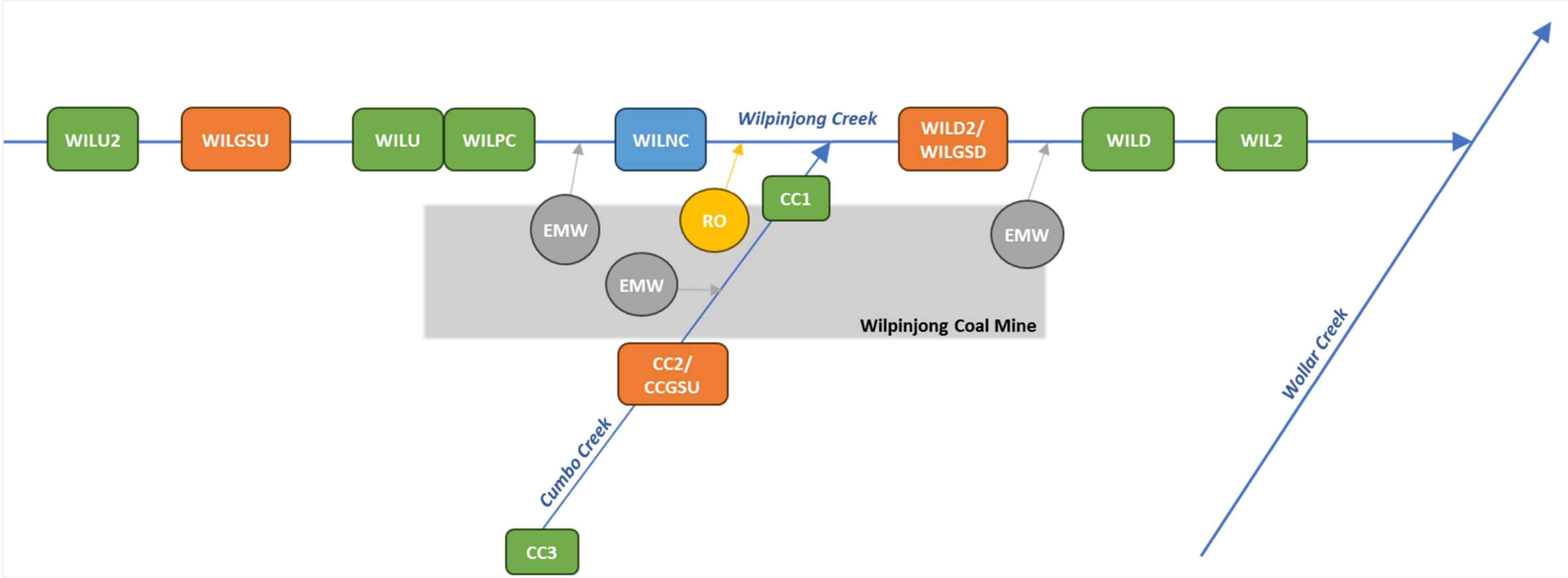
In the vicinity of WCM, Wilpinjong Creek flows from the west to the east, while Cumbo Creek and Wollar Creek flow from the south in a northerly direction to meet Wilpinjong Creek, as depicted in **Figure 2**.

Figure 2 WCM Catchment (adapted from Peabody, 2017)



A schematic of the WCM surface water system and monitoring locations are presented in **Figure 3**.

Figure 3 Wilpinjong Creek Surface Water System Schematic



The WCM Annual Review 2022 Surface Water Compliance report (SLR, 2023a) established that:

- The only exceedances of the SWMP Water Quality Impact Assessment Criteria were the pH (upper) trigger value at Wilpinjong Creek (Downstream);
- The exceedance sites were WIL-D2 and WIL-D;
- The exceedances during 2022 included five (5) consecutive observations above the pH (upper) trigger value at WIL-D2 and three (3) consecutive observations above the pH (upper) trigger value at WIL-D; and
- Due to the exceedances, it was recommended that the pH (upper) trigger value for Wilpinjong Creek (Downstream) be reviewed and consider amending it to reflect the 80th percentile baseline value.

Exceedances of the Wilpinjong Creek (Downstream) pH upper trigger value (7.7 pH) have been observed at the Wilpinjong Creek (Downstream) sites of WIL_D2 and WIL_D from mid-2021. During this time, elevated pH levels were recorded at the Wilpinjong Creek (Upstream) sites of WIL_U and WIL_U2.

The trigger values defined in the Water Quality Impact Assessment Criteria are used to initiate investigations into surface water quality (Peabody, 2017). The recently observed exceedances have necessitated a review of the relevant monitoring data to establish if the observed pH trends (1) are potentially caused by mining activities, (2) have potential to adversely harm the environment and/or if these are potentially within the natural variability of the system. A summary of the action items identified by the TARP and where they are addressed in the report is presented in **Table 2**.

Table 2 TARP Implementation – Summary

No.	Required Activity	Relevant Report Section
1	Notify the WCPL ECM.	N/A
2	Check and validate the data which indicates the trigger conditions have been exceeded.	Section **3.1**
3	Notify DP&E, EPA, DPI Water and other relevant agencies as soon as that an exceedance of the trigger level has occurred and investigation will be undertaken.	N/A
4	Collect supplementary samples upstream and downstream of the Wilpinjong Coal Mine.	Section **3.2**
5	Assess any changes to WCPL activities and inspect all relevant Erosion and Sediment controls.	Section **2.2**
6	Assess conditions (climatic, hydrological, hydrogeological and changes in land use activities in the catchment – including other mining activities and riparian revegetation works), preceding and during the event and assess their impact.	Section **2.0**
7	Investigate changes in continuously recorded salinity values with time and between stream gauging stations to assess if any trends are evident.	Section **2.3**
8	Identify plausible and possible causes of the trigger.	Section **4.0**
9	Decide if the trigger was directly caused by or predominantly as a result of activities being undertaken by or directly related to the Mine.	Section **5.0**

No.	Required Activity	Relevant Report Section
10	If required, engage and suitably qualified aquatic ecologist or similar to determine if any material harm to the surface water ecosystems have occurred.	N/A
11	Provide a preliminary investigation report to DP&E, EPA, DPI Water and relevant agencies within 7 days of identifying the trigger.	N/A

1.2 Scope

The scope of this report is to:

- Synthesise and review the exceedances of the Wilpinjong Creek (Downstream) pH upper trigger value observed at the Wilpinjong Creek (Downstream) monitoring sites of WIL_D and WIL_D2, during the reporting period of 1 June 2021 to 4 July 2023;
- Identify plausible and possible causes of the observed pH exceedances; and
- Assess if material harm to the surface water ecosystem has potentially occurred.

1.3 Methodology

A reporting period has been selected as 1 June 2021 to 4 July 2023. This period reflects the time when elevated pH levels were initially observed (June 2021) and the availability of data at the time of project commencement (June 2023).

A review of the exceedances of the Wilpinjong Creek (Downstream) pH (upper) trigger value during the reporting period includes an analysis of:

- Contextual information (including climate, hydrological, hydrogeological, land use change and salinity observations);
- Recent monitoring data from sampling events between 2015 and 2023;
- Historical monitoring data from sampling events between 2004 and 2014;
- Possible and plausible causes of the exceedances of the Wilpinjong Creek (Downstream) pH (Upper) trigger value;
- Licensed discharges to Wilpinjong Creek;
- Mine water seepage;
- Surrounding watercourses;
- Catchment variation; and
- Trigger value application.

The following data was reviewed in preparation of this report:

- Updated water monitoring database provided by WCM on 18 July 2023 (Peabody, 2023).

2.0 Context

2.1 Climate

New South Wales experienced an exceptionally wet year in 2022 with the state-averaged annual total being the second highest on record (Bureau of Meteorology, 2023). **Table 3** displays the monthly and annual rainfall records for 2016-2022 compared to the long-term averages at the Wollar (Barrigan St) Bureau of Meteorology (BOM) station 062032. **Table 3** clearly demonstrates the very wet conditions experienced in 2022 following the wet conditions experienced through 2020 and 2021, which was preceded by drought conditions from 2017 to the end of 2019. The annual total rainfall recorded in 2022 was 989 mm, 65% higher than the long-term average of 593.8 mm.

Other notable wet years, since WCM operations commenced and not included in **Table 3**, are 2007 (840 mm), 2008 (785.5 mm), 2010 (1,084 mm), 2012 (712.2 mm). Notable dry years during WCM operations, not included in **Table 3** are 2006 (330.9 mm) and 2009 (481.2 mm).

Significant variation in annual rainfall is a key influence on surface water flow and can influence water chemistry. Values below 20% of the average and more than 80% of the average have been highlighted.

Table 3 Long Term Average Rainfall and Recent Rainfall (Monthly and Annual)

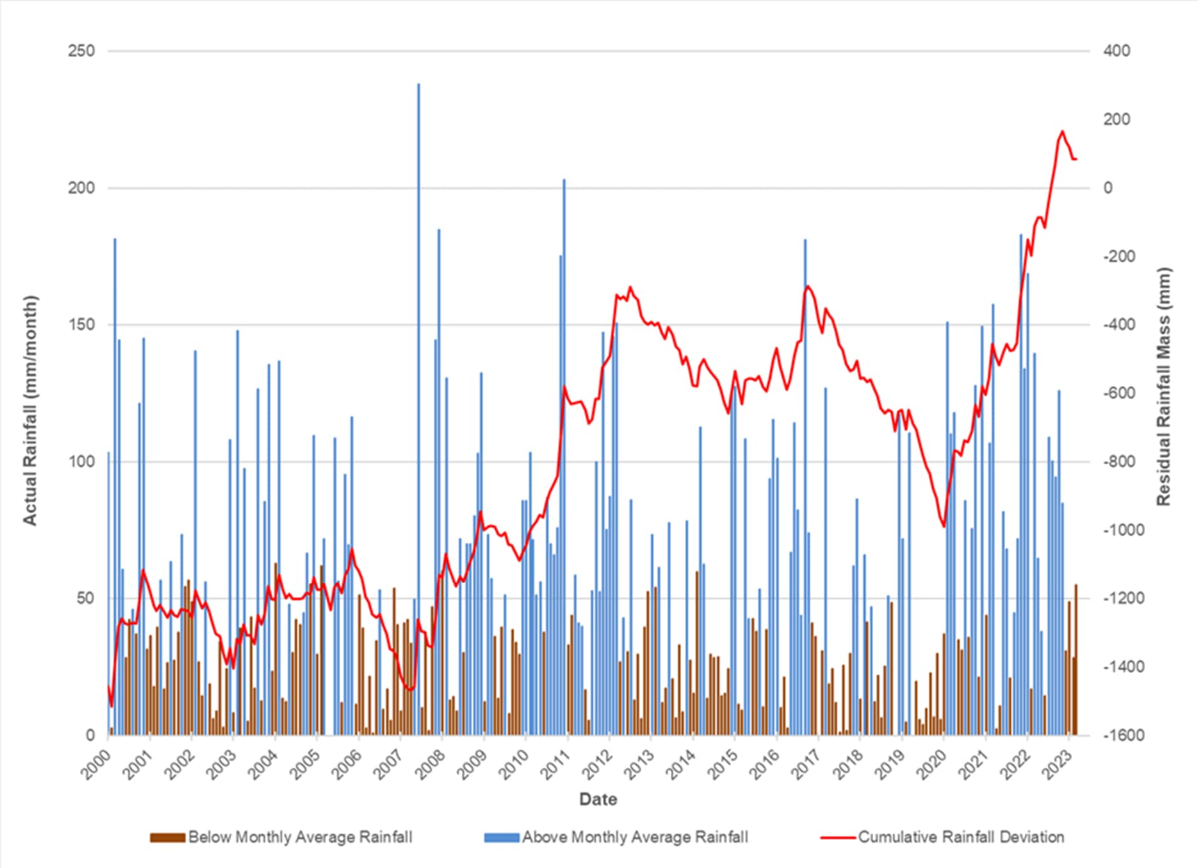
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Ave	***67***	***63***	***55***	***39***	***37***	***44***	***43***	***41***	***42***	***52***	***57***	***61***	***594***
2016	101	10	21	3	67	114	82	44	181	74	41	36	776
2017	13*	31	127	19	24	12	1	26	2	30	63	86	421
2018	13	66	41	47	13	22	7	26	51	49	44	118	496
2019	72	5	111	0	20	6	4	10	23	7	30	6	294
2020	37	151	110	118	35	31	86	36	76	128	22	149	979
2021	44	107	158	3	11	82	68	21	45	72	183	134	927
2022	169	17	140	65	38	15	109	101	95	126	85	31	989
2023	49	28.5	55	43.5	4	30.5	-	-	-	-	-	-	-

* No rainfall recorded at Wollar (Barrigan St). Rainfall from Bylong (Glenview) – 062107 used.

The cumulative rainfall departure (CRD) shows trends in actual rainfall over time relative to the long-term average and provides a historical record of relatively wet and dry periods. A positive slope in the CRD indicates periods of above average rainfall, while a negative slope indicates periods of below average rainfall. A level trace indicates rainfall conditions are equal to average rainfall conditions.

For the calendar years 2020- 2022 WCM experienced significantly above average rainfall conditions, as indicated by a sharp upward trend in the CRD. This contrasts with the declining CRD trend preceding this period from mid-2017 to the end of 2019 (**Figure 4**).

Figure 4 Monthly Rainfall and CRD (BOM station 062032)



2.2 Land Use Changes, Hydrology and Hydrogeology

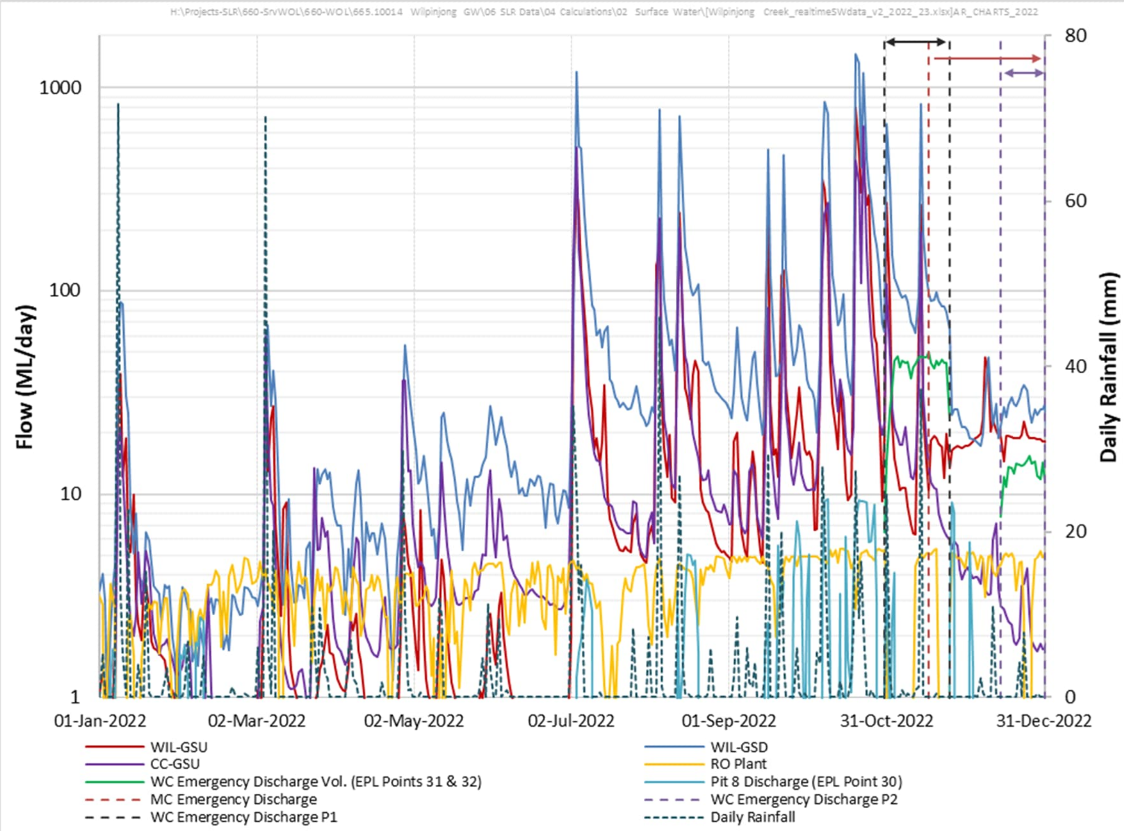
The following section presents and discusses daily flow data from three continuous surface water monitoring gauges on Wilpinjong Creek (WILGSU and WILGSD) and Cumbo Creek (CCGSU). Observed flow trends are reviewed against rainfall and discharge volumes throughout 2022.

The two Wilpinjong Creek gauging stations have been recording since January 2012. The catchment area reporting to the upstream site (WILGSU) is 86 km^2 while the downstream site has a catchment area of 216 km^2. CCGSU on Cumbo Creek has been recording data since August 2015. **Figure 5** shows flow trends at these sites in 2022 compared to the Reverse Osmosis Plant (EPL Point 24), Pit 8 CWD (EPL Point 30) and emergency discharge volumes.

During 2022, flow at CCGSU fluctuates between 1 and 650 ML/day in response to rainfall events, with the highest flow events recorded in July (500 ML/day) and October (650 ML/day) 2022. CCGSU was observed to flow for the majority of the year with the exception of two brief periods in February and March 2022.

Flows were observed for the entire monitoring period in both WILGSU and WILGSD throughout 2022, consistent with above average rainfall. WILGSU (0.25 - 802 ML/day) and WILGSD (1.5 - 1,200 ML/day). Wilpinjong Creek flow monitoring sites maintained higher flow rates compared to CCGSU in late 2022. This is due to discharge of mine water under emergency and licenced provisions by both Wilpinjong and Moolarben Coal supplementing natural flow.

Figure 5 WCM Continuous Flow Monitoring



SLR is not aware of changes in land use activities in the catchment, such us mining activities and riparian revegetation works, occurring prior to and during the period of observed pH exceedances. SLR is not aware of any uncontrolled discharges to Wilpinjong Creek prior to and during the period of observed pH exceedances. The WCM site personnel are also not aware of any land-use changes nor unauthorized discharges occurring from the site during the reporting period.

2.3 Salinity Observations

Trends in Electrical Conductivity (EC) at WILGSU, WILGSD and CCGSU are generally influenced by the following factors:

- WILGSU is most strongly influenced by the rainfall trend, with limited contribution identified from groundwater (baseflow). EC at WILGSU is therefore generally relatively consistent (~1,000 µS/cm), with a minor inverse response to the rainfall trend (lower rainfall results in an increase in EC) likely resulting from increased evaporation and lower contribution of fresh water in periods of low rainfall.
- Flow at CCSGU is likely to have a persistent groundwater contribution that is sourced from weathered Permian coal measures. This results in observations of EC between 6,000 and 8,000 µS/cm). Declines in EC are observed following peak rainfall events.
- Flow at WILGSD is influenced by upstream flow from both Wilpinjong and Cumbo Creeks as well as the RO Plant, which all have different EC values. EC at WILGSD is therefore variable and related to the primary source of flow at any point in time.

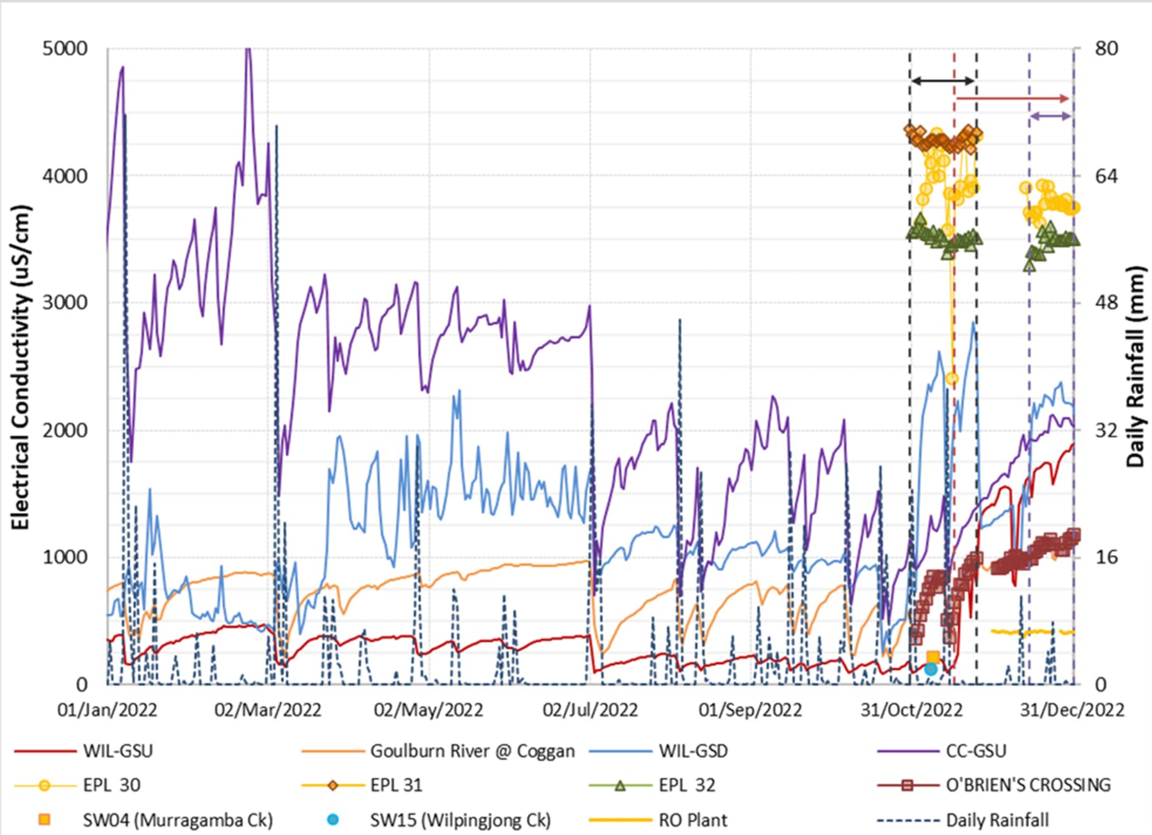
In 2022 continuous monitoring at Cumbo Creek (CCGSU) showed a declining EC trend (from ~4,000 µS/cm to 2,000 µS/cm) likely resulting from above average rainfall (

Figure 6). Both WILGSU and WILGSD displayed generally declining EC levels until late 2022 of around 500 µS/cm upstream and 1,000 µS/cm downstream. In late 2022, EC at Wilpinjong Creek sites increased in response to mine water discharge from Wilpinjong and Moolarben coal mines upstream as part of permitted emergency discharge provisions (**Figure 6**).

Water Quality Objectives (WQOs) for the protection of aquatic ecosystems are defined for the Hunter River catchment, in which WCM lies. The default trigger value (guideline value) for the water quality indictor of EC is 30 – 350 uS/cm for upland rivers in the Hunter River catchment (NSW Government, 2006). During the reporting period, continuous monitoring of EC exceeded the Hunter River EC guideline value for the protection of aquatic ecosystems, which is consistent with historical salinity trends at WCM.

Additional salinity studies, relevant to groundwater-surface water interaction for Cumbo Creek and Wilpinjong Creek, were undertaken in January 2022 (SLR, 2022) which found that rising EC in the alluvial bores adjacent to the waterways is likely the result of evaporative concentration of periodic surface water flow and due to the inferred low permeability of the alluvium, groundwater does not appear to be influenced by short term, lower EC surface water flows. The study recommended further investigations to reduce uncertainty in evaluating likely recharge mechanisms at individual groundwater monitoring bores.

Figure 6 Continuous EC Monitoring

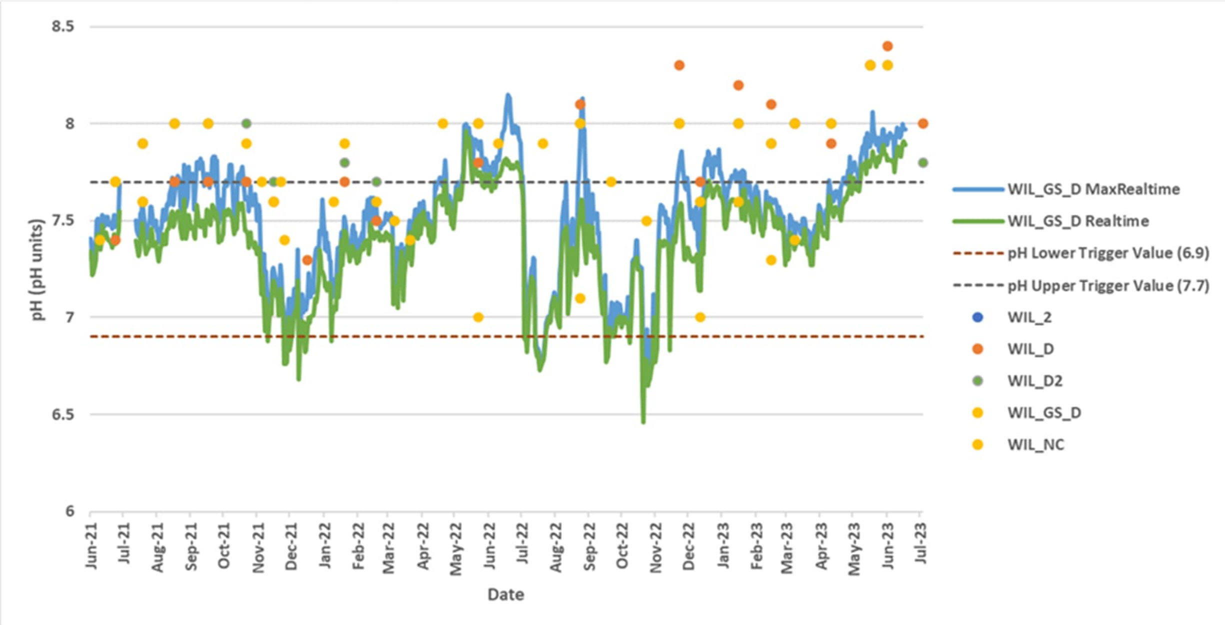


3.0 Wilpinjong Creek pH Trends

3.1 Quality Assurance and Quality Control

The pH level at Wilpinjong Creek (Downstream) obtained via continuous measurement at the gauging station is lower than the pH level via manual measurement for the same period, as shown in **Figure 7**. For the purpose of undertaking the scope of this report (Section **1.2**), it has been assumed that the manual measurements are valid and that the continuous measurements are not suitable for use.

Figure 7 Wilpinjong Creek (Downstream) – pH Continuous and Manual Measurement



3.2 Recent Monitoring Data

The pH results which were observed above the pH (upper) trigger value at WIL_D, WIL_D2 and WIL_NC along Wilpinjong Creek, during the reporting period, are listed in **Table 4** and presented in **Figure 8** and **Figure 9**.

Table 4 presents the Wilpinjong Creek (Downstream) pH observations which were above the Wilpinjong Creek (Downstream) pH (Upper) trigger value, and the associated Wilpinjong Creek (Upstream) pH observations which were recorded on the same day.

During the reporting period, pH was observed above the pH (upper) trigger value along Wilpinjong (Downstream) in 2021, 2022 and 2023 (WIL_D2 and WIL_NC) and from mid-2022 onwards at WIL_D, as shown in **Figure 8**.

Recent monitoring data (**Figure 8** and **Figure 9**) indicates that the 2022 pH trends generally appear to be continuing in 2023, with the pH level observed above the pH (upper) trigger value in January through July 2023 at WIL_D and WIL_D2.

A time series for pH at Wilpinjong Creek (downstream and upstream), Cumbo Creek and select environmental protection licence (EPL) discharge monitoring sites, including rainfall data, is presented in **Figure 10**. Continuous monitoring (**Figure 10)** indicates that generally, the pH level in Wilpinjong Creek (Upstream) has been lower than in Wilpinjong Creek (Downstream) and Cumbo Creek (Upstream). The exception to this trend is in late 2022, where the pH level in Wilpinjong Creek (Upstream) exceeded Wilpinjong Creek

(Downstream) and Cumbo Creek (Upstream), which discussed in Section **4.1** and Section **4.4**.

Table 4 Wilpinjong Creek (Downstream) Observations Above Wilpinjong Creek (Downstream) pH (Upper) Trigger Value

Date	Wilpinjong (Downstream)			Wilpinjong (Upstream)		
	WIL_D	WIL_D2	WIL_NC	WIL_PC	WIL_U	WIL_U2
24-06-2021	7.4	7.7	7.7	7.1	7.0	6.9
19-07-2021	7.6	7.9	7.6	6.9	7.2	-
17-08-2021	7.7	8.0	-	7.0	7.1	7.1
17-09-2021	7.7	8.0	-	7.0	7.0	7.0
22-10-2021	7.7	8.0	-	-	7.0	6.8
16-11-2021	7.6	7.7	-	7.2	7.2	7.2
17-12-2021	7.3	-	-	6.9	6.9	7.0
20-01-2022	7.7	7.8	-	7.0	7.1	6.8
18-02-2022	7.5	7.7	-	-	6.9	7.0
23-05-2022	7.8	8.0	7.0	7.2	7.0	6.7
24-08-2022	8.1	8.0	7.1	6.9	6.9	6.8
23-11-2022	8.3	8.0	8.0	7.8	7.4	7.5
12-12-2022	7.7	7.6	7.0	7.6	7.6	7.6
16-01-2023	8.2	8.0	7.6	8.0	8.0	8.1
15-02-2023	8.1	7.9	7.3	-	7.2	7.4
09-03-2023	8.0	8.0	7.4	-	7.3	-
11-04-2023	7.9	8.0	-	-	7.1	-
17-05-2023	8.3	8.3	-	-	-	8.2
02-06-2023	8.4	8.3	-	-	-	7.0
04-07-2023	8.0	7.8	-	-	-	-

"-" data not available.

Values exceeding the 7.7 pH trigger as well as the upstream values are indicated in red.

Figure 8 Wilpinjong Creek (Downstream) pH

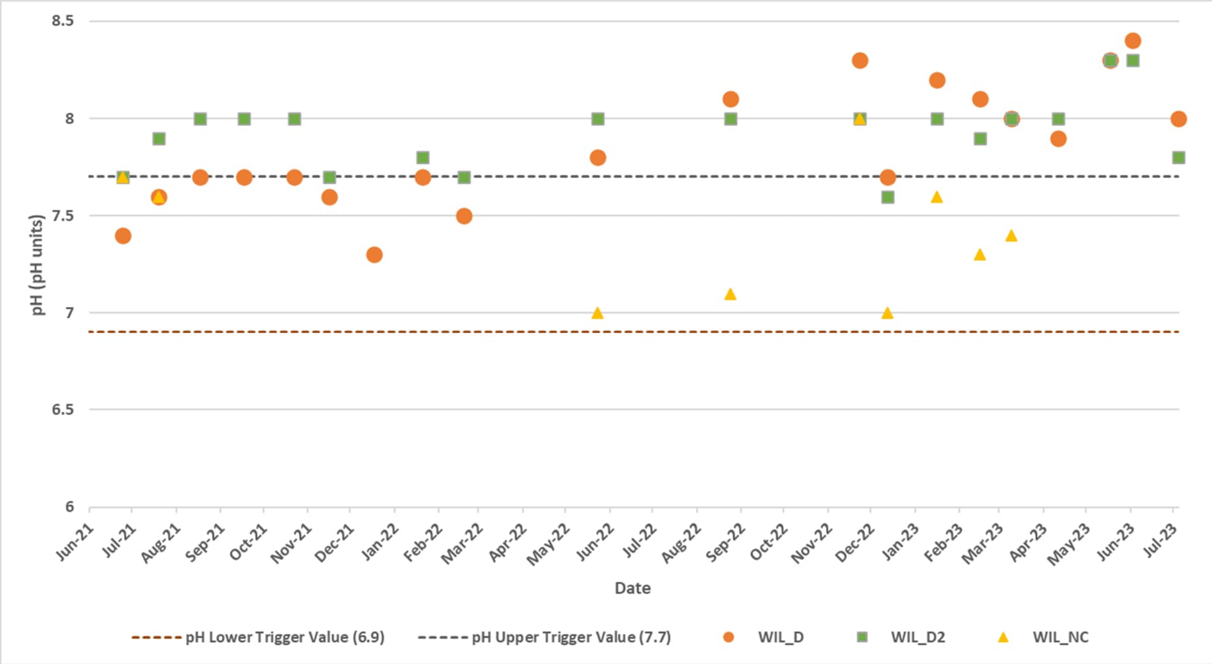


Figure 9 Wilpinjong Creek (Upstream) pH

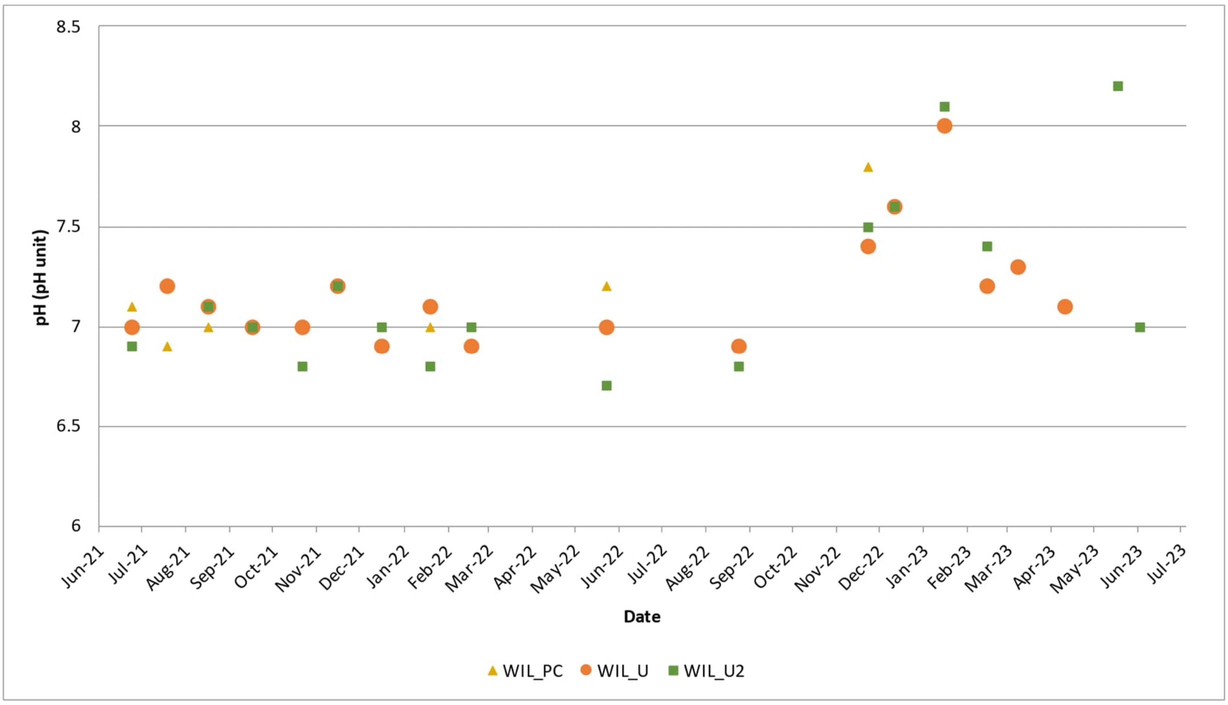
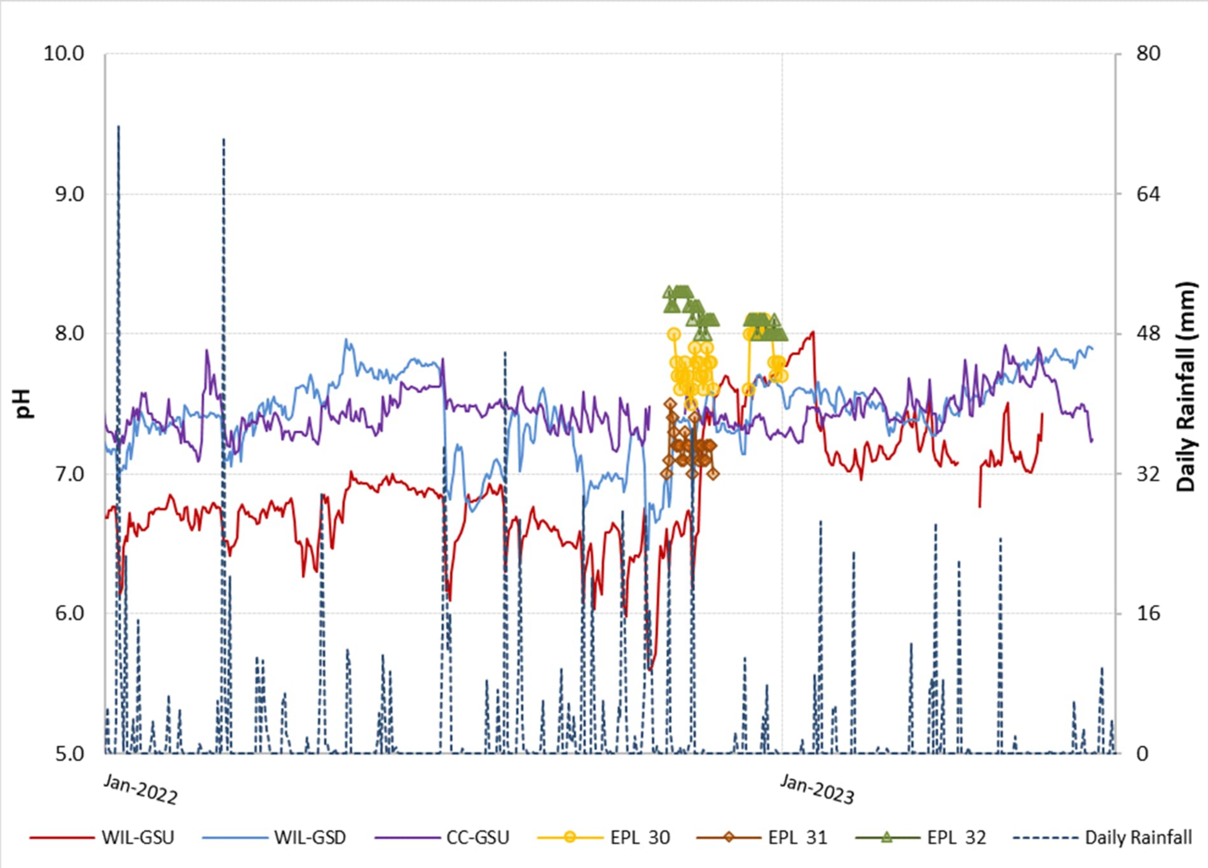


Figure 10 Wilpinjong Creek, Cumbo Creek and EPL Discharges Continuous Monitoring Real Time Data – pH



3.3 Historical Monitoring Data

Historical monitoring data from sampling events from 2004 onwards is presented in **Figure 11** and **Figure 12**. Over the 22-year monitoring record, the pH level at Wilpinjong (Upstream) has been generally lower than at Wilpinjong (Downstream) although the variance in pH between the reaches is within approximately one pH unit.

SLR understands that mining at WCM commenced in September 2006. The reporting period pH levels are contextualised by the historical monitoring data, with the relevant summary statistics presented in **Table 5** and **Table 6**.

The pre-mining water quality can be characterised by higher average pH at Wilpinjong Creek (Downstream) than at Wilpinjong Creek (Upstream) (**Table 5**).

On average, at Wilpinjong Creek (Downstream) sites, a lower pH was observed pre-mining than in the reporting period (**Table 6**).

Figure 11 Wilpinjong Creek (Upstream) pH – Historical

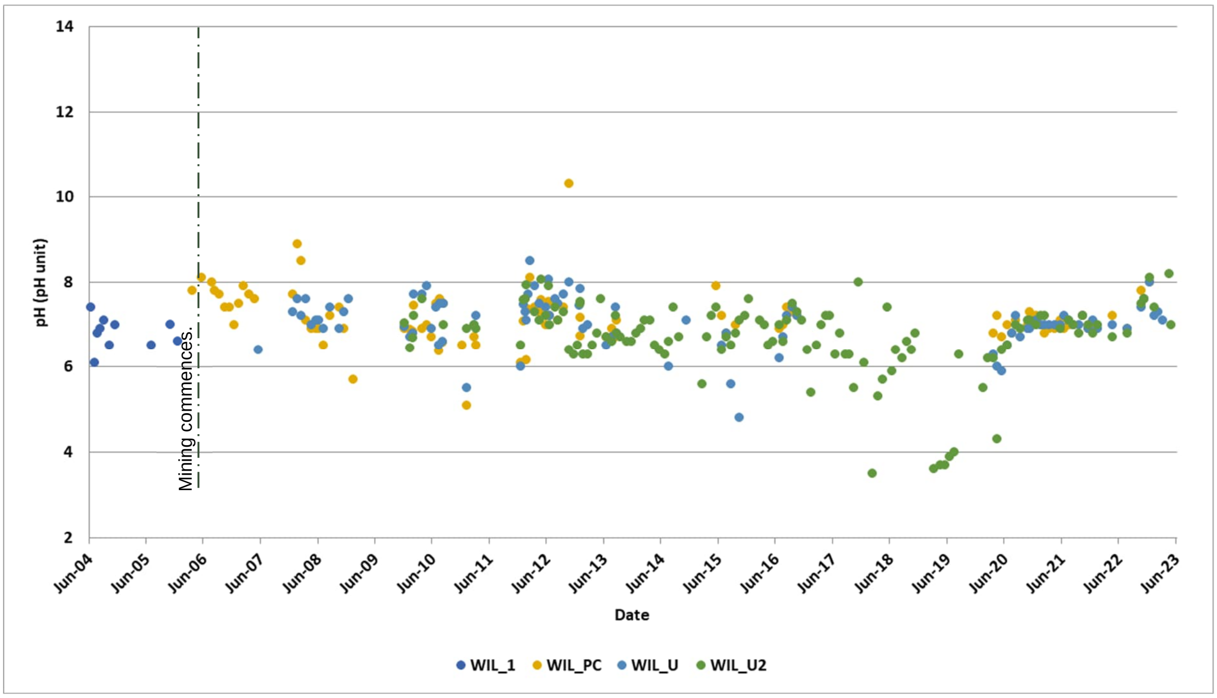


Figure 12 Wilpinjong Creek (Downstream) pH – Historical

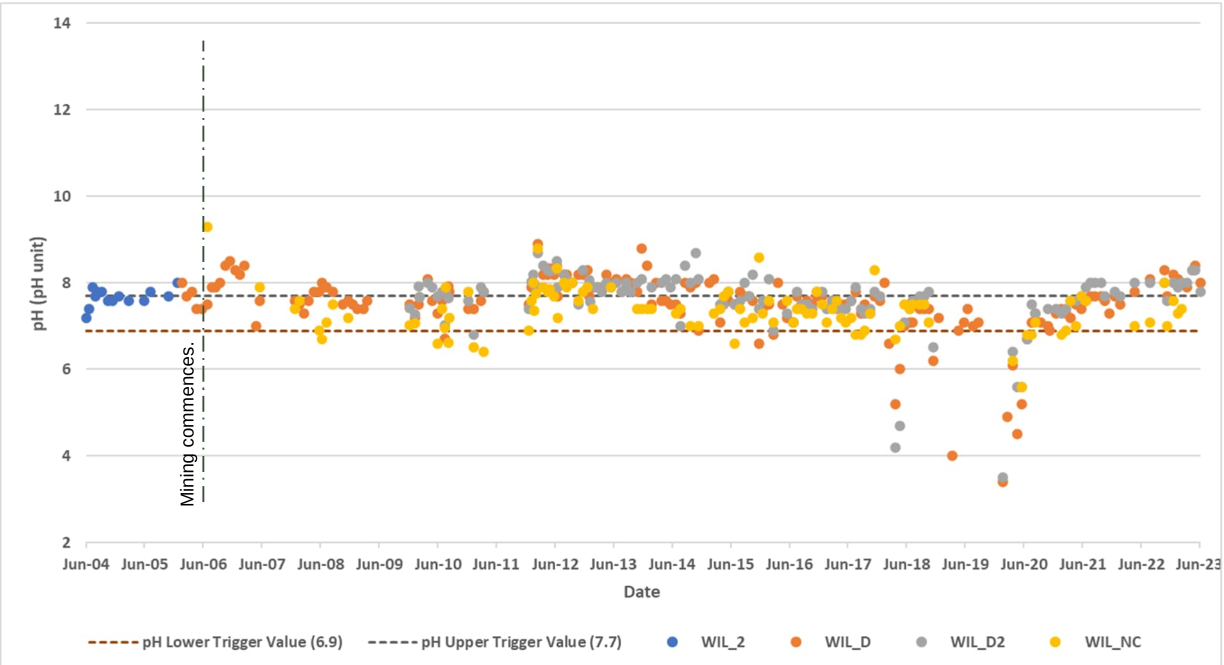


Table 5 Wilpinjong Creek Historical pH

Pre-mining (June 2004 – August 2006)	Minimum pH	Maximum pH	Average pH
Wilpinjong Creek (Upstream) (WIL1_WIL_U, WIL_U2, WIL_PC)	6.1	7.8	6.9
Wilpinjong Creek (Downstream) (WIL_2, WIL_D, WIL_D2)	7.2	8.0	7.7

Table 6 Wilpinjong Creek (Downstream) (WIL_2, WIL_D, WIL_D2) Historical and Recent pH

Time	Minimum pH	Maximum pH	Average pH
Pre-mining (June 2004 – August 2006)	7.2	8.0	7.7
Post-mining (September 2006 – June 2023)	3.4	8.9	7.6
Reporting Period (June 2021 – July 2023)	7.3	8.4	7.9

4.0 Plausible and Possible Causes

4.1 Licensed Discharges to Wilpinjong Creek

4.1.1 RO Plant Discharges (EPL 24)

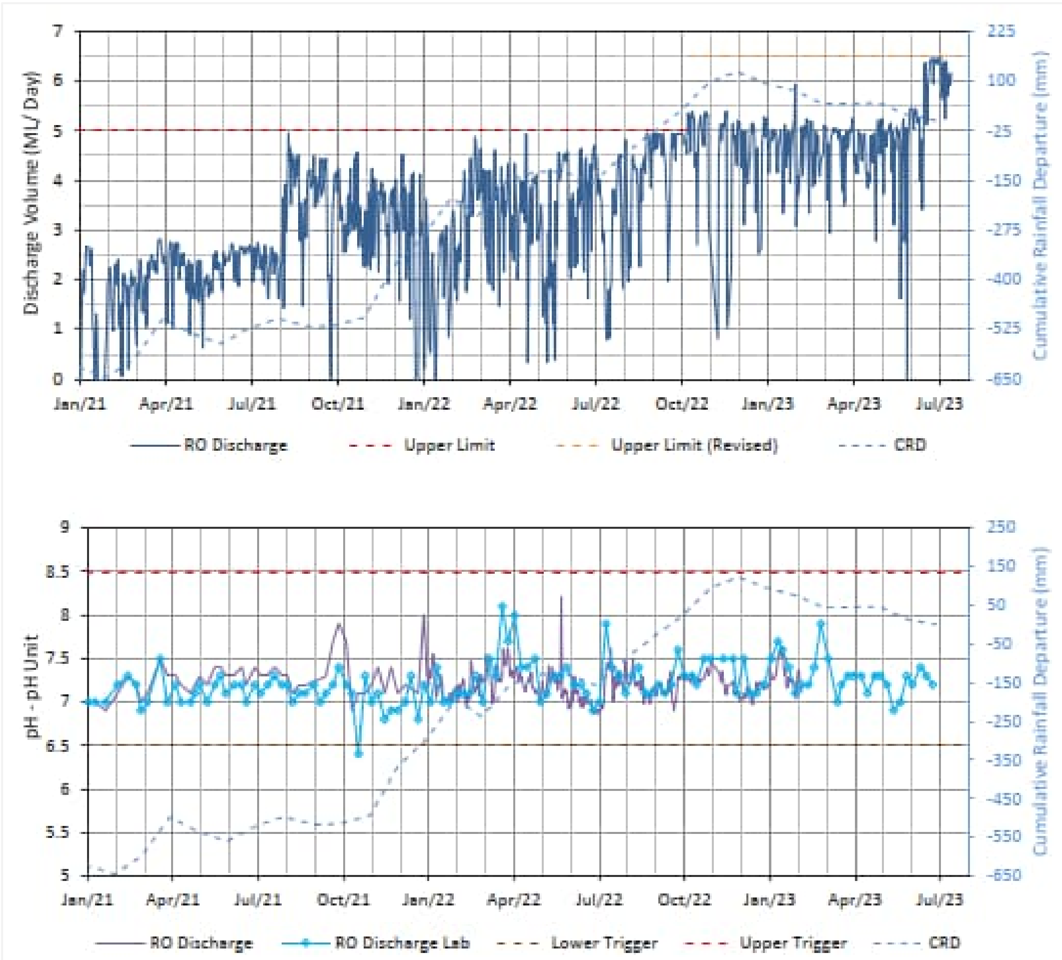
During the reporting period, the Reverse Osmosis (RO) Plant was discharging treated water from on-site water retention dams, under EPL12425 from EPL Point 24, with a pH of approximately 7 – 8 pH units (**Figure 13**).

The discharge limits for EPL Point 24 were not exceeded for any analytes during 2022 (SLR, 2023a) which indicates that the discharge from the RO Plant is not expected to have negatively impacted the Wilpinjong Creek (Downstream) water quality. In particular, the discharge from the RO Plant would have had only a minor impact on the Wilpinjong Creek (Downstream) pH levels.

It is noted that the pH discharge limits for EPL Point 24 is 6.5 – 8.5 pH units, which is 0.8 pH units above the Wilpinjong Creek (Downstream) pH upper trigger. However, in 2022, the pH of the RO Discharge exceeded a pH of 8 only briefly around April 2022, which does not correspond with the time periods when exceedances were observed.

Discharge from the RO Plant is unlikely to be driving exceedances of the pH (upper) trigger level at Wilpinjong (Downstream) as the pH of the RO Discharge has generally remained below a pH of 7.5 during the reporting period.

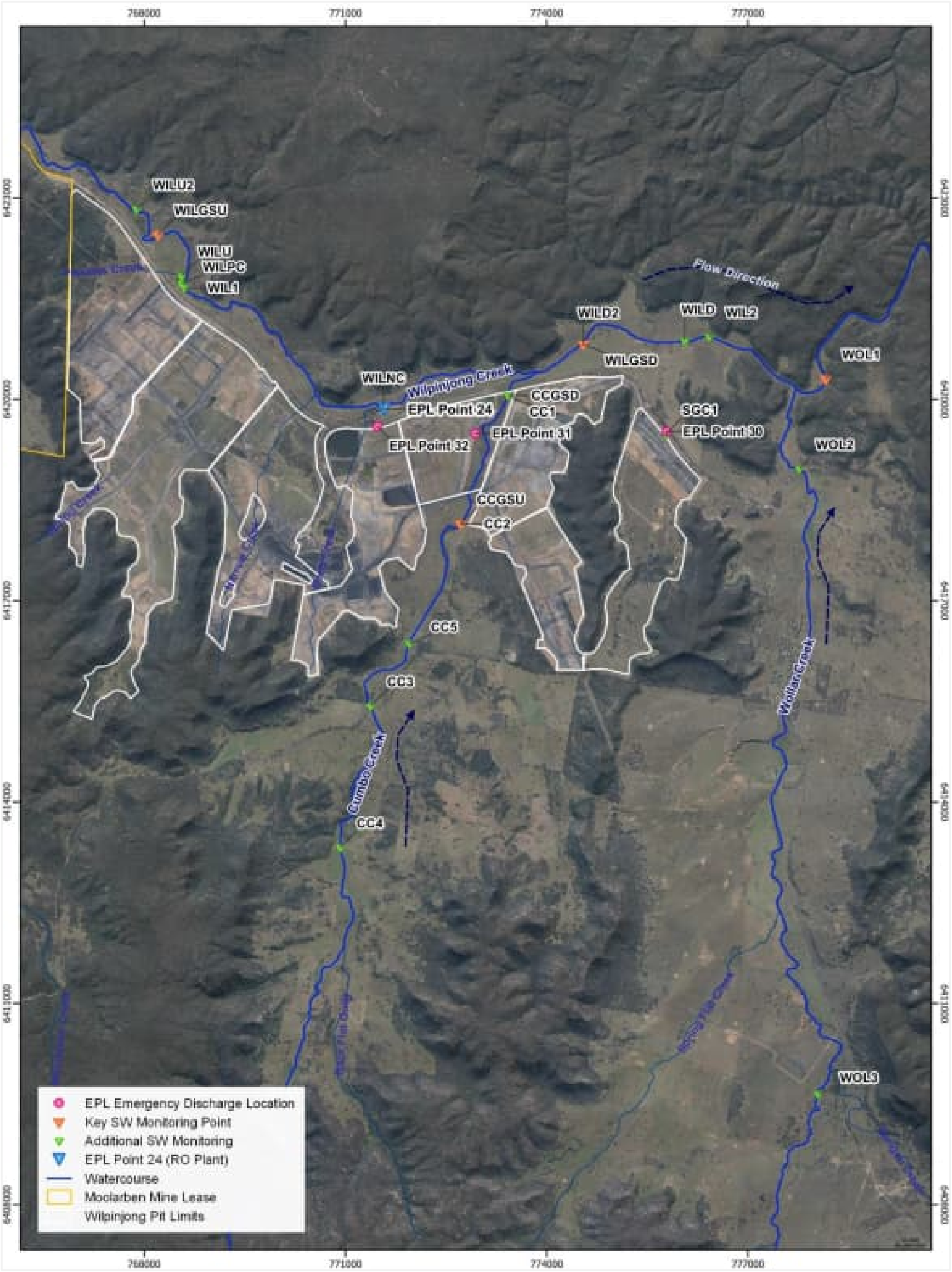
Figure 13 Reverse Osmosis (RO) Plant EPL12425 – Point 24 Volume, pH and EC



4.1.2 Emergency Discharges (EPL 30, 31, 32)

During the reporting period, WCM was granted an exemption by the NSW Environmental Protection Authority (EPA) to discharge excess mine water (EMW) to Wilpinjong Creek and Cumbo Creek (tributaries of the Goulburn River) at EPL 30, 31 and 32 ('emergency discharges'). The locations of the EPL discharge points are presented in **Figure 14**.

Figure 14 EPL Point Locations (adapted from SLR, 2023b)



EMW was discharged by WCM to the Wilpinjong Creek catchment during two periods (SLR, 2023b):

- Discharge Period 1: WCM discharge to Wilpinjong Creek and Cumbo Creek between 31 October 2022 and 25 November 2022 occurred at three locations (EPL Points 30, 31, 32) with a total permissible discharge of 71 ML/day. Discharge during this period was authorised under an exemption granted on 31 October 2022.

- Discharge Period 2: WCM discharge to Wilpinjong Creek between 15 December 2022 and 1 January 2023 occurred at two locations (EPL Points 30 and 32) with a total permissible discharge of 20 ML/day. Discharge during this period was authorised under an exemption granted on 14 December 2022.

As shown in **Figure 10,** the pH of the emergency discharges was generally higher than the pH of Wilpinjong Creek and Cumbo Creek, and the emergency discharges appear to have had a temporary influence of limited extent on the pH of Wilpinjong Creek. Following the commencement of the emergency discharges, the pH of Wilpinjong Creek (Downstream) increased until early January 2023 (**Figure 10**). Although, the observed pH did not increase to the full extent of the higher pH levels of the emergency discharges (**Figure 10**). Overall, the pH levels along Wilpinjong Creek have not returned to pre-emergency discharge levels (Figure 10). It is noted that during the period of emergency discharges, the pH of Wilpinjong Creek (Upstream) (i.e., located upstream of the emergency discharge locations) also increased until January 2023 despite not being influenced by the WCM emergency discharges.

Given that the increase in pH along Wilpinjong Creek was localised, short-term and limited in extent, the pH levels at Wilpinjong Creek (Downstream) from early January 2023 onwards are unlikely to be influenced by the WCM emergency discharges.

4.2 Mine Water Seepage

The water elevation in the Pit 2 water storage dam (‘Pit 2’) exceeds the creek bed elevation of Wilpinjong Creek throughout the reporting period, except in February 2022 (**Figure 15**). This gradient indicates that during the reporting period, there was a potential for mine water to seep from Pit 2 to Wilpinjong Creek.

The pH level of Pit 2 is represented by the pH level of ‘WTP Feedwater’, given the RO plant is supplied with feed water from here. It is noted that the RO Plant could also be supplied with feed water from other pits.

During the reporting period, the pH level of WTP Feedwater (i.e., Pit 2) is similar to the pH of Wilpinjong Creek (Downstream) (**Figure 16**). However, during this time, the pH level observed in groundwater piezometer bores located in between Wilpinjong Creek and Pit 2 (bores PZ20 and PZ21) is consistently lower than the pH of WTP Feedwater (i.e. Pit 2) and generally lower than the pH of Wilpinjong Creek (Downstream) (**Figure 16**). This observation suggests that water does not appear to be seeping from Pit 2 to Wilpinjong Creek, via a flow pathway aligning with PZ20 and PZ21. However, this observation is based on a limited dataset which is insufficient to exclude the possibility that mine water is seeping from Pit 2 to Wilpinjong Creek and driving the exceedances of the pH (upper) trigger level at Wilpinjong (Downstream). In addition, the creek bed elevation of Wilpinjong Creek was derived from LiDAR data and the presence of water in Wilpinjong Creek at the time of the survey being undertaken is unknown, which is a source of uncertainty in quantifying the creek bed elevation of Wilpinjong Creek. Although, the LiDAR data remains a suitable indication of the creek bed elevation of Wilpinjong Creek. It is also noted that, especially in the latter part of the reporting period, the pH of Wilpinjong Creek (Downstream) also regularly exceeded the pH of the water in Pit 2.

Further investigation of the pH levels and water quality of the groundwater piezometer bores which are located closest to the Pit 2 boundary, such as PZ15, PZ16, PZ17, PZ18 and PZ19 could be used to rule out the possibility of mine water seepage from Pit 2 contributing to the high pH in Wilpinjong Creek (Downstream).

Figure 15 Groundwater and Surface Water – Water Elevation

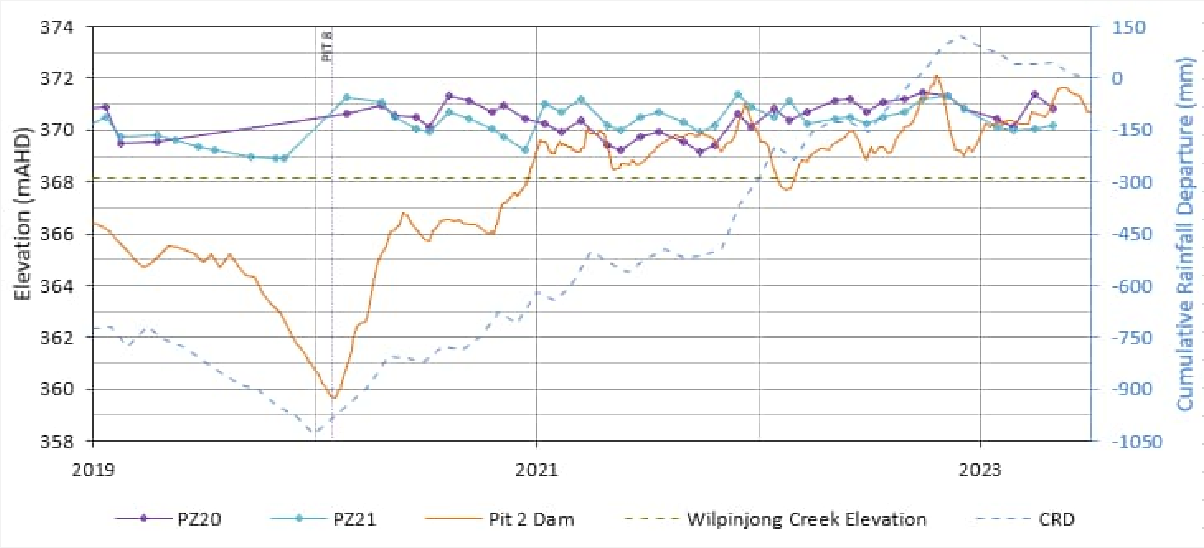
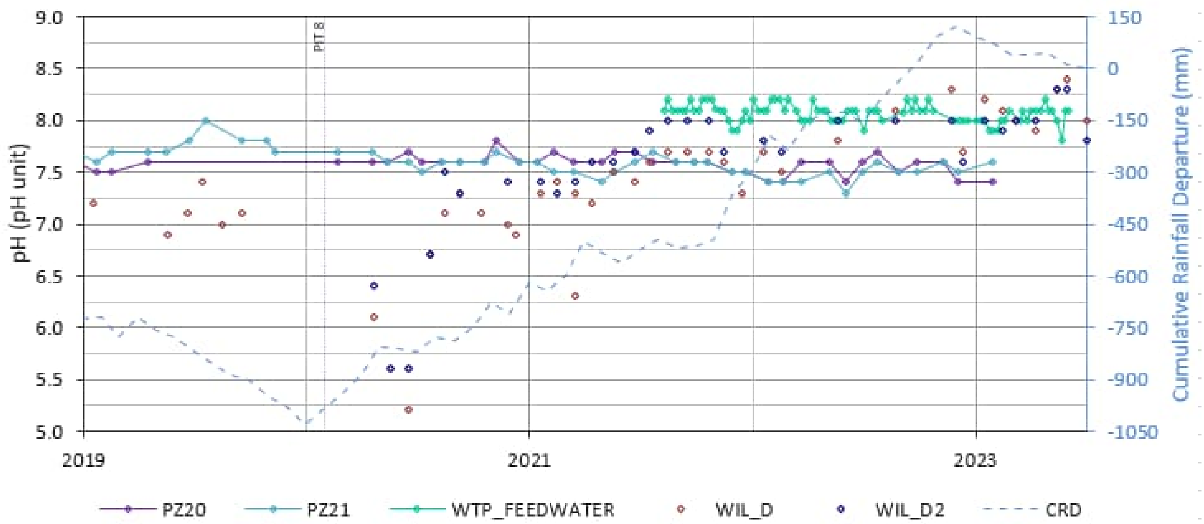


Figure 16 Groundwater and Surface Water – pH



4.3 Surrounding Watercourses

4.3.1 Water Signature

It is possible that other water courses could be contributing to the high pH observed at Wilpinjong Creek (Downstream).

The chemical analysis of surface water collected from 12 locations across Wilpinjong Creek, Cumbo Creek and Wollar Creek, from February 2022 to May 2023 (i.e., the data of the available dataset), is presented in the Piper Diagram on **Figure 17**. A Piper Diagram graphically represents the composition of the major ions of the surface water samples, as expressed in chemical equivalent percentages. Results which group in a cluster represent a similar water type, with the water type defined according to the area which they plot on the Piper Diagram.

The results indicate that distinct water types are present within the vicinity of WCM.

The Cumbo Creek results are tightly clustered together and indicate that the Cumbo Creek surface water is defined as mixed water type water with no dominant cations or anions, except for Cumbo Creek Site 'CC1' which is dominated by sulphate ions (**Figure 17**).

The Wollar Creek results indicate that the Wollar Creek surface water is also defined as mixed water type, although the water type is influenced by bicarbonate, sodium and potassium ions particularly at WOL-2 (**Figure 17**).

The results indicate that the Wilpinjong Creek (Upstream) surface water is generally defined as sodium chloride type water which is dominated by chloride, sodium and potassium ions (**Figure 17** and **Figure 18**). In comparison, the Wilpinjong Creek (Downstream) results are somewhat more broadly scattered with the surface water in Wilpinjong Creek (Downstream) generally presenting as mixed water type which is influenced by sulphate, sodium and potassium ions (**Figure 17** and **Figure 18**).

Overall, the results indicate that the water signature of Wilpinjong Creek varies from a sodium chloride water type at Wilpinjong Creek (Upstream) to a mixed water type at Wilpinjong Creek (Downstream), and that the water signature of Wilpinjong Creek (Downstream) is similar to that of Cumbo Creek and Wollar Creek, which are all mixed type water. This suggests that Cumbo Creek had a stronger influence on the water signature of Wilpinjong Creek (Downstream), compared to Wilpinjong Creek (Upstream)'s influence, during the period of February 2022 to May 2023.

Figure 17 Piper Diagram – Wilpinjong Creek, Cumbo Creek, Wollar Creek

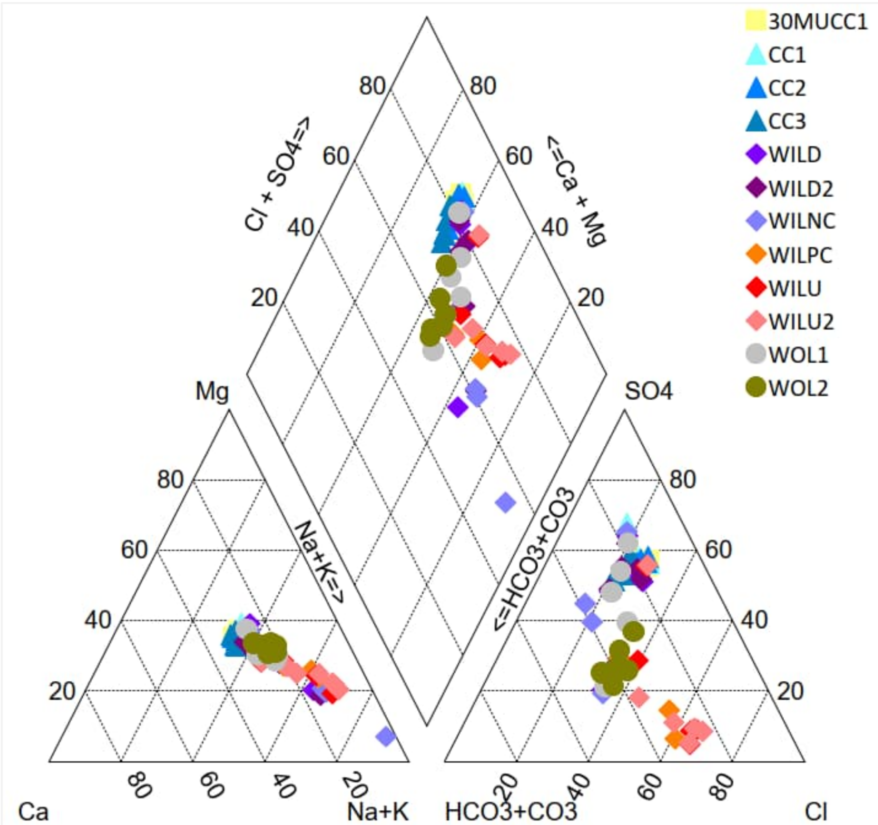
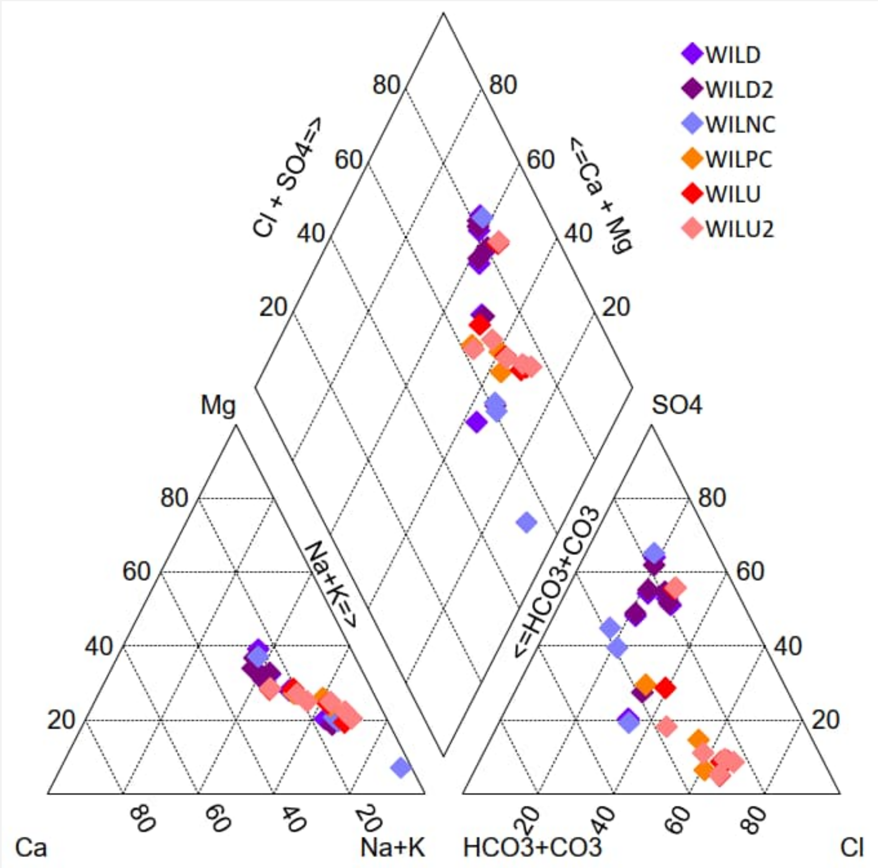


Figure 18 Piper Diagram Wilpinjong Creek



4.3.2 Bicarbonate Alkalinity

Typically, the pH of natural waters is controlled by the reactions of the carbonate system (Drever, 1997). **Table 8 (Appendix A)** summarises the bicarbonate alkalinity and pH of surface water collected from Wilpinjong Creek, Cumbo Creek and Wollar Creek from February 2022 to May 2023 (i.e., the data of the available dataset). The monitoring data suggests that pH is strongly influenced by bicarbonate alkalinity, with high concentrations of bicarbonate alkalinity correlating with high pH levels and low concentrations of bicarbonate alkalinity correlating with relatively low pH levels across all monitoring sites.

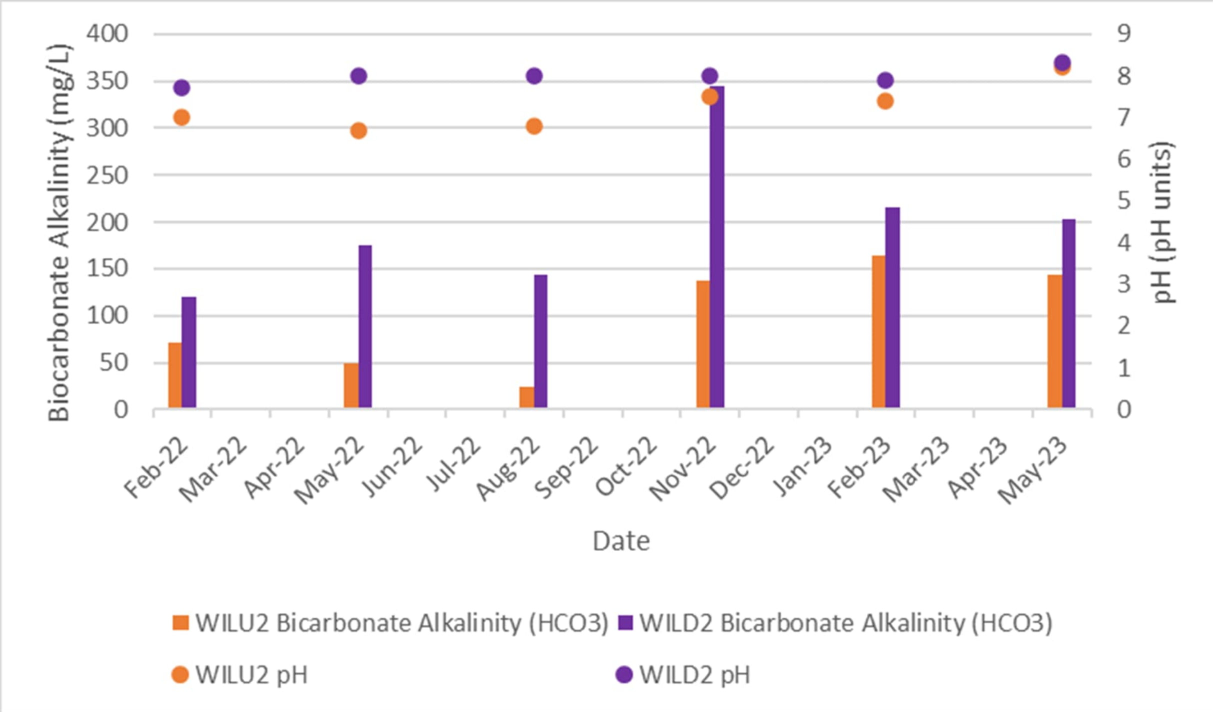
Along Wilpinjong Creek, the concentration of bicarbonate alkalinity is lower, and the associated pH levels (i.e., measured on the same day) are generally lower, in the upstream sites compared to the downstream sites, as shown in **Figure 19**.

In each monitoring event, the lowest bicarbonate alkalinity occurs at the Wilpinjong Creek (Upstream) sites while the highest bicarbonate alkalinity occurs at Cumbo Creek sites (**Table 8**). The exception to this trend is in November 2022 where the highest bicarbonate alkalinity concentration occurs at WIL_NC (Wilpinjong Creek (Downstream)).

These observations suggest that Cumbo Creek may contribute a relatively higher bicarbonate alkalinity concentration to Wilpinjong Creek (Downstream), and therefore influence the pH of Wilpinjong Creek (Downstream), than the contribution of Wilpinjong Creek (Upstream) during the period of February 2022 to May 2023. However, it is noted that the quantification of the flow contribution of Cumbo Creek to Wilpinjong Creek is limited by the fact that the Cumbo Creek gauging station is located upstream of WCM. Also, in 2023, CC_1 has been dry, and flow anecdotally occurs through the alluvium.

Testing the discharged water from the RO Plant for bicarbonate alkalinity could validate the extent to which Cumbo Creek influences the bicarbonate alkalinity, and pH, of Wilpinjong Creek (Downstream). Furthermore, the pH of WIL_NC appears to fluctuate and confirmation of whether WIL_NC is located upstream or downstream of the RO Plant would assist to understand the potential influence of the RO discharge on the Wilpinjong Creek (Downstream) pH.

Figure 19 Bicarbonate Alkalinity and pH – Wilpinjong Creek



4.4 Natural Variation

4.4.1 NSW Water Quality and River Flow Objectives

Water Quality Objectives (WQOs) for the protection of aquatic ecosystems are defined for the Hunter River catchment, in which WCM lies. The default trigger value (guideline value) for the water quality indictor of pH is 6.5 – 8.0 pH units for upland rivers in the Hunter River catchment (NSW Government, 2006).

During the reporting period, all pH observations at the Wilpinjong Creek (Upstream) monitoring locations were within the Hunter River pH guideline value for the protection of aquatic ecosystems, except in January and May 2023 where the maximum pH was 8.1 and 8.2 pH units respectively.

The observed pH levels at Wilpinjong Creek (Downstream) are generally representative of the conditions across the catchment. During the reporting period, all pH observations at Wilpinjong Creek (Downstream) were within the lower bound of the Hunter River pH guideline value for the protection of aquatic ecosystems. However, during the reporting period, pH observations at Wilpinjong Creek (Downstream) were greater than the upper bound of the Hunter River pH guideline value for the protection of aquatic ecosystems in the majority of 2021, 2022 and 2023.

4.4.2 Catchment pH Trends

Aside from Wilpinjong Creek, other creeks within the vicinity of WCM have relatively high pH levels.

Observations in 2022 of pH 7.5-8 at upstream Wollar Creek (WOL2), and approximately pH 8.5 at upstream Cumbo Creek (CC3), are consistent with historical monitoring data.

Statistics for the pH levels at Cumbo Creek (Upstream), Wollar Creek (Upstream) and Wilpinjong Creek (Downstream) are presented in **Table 7** for the available monitoring record and the reporting period.

Table 7 shows that the 80th percentile value of the reporting period pH data set is highest for Cumbo Creek (Upstream) (8.2) and lowest for Wilpinjong Creek (Downstream) (8.0) which indicates that higher pH surface water is locally present, beyond the influence of WCM activities. Therefore, it is possible that watercourses within the broader catchment could be contributing to the pH exceedances at Wilpinjong Creek (Downstream).

In addition, following high rainfall conditions in late 2022, the pH level at Wilpinjong Creek (Upstream), Wilpinjong Creek (Downstream) and Cumbo Creek (Upstream) increased and remained high despite the cessation of emergency discharges (**Figure 10**). It is likely that with the high rainfall, creeks and tributaries commenced to flow during this time which contributed to elevated pH levels across the catchment.

Furthermore, during the reporting period, the pH level at Wilpinjong Creek (Upstream) has generally been lower than the pH level at Wilpinjong Creek (Downstream) and Cumbo Creek (Upstream) (**Figure 10**). Similarly, pre-mining, the average pH level was lower at Wilpinjong (Upstream) than at Wilpinjong (Downstream) (**Table 5**). Although, the variance in pH between the two reaches of Wilpinjong Creek has historically been within approximately one pH unit and during the reporting period, it has been within 0.5 - 1 pH unit.

Table 7 Catchment Statistics

Period	Statistic	Cumbo Creek (Upstream)	Wollar Creek (Upstream)	Wilpinjong Creek (Downstream)
Available monitoring record (June 2004 – July 2023)	Maximum	9.4	9.9	8.9
	80th percentile	8.2	8.0	8.0
	20th percentile	7.7	7.4	7.4
Reporting period (June 2021 – July 2023)	Maximum	8.7	8.6	8.4
	80th percentile	8.2	8.1	8.0
	20th percentile	7.9	7.7	7.7

4.5 Trigger Value Selection

Based on pH results from the baseline monitoring period (Peabody, 2017):

- The Wilpinjong Creek (Upstream) 80th percentile value is pH 7.7 and the 20th percentile value is pH 6.9; and
- The Wilpinjong Creek (Downstream) 80th percentile value is pH 7.9 and the 20th percentile value is pH 7.4.

The Wilpinjong Creek (Downstream) pH (upper) trigger value is the same as the Wilpinjong Creek (Upstream) baseline 80th percentile pH value (i.e., 7.7). Conceptually, it is expected that Cumbo Creek, and other minor drainages, may influence the water quality of Wilpinjong Creek (Downstream). Therefore, it seems inappropriate that the Wilpinjong Creek (Downstream) pH (upper) trigger value is the same as the Wilpinjong Creek (Upstream) pH (upper) trigger value.

It is possible that the use of an inappropriate trigger value has contributed to over-reporting of exceedances of the Wilpinjong Creek (Downstream) pH (upper) trigger level.

It is recommended that the Wilpinjong Creek (Downstream) pH (upper) trigger level be revised to a more appropriate value.

5.0 Study Outcomes

The study found that the data used to determine if the trigger conditions have been exceeded, could possibly be erroneous, given the discrepancy between the real-time datasets and the manual measurements. It is likely that either the gauging station (i.e., continuous measurement) and/or the field meter (i.e., manual measurement) is not adequately calibrated and may be returning inaccurate pH levels.

The plausible and possible causes of the exceedances of the Wilpinjong Creek (Downstream) pH (Upper) trigger value are:

- Emergency discharge of EMW (temporary influence).
- Cumbo Creek influencing the water signature of Wilpinjong Creek (Downstream).
- Cumbo Creek contributing bicarbonate alkalinity to Wilpinjong Creek (Downstream).
- Potential mine water seeping from Pit 2 to Wilpinjong Creek (unlikely, but not excludable as a potential contributing cause).
- Higher pH surface water within the broader catchment, beyond the influence of WCM activities, indicates the possibility of natural variation also contributing. High rainfall conditions in late 2022 may have resulted in the migration of stagnant surface waters which may have contributed to elevated pH levels across the catchment.

On this basis, it is likely that a combination of factors caused the exceedance of the Wilpinjong Creek (Downstream) pH (Upper) trigger value and therefore it is unlikely that the observed pH exceedances were directly caused by, or predominantly the result of, WCM mining activities.

Additionally, the study found that it is unlikely that material harm to the surface water ecosystem has occurred. Given that higher pH surface water is naturally present locally, beyond the influence of WCM activities, the pH exceedances at Wilpinjong Creek (Downstream) are unlikely to have posed a threat to the health of local and downstream ecosystems.

6.0 Recommendations

It is recommended that the original Wilpinjong Creek (Downstream) pH (upper) trigger level of pH 7.7 be reviewed and adjusted to a more appropriate value.

Further studies would be required to determine an appropriate trigger level. These studies would involve additional analysis of flow volumes and water chemistry of Wilpinjong Creek, Cumbo Creek, and neighbouring catchments as well as a review of the potential impacts of a raised pH trigger value by a suitably qualified aquatic ecologist.

7.0 References

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Appendix A

Table 8 Bicarbonate Alkalinity and pH

Date	Site	Bicarbonate Alkalinity (HCO_3)	pH
February 2022	CC1	402.6	7.6
	CC2	452.6	8.1
	CC3	327.0	8.3
	WILU	75.6	6.9
	WILU2	72.0	7
	WILD	135.4	7.5
	WILD2	119.6	7.7
	WOL1	272.1	8.1
	WOL2	358.7	7.7
May 2022	CC1	305.0	7.9
	CC2	296.5	7.9
	CC3	230.6	8
	WILU	51.2	7
	WILU2	48.8	6.7
	WILNC	103.7	7
	WILPC	78.1	7.2
	WILD	178.1	7.8
	WILD2	175.7	8
	WOL1	190.3	7.9
	WOL2	189.1	7.8
August 22	CC1	203.7	8
	CC2	198.9	8.1
	CC3	162.3	8.2
	WILU	28.1	6.9
	WILU2	24.4	6.8
	WILNC	95.2	7.1
	WILPC	68.3	6.9
	WILD	137.9	8.1
	WILD2	144.0	8
	WOL1	131.8	8.1
	WOL2	133.0	8.2
November 2022	CC1	383.1	7.8
	CC2	190.3	8.2
	CC3	196.4	8
	WILU	126.9	7.4
	WILU2	136.6	7.5

Date	Site	Bicarbonate Alkalinity (HCO_3)	pH
	WILNC	447.7	8
	WILPC	123.2	7.8
	WILD	388.0	8.3
	WILD2	344.0	8
	WOL1	339.2	8.1
	WOL2	161.0	7.7
February 2023	CC2	398.9	7.8
	CC3	318.4	8.1
	WILU	175.7	7.2
	WILU2	164.7	7.4
	WILD	223.3	8.1
	WILD2	215.9	7.9
	WOL1	236.7	8.2
	WOL2	287.9	8
May 2023	CC2	364.8	8.2
	CC3	283.0	8.4
	WILU2	144.0	8.2
	WILD	217.2	8.3
	WILD2	203.7	8.3
	WOL1	218.4	8.6
	WOL2	261.1	8.6

Making Sustainability Happen

Water Balance Model Update 2024

Model Update and Calibration

Wilpinjong Coal Mine

Wilpinjong Coal Pty Ltd

1434 Ulan-Wollar Road
Wilpinjong NSW 2850

Prepared by:

SLR Consulting Australia

10 Kings Road, New Lambton NSW 2305,
Australia

SLR Project No.: 630.031405.00001

27 March 2024

Revision: v1.0

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
630.031405-R01-v1.0-20240327	27 March 2024	Emily Curtis/ Walter Rowlands	Paul Delaney	Paul Delaney
630.031405-R01-v0.1-20240326	26 March 2024	Emily Curtis/ Walter Rowlands	Paul Delaney	Paul Delaney

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Wilpinjong Coal Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

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Appendices

1.0 Introduction

Wilpinjong Coal Pty Ltd (WCPL) operates the Wilpinjong Coal Mine (WCM), which is located approximately 40 km north-east of Mudgee in the Mid-Western region of New South Wales (NSW).

WCPL have developed and continue to maintain a water balance simulation model for the WCM. The model was updated and converted to GoldSim software in 2020 by SLR Consulting Pty Ltd (SLR, 2020a), based on calibration against monitoring data collected between January 2018 and December 2019. Prior to this update the model utilised OPSIM simulation software which was calibrated to monitoring data between January 2014 and January 2018. SLR recalibrated the model again during 2023 to provide updated forecasts for WCM, and for the 2023 annual review process.

WCPL are required to prepare a site water balance in accordance with Condition 30(d)(ii), Schedule 3 of Development Consent SSD-6764. WCPL have engaged SLR to review and update the WCPL Water Balance Model (WBM) to capture changes to the site water catchments and management system during 2023 and calibrate the WBM using monitoring data collected up to the end of December 2023.

This report documents the model update process and outcomes, including:

- Collation and review of historical water monitoring data;
- Review of WCPL's harvestable rights for 2023;
- Updated catchment and land use mapping and changes incorporated to the Water Management System (WMS) in 2023;
- Calibration of WCPL's GoldSim model against the 2023 GoldSim output and data collected between January 2018 and December 2023;
- Description of the GoldSim model, operating rules, and model schematic; and
- Forecast of site water behaviour for the next three years (2024 to 2026).

The intent of this report is to document the basis of the updated WCPL GoldSim model, assess the predicted water balance versus actual monitored water inventory during 2023, and to provide a 3-year forward projection of water balance at WCM.

2.0 Background

2.1 Operational Description

The WCM is an open cut thermal coal mine located approximately 40 km north-east of Mudgee near the village of Wollar, within the Mid-Western Regional Local Government Area (LGA) in central NSW.

WCM is owned and operated by WCPL, a wholly owned subsidiary of Peabody Energy Australia Pty Ltd (Peabody). The WCM ("the mine" or "the site") extracts Run-Of-Mine (ROM) coal from the Ulan Seam or Moolarben Coal Member which is either processed on site at the Coal Handling and Preparation Plant (CHPP) or bypassed directly to product stockpiles. Current approvals permit production of up to 16 million tonnes per annum (Mtpa) of ROM coal. Coal products are transported by rail on the existing Sandy Hollow Gulgong Railway to domestic energy generators and to the Port of Newcastle for export (Resource Strategies, 2015).

The WCM has eight approved open cut mining areas, named Pit 1 through to Pit 8. Mining is currently undertaken in Pits 1 to 8. Open cut mining of Pit 1, 2 and 5 historically originated at a point and has progressed outward, forming a series of peripheral excavations separated by backfilled spoil. These sub-pits are defined based on their relative position within the associated main pit, i.e., Pit 5 South (Pit 5S), Pit 5 North (Pit 5N) and so on (WRM, 2019).

WCM is located adjacent to the right (southern) bank of Wilpinjong Creek, which is incised into a valley between the sandstone plateaus of the Munghorn Gap Nature Reserve to the south, and the Goulburn River National Park to the north. The mine is located on the alluvial/colluvial flats associated with the gullies draining the southern escarpment. The valley flats have typical gradients toward Wilpinjong Creek of approximately 1 in 65 (1.5%). The escarpment rises approximately 100 m from the valley floor to elevations exceeding 450 m Australian Height Datum (mAHD) on the plateau. The sandstone plateaus are heavily forested. The surrounding valley flats are used for cattle and sheep grazing with intermittent cropping, principally for fodder (WRM, 2015).

A general arrangement plan of WCM as of 31 December 2023 is provided in **Figure 1**.

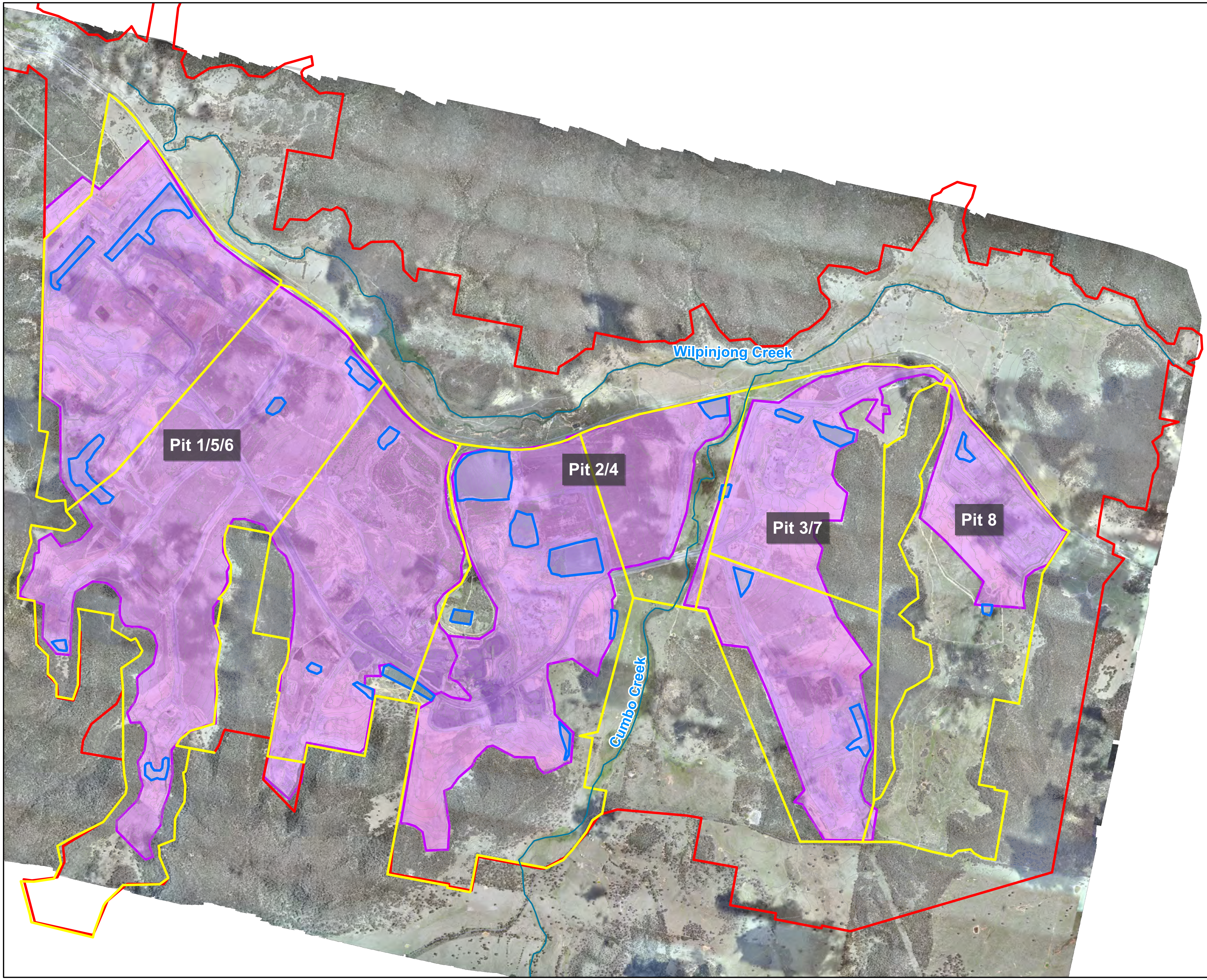
2.2 Approvals and Licences

WCM originally operated under Project Approval 05-0021 that was granted by the NSW Minister for Planning under Part 3A of the NSW Environmental Planning and Assessment Act 1979 (EP&A Act) on 1 February 2006.

On 24 April 2017, WCPL was granted Development Consent SSD 6764 for the Wilpinjong Extension Project (WEP) that provides for the continued operation of WCM at rates of up to 16 Mtpa of ROM coal out to 2033, and access to approximately 800 hectares (ha) of open cut extensions. Development Consent SSD 6764 has superseded the Project Approval 05 0021, which was surrendered on 28 April 2020 as required under SSD-6764.

WCM is also subject to conditions outlined in Environmental Protection Licence (EPL) No. 12425.

Mining operations are carried out upon Mining Leases (MLs) 1573, 1779, 1795 and 1846 in accordance with the Rehabilitation Management Plan (RMP), a requirement of MLs and SSD-6764.



WILPINJONG MINE
WATER BALANCE UPDATE

END OF YEAR 2023
GENERAL ARRANGEMENT

FIGURE 1

LEGEND

- WEP New DA Boundary
- Water Storage
- WBM Pit Grouping
- Pit Boundary
- Watercourse
- Existing Contours (5m intervals)

0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:32,000 at A4
Project Number:	630.031405
Date Drawn:	22-Mar-2024
Drawn by:	JH

SLR

Path: H:\Projects-SLR\630-SrvNTL\630-NTL\630.031405.00001 Wilpinjong AR23 - Water Balanc\06 SLR Data\01 CADGIS\630031405_Wilpinjong_MineWaterBalance\630031405_Wilpinjong_MineWaterBalance.aprx\630031405_F01_GeneralArrangement_EoY2023

3.0 Water Management System

3.1 Overview

The WCM Water Management System (WMS) comprises a network of internal dams interconnected via pumps/pipelines and drainage channels. The main objective of the WMS during wet periods is to minimise the risk of uncontrolled discharge of water to the receiving environment and to minimise the risk of pit inundation which may impact coal production. During dry periods, the main objective of the WMS is to ensure that adequate reserves are available to maintain water supply for mining operations. If required, WCM have access to a water supply bore field which can be activated to import external water during these periods. The majority of the system's water storage capacity is provided by Pit 2W, a former open cut mining pit located adjacent to Ulan-Wollar Road. Other significant water storages include the Recycled Water Dam (RWD) and Clean Water Dam (CWD) (refer **Figure 1**).

WCM currently has eight open cut mining pits (Pit 1, 2, 3, 4, 5, 6, 7 and 8). Review of deepest mined topographic data shows that historical mining has occurred within three distinct voids, which each share a common and continuous pit floor, and are divided from each other by an unmined in-situ rock barrier. These voids are referred to herein as Pit 1/5/6 (containing Pits 6, 5S, 5N, and 1), Pit 2/4 (containing Pits 2W, 2S, 2E and 4) and Pit 3/7 (containing Pits 3 and 7). Pit 1/5/6 and Pit 2/4 feature a central overburden emplacement area, which acts as a highly permeable aquifer. During 2023, mining activities proceeded in Pits 5, 6,7 and 8.

Water within each void passively drains to the north down the dip of the former coal seam, collecting in either Pit 3, Pit 4, Pit 5N, or Pit 8 where it is then pumped to the Pit 2W hub water storage. Note that the Pit 1/5/6, Pit 2/4 and Pit 3/7 definitions are only used in the context of water management; these definitions do not align with mine planning terminology.

Water inflows to the WMS include rainfall, catchment runoff and groundwater interception. The mine has intersected several ephemeral creeks and these catchments now report to the WMS. It is also noted that WCM's mine rehabilitation is still progressing in accordance with the RMP and those completed rehabilitated areas have not yet had sufficient time to mature to the extent that would allow runoff from these areas to be discharged off-site.

Water is used for dust suppression (road watering, stockpile sprays), wash down (washbays and vehicle wash stations) and for washing coal. The majority of water used for these applications is lost via evaporation or entrainment within railed product coal and waste rock dumps. The coal washing process formerly included a wet-tailings circuit, with tailings slurry pumped to a number of approved Tailings Dams (TDs) adjacent to Pit 2W for consolidation and water recovery (note that tailings was pumped into two approved TDs located at the northern end of Pit 1 prior to using the Pit 2 TDs).

The process was modified in April 2015 to include a tailings Belt Filter Press (BFP). Mixed reject is now co-disposed of within the overburden dumps. TD1 to TD5 have been capped and rehabilitated. TD6 remains active to allow for the deposition of tailings slurry during periods in which the BFP is undergoing maintenance. TD7 receives only water that has seeped through the north-western corner of TD6.

During periods of high-water inventory, WCM operates a Water Treatment Facility (WTF) which utilises Reverse Osmosis (RO) technology and discharges a blend of permeate and Pit 2W water to the adjacent Wilpinjong Creek in accordance with flow and water quality limits specified in EPL 12425.

Prior to 2018, the WTF comprised a WCPL owned primary plant, supplemented with a second leased plant installed to provide temporary additional treatment/discharge capacity.

The temporary WTF was decommissioned at the beginning of 2018. WTF reject was pumped to Pit 1S and/or the RWD until late 2018 when Pit 1S was taken offline and was mined through in early 2019. WTF reject, along with backwash from the WTF and water that doesn't meet the requirements outlined in EPL 12425, is now directed to Pit 2W and/or the RWD.

During periods of low water inventory associated with extended drought, WCM are licenced to draw water from a network of water supply bores to supplement site water demands.

WCM also imports potable water which is used to supply amenities. Sewage is either treated and disposed on site via irrigation in accordance with EPL 12425, or occasionally removed from site by a licenced contractor to be processed through a licenced facility. The potable water circuit has no functional influence on the performance of the WMS and is not discussed further in this study.

The following subsections summarise the physical characteristics of the WCM water management system, including water storage specifications and function, catchment and land use classification breakdown, and key transfer infrastructure specifications as incorporated in the model.

3.2 Water Storage infrastructure and Voids

3.2.1 Function and Specifications

Table 1 summarises the location, specifications and description for key water storages and voids within the WMS. Consistent with documentation associated with previous water model updates, infrastructure has been grouped as follows:

- **Water Storages:** Infrastructure used for storing water that has come into contact with mining operations. Comprises surface ponds/dams and inactive mining pits used for bulk water storage;
- **Sediment Dams:** Sumps/dams used to intercept and capture sediment laden runoff generated from disturbed areas. Water captured in these structures is pumped back to the mine WMS;
- **Tailings:** Dams or repurposed open cut mining pits used to store tailings waste. Note that tailings storage capacities have not been listed in the following tabulation, as available air space is not intentionally used for water storage; or
- **Mining Pits:** Open cut voids currently subject to active mining. Not used for water storage (unless required to prevent off-site discharge to the environment).

Table 1: Key Water Storage and Void Specifications with Functional Descriptions

Storage	Location (GDA94 Zone 55)		Catchment (ha)	Full Storage Capacity		Functional Description
	Easting	Northing		(mAHD)	(ML)	
Water Storages						
Pit 2 West	770975	6419350	413.0	398	4,088	Hub water storage, and primary buffer storage. Receives dewatering from mining and processing areas, and supplies water to industrial tasks as required. Feed water supply for the WTF.
Pit 1 South (offline from late 2018)	769250	6417120	-	421.4*	295*	Stores reject from the WTF.

Storage	Location (GDA94 Zone 55)		Catchment (ha)	Full Storage Capacity		Functional Description
	Easting	Northing		(mAHD)	(ML)	
Pit 5 Fill Point (FP) Dam	769030	6419995	33.2	392.2	8	Water supply for dust suppression activities in the Pit 5 mining area. Water makeup from local mining area dewatering, or Pit 2W as a backup.
Clean Water Dam (CWD)	770785	6418000	2.1	397	51	Water supply for CHPP/MIA area tasks. Water makeup from Pit 2W.
Recycled Water Dam (RWD)	770270	6417430	26.7	412.6	295	Water supply for CHPP/MIA area tasks and to the ROM truck fill point. Water makeup from Pit 2W. May also receive concentrate from the WTF.
Ed's Lake	770085	6419690	292.4	375.3	110	Transfer dam located in backfilled Pit 1N void. Storage capacity includes basin to the north-east of the main void storage.
MIA Dam	770570	6417820	-	-	-	Sediment trap located near admin area. Intercepts sediments from water draining back to Pit 2W from the CHPP/Mine Infrastructure Area (MIA). **Note:** not included in GoldSim model.
Pit 8 CWD (constructed in Q1 2020)	775683	6418277	310.2	-	25	Captures majority of Pit 8 upslope catchment via Pit 8 upstream diversion. Constructed March 2020. Two downstream farm dams capture overflow which in turn overflow to Pit 8. Discharge of clean water from the Pit 8 CWD is via LDP 30.
Sediment Dams						
Pit 5N Sed. Dams	769530	6420700	-	-	-	Sediment interception works located adjacent to open cut workings. Function is to capture sediment laden runoff, allowing this water to then be pumped back to the WMS. **Note:** these dams have been functionally modelled as additional catchment assigned to their respective open cut void (i.e. assumes no storage in sediment ponds, and no pumping constraints).
Pit 2E Sed. Dams	772800	6418580	-	-	-	
Pit 3 Sed. Dams	773850	6420010	-	-	-	
Pit 7 Sed. Dams	773240	6417880	-	-	-	
Pit 8 Sed. Dams	775782	6419484	-	-	-	
Mining Pits						
Pit 5 South	767730	6418020	592.7	n/a	n/a	Active mining pits.
Pit 5 North	769220	6420690	732.3	n/a	n/a	
Pit 1	769440	6417660	297.7	n/a	n/a	
Pit 2 South	771250	6416940	37.9	n/a	n/a	
Pit 2 East	772070	6417900	33.1	n/a	n/a	
Pit 4	772840	6419850	132.5	n/a	n/a	
Pit 3	773840	6419230	294.0	n/a	n/a	
Pit 7	774210	6417780	295.3	n/a	n/a	
Pit 6	767950	6420330	383.7	n/a	n/a	
Pit 8	775851	6419225	310.2	n/a	n/a	
Tailings Storage						

Storage	Location (GDA94 Zone 55)		Catchment (ha)	Full Storage Capacity		Functional Description
	Easting	Northing		(mAHD)	(ML)	
TD6	771800	6418530	78.7	n/a	n/a	TD6 is an active Tailings Storage Facility (TSF) used intermittently when the BFP is offline. TD7 currently only collects seepage from TD6. TSF design is underway for TD7.
TD7	771320	6418860		n/a	n/a	

Note: *2018 data prior to decommissioning.

3.2.2 Storage Characteristics

Storage characteristics (level-area-volume relationships) remain generally consistent with the previous model update (SLR, 2023) with some updates made to active pits.

Modelled level-area-volume profiles for all storages have been provided for reference in **Appendix D.**

3.2.3 Storage Capacities

3.2.3.1 Water Storages

Adopted Full Storage Levels (FSLs) for all water storages are listed in **Table 2.**

Table 2: Adopted Full Storage Levels for Site Water Storages (Source: WRM, 2019)

Storage	FSL (mAHD)	Basis
Pit 2 West	373	As per the stage storage provided by WCPL from recent Bathymetric survey (July 2023).
Pit 1 South (offline from late 2018)	422	Nominal 0.5 m offset below the level at which additional seepage flows to Ed's Lake were inferred as part of the WBM verification (WRM, 2019).
Pit 5 Fill Point (FP) Dam	392	Defined based on review of 2019 surface topography. Nominal level at which overflow to Pit 5N would occur.
Clean Water Dam	397	Maximum water level recorded in historical water level survey. FSL defined as a maximum operating level rather than a spillway level. It is understood that this dam has no formally constructed spillway outlet.
Dirty Water Dam	413	It is understood that this dam seeps to the CHPP area at high water levels, and water levels in the dam are managed to minimise the risk of this occurring. FSL defined as an operational level rather than a spillway level. It is understood that this dam has no formally constructed spillway outlet (WRM, 2019).
Ed's Lake	375	Defined based on review of 2019 surface topography. Nominal elevation at which overflow to Wilpinjong Creek would occur via a low point in adjacent road/rail.
Pit 8 CWD	-	Dam has a capacity of 25 ML.

3.2.3.2 Open Cut Pits

To prevent an uncontrolled release of water to the receiving environment, excess mine water would be temporarily stored within one or more open cut mining pits. This practice would continue until the excess water is drawn down through evaporation, supplied to demands (e.g. dust suppression) or via EPL Licensed Discharge Point (LDP) LDP No.24 (via the site's WTF).

The assumed order of preference in which pits would be filled is Pit 3, Pit 4 then Pit 5N. Note that water storage in up-dip pits (i.e., Pit 5S, Pit 1, Pit 2S, Pit 7, Pit 6) is not possible as these voids freely drain down the dip of the coal seam, through the in-pit spoil placement areas to their respective down-dip pits.

Overflow and recommended maximum fill levels have been listed in **Table 3**. Recommended maximum fill levels reflect settings incorporated into the WBM for current storage capacities. Recommended fill levels have been set five metres below the nominal overflow level. Actual fill levels (which trigger filling of the next pit in sequence) should continue to be confirmed/defined to reflect changes due to mine progression.

Table 3: Mining Pit Overflow and Recommended Maximum Fill Levels

Pit	Level (mAHD)		Notes
	Overflow	Max Fill	
Pit 5N	381.0	369.0	Assumed hydraulic connection between Pit 5N and Ed's Lake.
Pit 4	366.0	362.0	Overflow level based on low point in northern end of Pit 4N high wall. Note that low point will reduce as mining progresses eastward.
Pit 3	362.0	358.0	Overflow level based on low point on western side of Pit 3N void (adjacent to Cumbo Creek).

3.2.4 Catchment Breakdown

Catchment boundaries for water storages within the WCM have been delineated based on the most recent available topographic data and advice from operational personnel. 2023 catchment areas have been summarised in **Table 1**. Catchment maps and land use maps have been provided in **Appendix B**.

Land use classifications used for the model calibration have been determined based on review of end of year 2023 satellite imagery.

Current investigations have adopted a land use classification schedule to align with catchment yield parameters:

- **Natural / undisturbed** – no disturbance, typically grass or brush;
- **Roads / industrial / hardstand/ mining Pit** – sealed or unsealed road or track, cleared and compacted earth or concrete (layout areas etc.), open-cut void;
- **Spoil / overburden** – unrehabilitated spoil emplacement, clear of vegetation, also includes cleared areas and beach and other exposed tailings reject areas; and
- **Rehabilitated overburden** – emplacement areas that have been shaped and re-vegetated.

Land use data has been used to calculate catchment yield within the WBM. Different land use classifications generally correspond with a unique catchment runoff model parameter set. Catchment yield is discussed further in **Section 4.4.**

A breakdown of land use type per water storage catchment area has been provided in **Appendix B**, in addition to catchment and land use plans.

3.2.5 Water Transfer Infrastructure

The WCM transfer network comprises a mixture of fixed pump and pipeline infrastructure connections, supplemented with portable infrastructure that can be moved around for pit dewatering. Water transfer capacities adopted as part of the WCM GoldSim WBM are consistent with the previous model update and are summarised in **Table 4**. Active management of Pit 8 commenced in 2020 and pumped discharge from the Pit 8 CWD via EPL Licensed Discharge Point LDP No.30 commenced in 2021 and are included below.

The following assumptions towards water transfer infrastructure have been applied:

- Assumed no pumping from up-dip pits, i.e. Pit 5S, Pit 1, Pit 2S, Pit 2E and Pit 7. These pits passively drain along the dip of the mined coal seam (either along the surface or through the highly permeable in-pit spoil placement areas) to their respective down-dip pits.
- Water transfers from dams for industrial tasks are assumed to be constrained by demand, not by pump/pipeline capacity.
- Assumed no pumping from any tailings dams – water inflow to these areas is assumed to evaporate or seep to the underlying Pit 2/4 spoil aquifer which is hydraulically connected to Pit 2W.

Table 4: Water Transfer Infrastructure Modelled Capacities

Category	Connection Points		Flow Capacity	
	Storage (From)	Directed (To)	L/s	ML/day
Pit Dewatering	Pit 5N	Pit 2W	180[1]	15.5
	Pit 4	Pit 2W	160[1]	13.8
	Pit 3	Pit 2W	100	8.6
	Pit 6	Pit 2W	100[3]	8.6
	Pit 8	Pit 2W	100	8.6
Mine Water Containment	Ed's Lake	Pit 5 FP Dam	100	8.6
	Ed's Lake	Pit 2W	100	8.6
	Pit 2W	Pit 5N	100	8.6
	Pit 2W	Pit 3N	100	8.6
Controlled Discharge	Pit 8 CWD	Offsite[2]	200	17.3
Other	Pit 2W	CWD	100	8.6
	Pit 2W	RWD	100	8.6

[1] Dewatering capacity for active pits is variable subject to allocation of pump resources.
[2] Prior to 2021 water was pumped from Pit 8 CWD to Pit 2W at 160 L/s.
[3] Dewatering of Pit 6 from 2023.

The WBM includes a time delay for transfer of water volumes by seepage, and this parameter has been progressively calibrated over the last several years.

4.0 Climate

4.1 Overview

Climatic influences on the WMS include catchment rainfall–runoff and evaporation (from wetted areas) and evapotranspiration (from catchments). The WBM has been configured to simulate system performance on the basis of long-term historical climate data. Historical data has been directly applied, based on the assumption that climatic conditions observed in the past, and captured in the data, are indicative of persistent local climatic trends. Historical data is therefore assumed to represent the range of potential conditions likely to be observed in the near future.

This investigation, and those prior, have not included allowance for climate change effects as these are unlikely to be material in the three-year forecasting period.

Updated climatic data for WCM (latitude -32.35, longitude 149.9) has been sourced from the SILO Data Drill service (Queensland Government Department of Science, Information Technology and Innovation). The Data Drill service accesses grids of climate data interpolated from point observations by the Bureau of Meteorology (BoM) for any point in Australia. Sourced information includes daily resolution rainfall and evaporation data, for the 124-year period 1900 to present. This information has been processed and summarised in the following sub-sections.

WCPL have also provided rainfall data for the January 2016 to December 2023 period, recorded at the site Automated Weather Station (AWS), located within the rail loop (near the CWD). Rainfall data recorded at the neighbouring BoM rainfall gauge at Wollar (Wollar Barrigan St Station 062032) has also been sourced and used for reference. Site AWS and BoM rainfall data has been compared against Data Drill rainfall in **Section 4.2.3.**

4.2 Rainfall

4.2.1 Annual Rainfall (Data Drill)

WCM experienced drought conditions during the end of 2018 and throughout 2019. During 2019 a total annual rainfall of 266 mm was recorded at the Site AWS, which is significantly less than a 10th percentile annual rainfall. Changes to the WBM were undertaken in the previous update (SLR, 2020a) to reflect monitored conditions during these years. During 2020 and 2021, a significant increase in annual rainfall was observed with 987 mm and 899 mm recorded, respectively. Far wetter than average conditions continued to prevail in 2022 as a total of 994 mm was reported across the year, equating to 97th percentile rainfall. Annual rainfall totals (calendar year) have been presented in on a percentile basis in **Figure 2**.

Annual rainfall varies between approximately 200 mm and 1,200 mm (~1,000 mm range), with a median of 608 mm ± 183 mm. Approximately 70% of the data set falls within 1 standard deviation of the median.

Also shown for reference are calendar year rainfall totals for the seven most recent years. Review of this information shows that during the recent drought conditions the 2017 and 2018 rainfalls were equivalent to historical 21st and 26th percentile (dry), respectively, whilst the 2019 rainfall was equivalent to a historical 1st percentile (very dry). In contrast, rainfall experienced during 2020, 2021 and 2022 was equivalent to a historical 96th percentile, 94th percentile rainfall and 97th percentile, respectively (very wet). Rainfall during 2023 was low, equivalent to a historical 28th percentile (dry) condition.

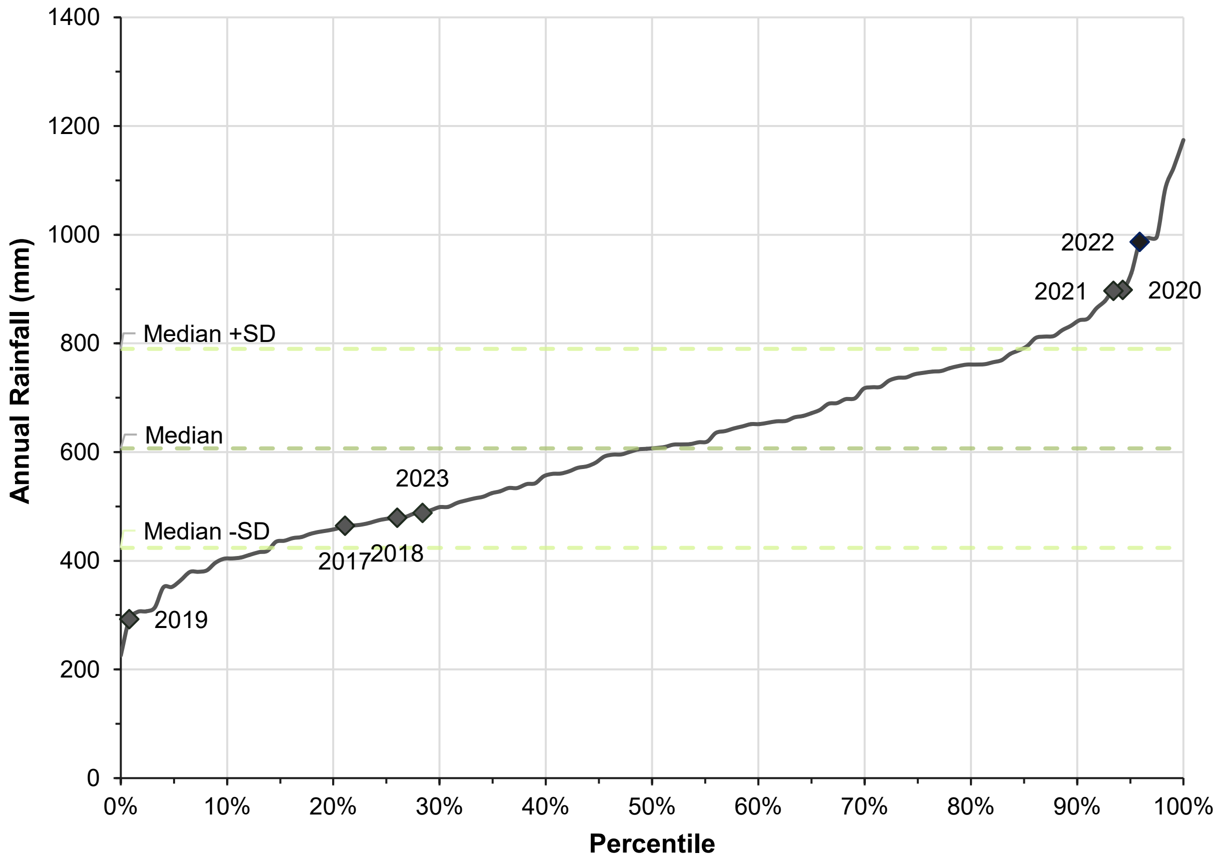


Figure 2: Historical Annual Rainfall Percentiles

4.2.2 Rainfall Statistics (Data Drill)

The statistics for the long-term Data Drill rainfall data for the 124-year period are summarised in **Table 5**. Annual totals are for a calendar year January to December.

Table 5: Long-Term Data Drill Rainfall Statistics (mm)

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Max	204	364	241	200	184	249	175	137	174	216	266	203
90th %ile	132	141	123	79	74	88	97	84	90	110	123	124
Median	60	45	45	31	31	34	40	37	35	48	56	50
10th %ile	14	5	5	2	5	10	7	12	10	9	10	12
Min	0	0	0	0	0	0	1	0	0	0	0	0
Mean	67	62	57	40	38	45	45	44	43	53	61	62
St. Dev	45	59	49	37	33	41	33	29	32	42	47	46
Count	124	124	124	124	124	124	124	124	124	124	124	124

4.2.3 Data Drill vs Site and BoM Rainfall

SILO Data Drill rainfall data has been compared against data recorded at the WCM AWS and at the neighbouring BoM rainfall gauge at Wollar (approximately 8 km east of Wilpinjong).

The intent of comparing SILO Data Drill rainfall against the site and BoM reference data is to:

- demonstrate that the SILO rainfall is comparable to local measurements, and is therefore an appropriate input time-series to the Wilpinjong WBM model (for long-term modelling); and
- identify an appropriate measured rainfall dataset to be used in the WBM calibration exercise completed as part of current investigations.

Cumulative rainfall totals, resetting on an annual basis, are presented in **Figure 3**.

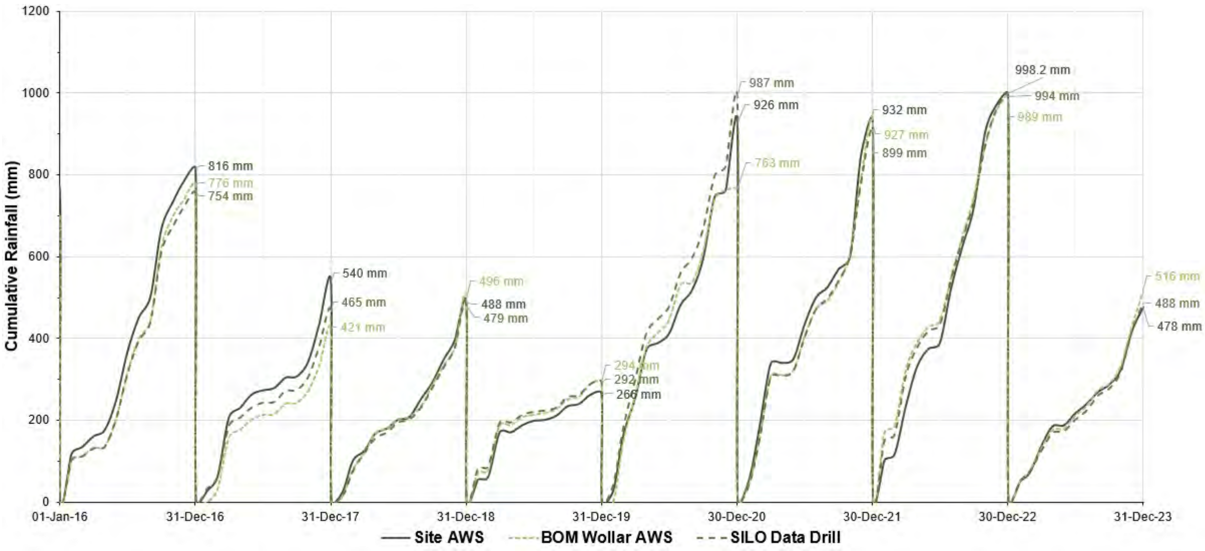


Figure 3: Cumulative Rainfall (Resetting 1st Jan) – Site AWS, BoM Wollar, SILO

Data from the AWS appears to be more consistent with the other gauges. Note the 2016 model update (Hatch, 2017) compared Site AWS data against data from nine surrounding BoM rainfall gauges (including Wollar) and observed similar trends in 2014 and early 2015.

Key outcomes of the above comparison are:

- The model calibration exercise completed as part of this update has focused on the period January 2018 to December 2023 (six years). The first year of this period overlaps with the calibration period studied as part of previous investigations (WRM, 2019). For consistency with previous model updates, model calibration was based on the Site AWS data.
- SILO Data Drill rainfall is consistent with rainfalls recorded at gauges in the study area and is therefore considered to be an appropriate input time-series to the WBM.

4.3 Evaporation

Long-term daily evaporation data for the WCM has been sourced from the SILO Data Drill service. Morton lake evaporation ('Mlake') has been used to estimate evaporation from the wet surface areas of surface storages.

No adjustment factors have been applied to pits or catchment areas. The statistics for the long-term Data Drill Mlake evaporation data are summarised in **Table 6**.

Table 6: Long-term Data Drill Mlake Evaporation Statistics (mm)

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Max	229	186	164	108	67	45	53	84	122	165	204	232	1539
90th %ile	217	174	151	98	62	42	50	76	112	157	186	213	1461
Median	196	156	137	90	56	38	44	68	102	142	168	192	1393
10th %ile	169	138	124	81	50	33	39	62	91	126	149	176	1300
Min	153	122	106	67	44	30	33	58	79	101	109	149	1135
Mean	194	156	136	89	56	38	44	69	102	142	168	193	1387
St. Dev	17	14	11	7	5	3	4	6	8	12	15	15	65
Count	124	124	124	124	124	124	124	124	124	124	124	124	124

4.4 Catchment Yield

4.4.1 Overview

Accurate estimation of catchment yield hydrology is an important component of water management investigations. Catchment yield within the WBM is simulated using the Australian Water Balance Model (AWBM). The AWBM is a saturation overland flow model which uses daily rainfalls and estimates of catchment evapotranspiration to calculate daily values of runoff using a water balance approach (Boughton, 1993). The AWBM is widely accepted and commonly used throughout Australia.

4.4.2 Parameters

Different AWBM model parameters are defined for each land use type within the mine catchment. AWBM model parameters were initialised using values from the previous 2019 model update (WRM, 2019) and are considered to remain well suited to current site conditions, determined through the WBM calibration.

Adopted AWBM model parameters are summarised in **Table 7**.

Table 7: Calibrated AWBM Parameters

Parameter		Natural	Rehab	Spoil	High Runoff (Hardstand/Active Pit)
Partial Areas	A1	0.134	0.134	0.134	1.0
	A2	0.433	0.433	0.433	-
	A3	0.433	0.433	0.433	-
Soil Storage	S1	17.6 mm	14.7 mm	11.0 mm	17.0 mm
	S2	182.6 mm	153.2 mm	114.1 mm	-
	S3	366.2 mm	306.9 mm	228.8 mm	-
Baseflow Index	BFI	0.50	0.50	0.50	0.00
Surface Lag	Ks	0.80	0.97	0.97	0.00
Baseflow Lag	Kb	0.97	0.80	0.80	0.00
Avg. Storage	S_avg	239.9 mm	201.2 mm	150.0 mm	17.0 mm

5.0 Site Water Usage

5.1 CHPP and MIA Usage

Water is pumped from Pit 2W to the RWD and CWD. Water is then pumped from these dams into a distribution network which is used to supply water to the following demands within the CHPP and MIA area:

- CHPP process;
- Heavy Vehicle (HV) and Light Vehicle (LV) wash bays;
- MIA wash-down pads;
- Coal handling/stockpile dust sprays; and
- Other miscellaneous MIA/CHPP tasks (cleaning/hoses, clarifier tank overflow or bleed-off via old tailings lines).

Water supply from the RWD and CWD to the distribution network is metered, but the individual offtakes are not (WRM, 2019).

The following sub-sections summarise a process which has attempted to separate the CHPP process water makeup from the other MIA area demands.

5.1.1 CHPP Usage

5.1.1.1 Overview

A conceptual model of the coal washing process is shown in **Figure 4**. Note that prior to April 2015 the CHPP reject circuit comprised separate coarse and fine waste material streams. Coarse rejects were trucked and disposed of within in-pit overburden dumps, and fine tailings were pumped as a slurry to tailings cells adjacent to Pit 2W. The CHPP tailings circuit was modified in April 2015 to include a BFP, which dewaters the tailings stream and allows this material to be disposed of as a dry waste stream with the coarse reject. Any moisture bleed-off from within the BFP process is captured and re-circulated to the clarified water tank. Excess water from the clarified water tank may be drained off by pumping water to the tailings dams via the old slurry pipelines (WRM, 2019).

The following moisture contents are assumed for various material streams within the CHPP:

- ROM: 5% moisture w/w
- Bypass coal: 7.5% moisture w/w
- CHPP feed: 7.5% moisture w/w
- Product coal: 10.3% moisture w/w
- Mixed reject: 28.0% moisture w/w

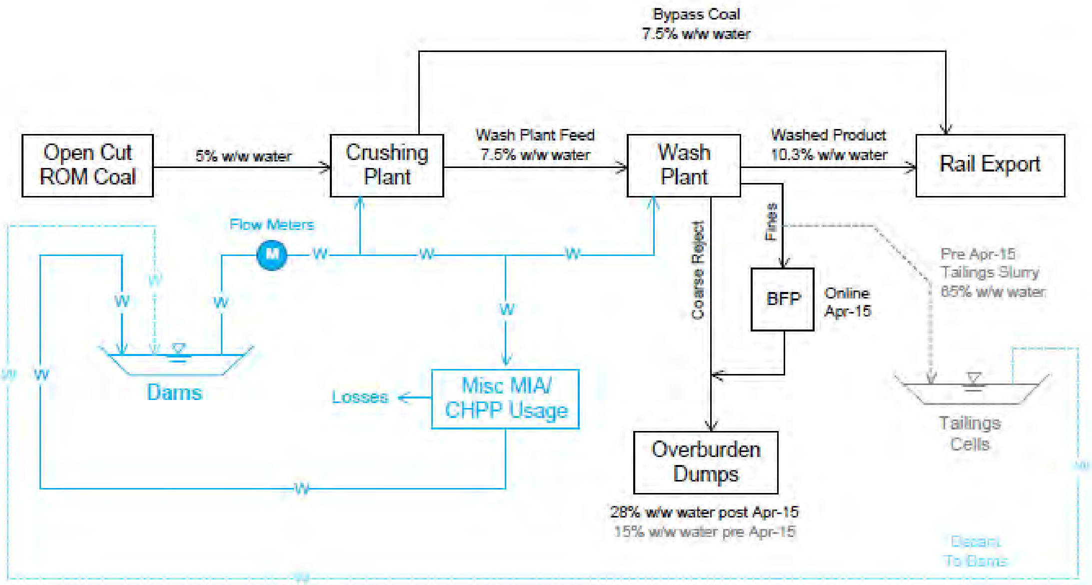


Figure 4: Coal Washing Process Conceptual Model (Source: WRM, 2019)

5.1.1.2 Historical Production

Recent observed material tonnages have been summarised in **Table 8** for the 2021, 2022, 2023 and predicted 2024 calendar years. Review of **Table 8** shows that the annual railed product was approximately 10.53 Million tonnes (Mt) in 2023 which is a minor decrease from 2022. Since 2019, the volume of railed product has continually declined.

Table 8: Production Summary

Material Stream	2021	2022	2023	2024 (Predicted)
Waste Rock/Overburden	43.71 Mbcm	40.31 Mbcm	40.45 Mbcm	44.77 Mbcm
ROM coal^	14.48 Mt	13.28 Mt	12.84 Mt	12.30 Mt
Coarse Reject & Tailings (TFP*)	2.57 Mt	2.20 Mt	2.11 Mt	2.10 Mt
Fine Tailings	0	0	0	0
Railed product	12.17 Mt	11.05 Mt	10.53 Mt	10.08 Mt

Note: ^WCM approved rate of up to 16 Mtpa out to 2033.
*Tailings Filter Press.
Mbcm: Million bulk cubic metres.

5.1.1.3 Process Water Makeup

Figure 5 presents the metered water supply from the RWD and CWD to the CHPP-MIA water distribution network. Data relating to the allocation of water to the CHPP area and MIA separately is not available for the 2019 or 2023 monitoring periods.

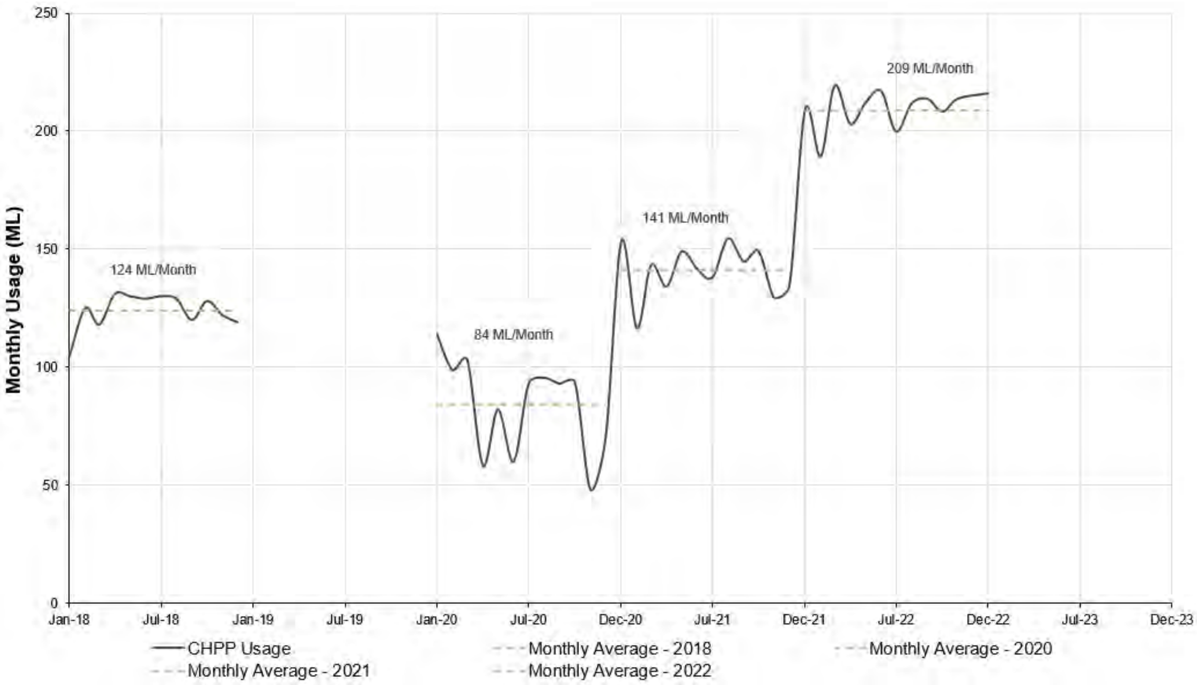


Figure 5: CHPP and MIA Monitored Demand

Review of **Figure 5** shows the following:

- No CHPP or MIA water usage data was recorded during 2023;
- Water usage, when last metered in 2022 at an average of 209 ML/month, was on a continually increasing trend from 2020;
- The water supply rate for 2021 fluctuated between 116 ML/month and 154 ML/month throughout the year. The average monthly usage rate was 141 ML/month;
- Combined CHPP water usage for 2020 was an average supply rate of 84 ML/month which is significantly less than 2021;
- Combined CHPP water usage for 2018 was an average water supply rate of 124 ML/month. No water usage data is available for 2019; and
- Given the above, the average water supply for the calibration period is approximately 140 ML/month and this has been adapted in the 2023 WBM.

5.1.1.4 Model Configuration

The yearly fluctuation in water demand at the CHPP has been set as a time series with demand for each year set as the average monthly usage for that year (i.e., 209 ML/month for 2022). As no data was available for the 2023 period, a usage of 91.5 ML/month has been adopted based on calibration.

Note the model assumes all water sent to the CHPP to close the mass balance is lost, with nil recovered (e.g., all water is entrained within railed product or in-pit dumps). Note that a 20 ML/month miscellaneous usage is modelled with a large percentage of this water returning to Pit 2W (see **Section 5.1.2**). It is possible that a portion of this water is associated with activities in the CHPP.

5.1.2 MIA and Miscellaneous Usage

Previous model updates have shown an unaccounted-for component of the RWD and CWD water supply which is estimated at approximately 20 ML/month. This flow rate is understood to represent water supply to the various demands listed in **Section 5.1.**

Based on the previous water balance modelling, the inferred net loss rate from this miscellaneous water usage stream is expected to be relatively low. Modelling has adopted a net water loss of 100 ML/year (8.3 ML/month) which is consistent with the previous 2019 model update (WRM, 2019) and typical MIA water consumption observed at other operations comparable to Wilpinjong.

The WBM has been configured to extract 20 ML/month from the CWD or RWD and recirculate 17.4 ML/month of this flow back into the WMS via Pit 2W.

5.2 Haul Road Dust Suppression

5.2.1 Measured Water Usage

Water is extracted from the WMS and applied using water trucks over HV/LV roads to minimise dust lift-off. There are four Fill Points (FPs) in operation: the ROM FP, Pit 2 FP, Pit 3 FP, and Pit 5 FP. All water truck fill points have been fitted with flow meters; however data is not yet available for Pit 3 FP as this point was only introduced in late 2023.

From 2019 to 2021, the site utilised Dust-a-side (DAS) at the site to help water usage associated with dust suppression. DAS is a dust suppression agent that reduces dust generation on roads, hardstand and laydown areas and reduces the need for water carts. At a stage in 2021, WCM moved to a Reynolds Soil Technologies (RST) product to assist with dust mitigation and reduce dust suppression water usage.

On the occasion that FP flow meters are offline or technical malfunction occurs and daily data cannot be obtained, trip-count data is used to estimate usage. WCM operates a Global Positioning System (GPS) logging system which maintains a count of how many times each truck has driven within a certain proximity of a FP. Water usage is estimated by multiplying each individual truck's trip count by its respective water fill capacity.

WCPL have provided updated flow meter data and trip-count-based estimates of water usage for January 2016 to December 2022. During 2023, no data pertaining to water truck usage was recorded by the site. As such, **Figure 6** only presents haul road dust suppression from 2016 to end 2022.

It has been assumed that actual haul road dust suppression water losses are lower than what is recorded by the flow meters and/or estimated based on GPS trip counts. Consistent with previous model updates an adjustment factor of 0.9 has been applied to the historical water usage data to account for the following:

- Flow recirculation recorded by flow meters (e.g. trucks being overfilled, with excess water draining back to the supply dam); and
- Over-estimation bias inherent to trip-count based methods, which assume every 'trip' entails a truck being filled from empty to full, whereas in practise trucks may return to the fill point part-full or may even drive past the fill point without stopping (which is still registered as a 'trip').

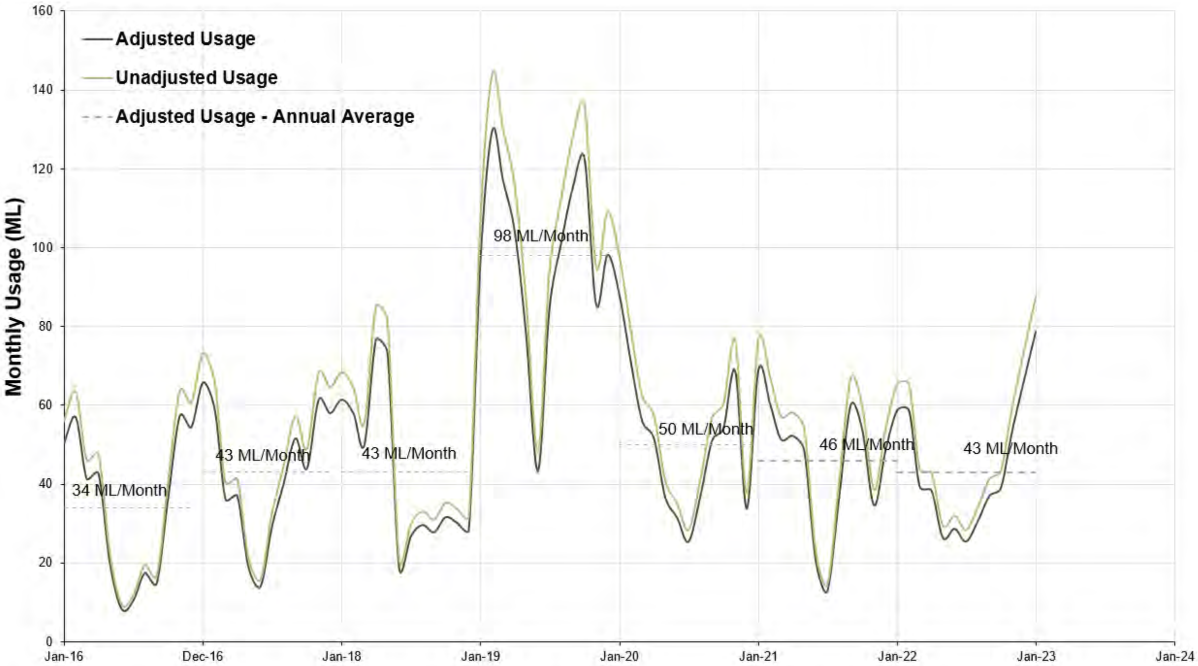


Figure 6: Metered Haul Road Dust Suppression Water Usage

Review of **Figure 6** indicates:

- Water usage is seasonal, with highest usage rates occurring in summer, and lows in winter. Seasonal variability is driven largely by changes in ambient temperature and evaporation rates;
- Water usage is also lower during periods of rainfall; and
- Average water usage rates during 2016-2018 are relatively consistent year-to-year at around 34-43 ML/month (408-516 ML/year), however, 2019 usage was significantly higher than previous years. This is likely to be attributed to the prevalent drought conditions experienced throughout 2019 including limited rainfall and increased evaporation. Water usage during 2020 and 2022 was reduced and closely followed pre-2019 levels with annual averages from 43-50 ML/month due to increased rainfall throughout the year.

No data breakdown of dust suppression demand by FP was provided for 2019 – 2023 and it is therefore assumed to be consistent with 2018 values discussed in the previous 2019 update (WRM, 2019). The breakdown by FP in 2018 is as follows, noting data is yet to be available for the Pit 3 FP installed in late 2023:

- ROM FP: 75.08%
- Pit 2 FP: 24.91%
- Pit 5 FP: 0.01%

5.2.2 Dust Suppression Sub Model

Haul road dust suppression water usage is simulated within the WBM using a sub-model, which accounts for the seasonal variation and sensitivity to rainfall observed in the metered usage data. Daily water application is calculated as a function of wetted haul road area, evaporation, and rainfall. Water is applied to offset daily evaporation from the wetted area. Evaporation rates are subject to monthly adjustment factors. Application is cancelled if rainfall exceeds a nominated minimum threshold (1.5 mm/day) (WRM, 2019).

Monthly evaporation factors and the rainfall threshold determined in the previous model update are compared to measured water usage rates during the period January 2018 to December 2022 and adjusted as required. The results of this process are presented in **Figure 7**. Note that measured data have been factored per **Section 5.2.1**.

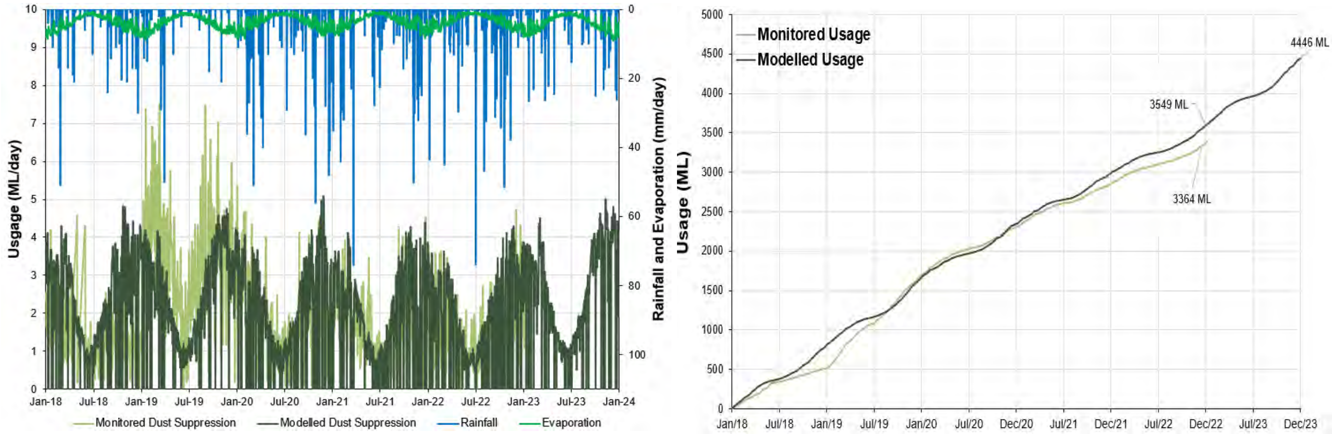


Figure 7: Dust Suppression Sub Model: Modelled vs Monitored Values

Review of **Figure 7** shows relatively good agreement between calculated and measured data. Anomalies do occur throughout the calibration period however overall usage shows good correlation with seasonal trends demonstrated. Results have been derived using the following parameter set consistent with the previous 2019 model update (WRM, 2019):

- Haul road wetted area: 44 ha (per WEP surface water assessment, WRM 2015)
- Rainfall threshold: 1.5 mm/day
- Evaporation adjustments:
  - January to February: 1.1
  - March to June: 1.6
  - July to September: 1.9
  - October: 1.7
  - November: 1.5
  - December: 1.3

The parameter adjustment process has sought to reproduce: 1. total usage volumes, 2. seasonal variation in water usage (i.e. general peaks and troughs in spring/summer and autumn/winter respectively), and 3. sensitivity to rainfall (reductions in usage during wet periods such as winter 2016, 2020 and 2022).

Additionally, monthly adjustment factors are the same for each year, and should also follow a relatively smooth profile within the year (e.g., not fluctuating up and down repeatedly).

5.3 Water Destruction (Sprays)

WCPL have previously operated a system of evaporator sprays which are located on the eastern bank of Pit 2W between October 2017 and February 2018. During this time, there were 10 sprays in operation. Water supply to the spray system was unmetered and has been estimated at approximately 1 ML/day. Net water losses have been estimated at 0.25 ML/day assuming a 25% spray efficiency, which has been selected based on past experience with similar systems at other operations. These evaporator sprays were not operated from 2019 – 2021. The sprays were commissioned again in 2022 and 2023 and were used on an ad-hoc basis.

The WBM has been configured to model a net 0.25 ML/day water extraction from Pit 2W. The outflow is assumed to remove no salt from Pit 2W. Operation of the spray system has been assumed to cease if the combined inventory in the WMS reduced below a specified minimum threshold, which has been initially defined at 1,000 ML in previous models. This threshold has been increased to 4,000 ML in the 2023 model update to better reflect site operations during drier periods and observed operation during wet periods. This threshold is considered suitable for continued use in this model update; however, this threshold should continue to be confirmed on a case-by-case basis.

5.4 Harvestable Rights

The site is located within the coastal draining catchments and central inland-draining catchments harvestable rights area. As of September 2023, up to 10% of the average annual regional rainfall runoff may be captured and used for any purpose within this harvestable rights area, as per the *Harvestable Right (coastal-draining catchments) Order 2023* (DPE, 2023) under the *Water Management Act 2000*.

The WCPL landholding area is 20,400 ha. Using a harvestable rights multiplier of 0.07 as per the Department of Planning and Environment (DPE) guidelines, the harvestable right for the site is 1428 ML. Based on rainfall data sourced from the Site AWS, the annual rainfall for the reporting period is 488 mm (refer **Section 4.2**).

There are currently 423 farm dams located within the WCPL landholding area. Due to the nature of these dams the capacity is unknown. The method set out by DPE to determine the capacity of existing harvestable rights dams for small dam (less than 10 ML) has been used to determine the approximate capacity of WCPL farm dams within the land holding. The capacity of these existing water storages is estimated at approximately 242 ML.

It is noted that the maximum harvestable right does not include storages that are used to control pollution to a water source. Dams used solely for the capture, contamination, and recirculation of drainage and/or effluent, consistent with best management practices or required by a public authority to prevent the contamination of a water source, that are located on a minor stream are exempt under *Clause 3 of Schedule 1 of the Water Management (General) Regulation 2018*.

For the site, preventing contamination includes the capture of predominantly "dirty" water, including sediment laden runoff and mine water runoff. Therefore, water that is captured within mining disturbance boundaries is exempt from requiring a Water Access Licence (WAL), water use approval or water supply work approval. Water captured can be used for any purpose, such as dust suppression and processing, provided it does not result in the contamination of a water source.

The current mining disturbance area captured within the site water management system is 2504 ha. Clean water catchment draining internally to the mine water management structures consists of 1146 ha. The estimated runoff captured from these clean water areas is 597 ML.

The total WCPL harvested volume is calculated as:

Farm Dam Capacity + Clean water Draining to WCM = Total Harvested Volume (ML)

The calculated volume is described in **Table 9**.

Table 9: Harvestable Rights Inputs and Estimates – 2023 Reporting Period

Parameter	Input Value
Annual Rainfall Depth (mm)	488
Runoff Coefficient (clean catchment)	0.11
Mine Disturbance Area (ha)	2,504
Clean Catchment Draining to WCM (ha)	1,146
Storage / Licence	**Estimated / Known Value**
Clean Water to WCM (ML)	597
Farm Dam Capacity (ML)	242
WAL Volume (ML)	150
Reporting Volume	**Estimated Value**
Total Harvested Volume (ML)	**839**
Surplus Volume (ML)	589
Surplus Volume (with WALs) (ML)	739

The total harvested volume for 2023 is estimated to be 839 ML. Given that the WCPL harvestable right is 1428 ML, there is potential to capture an additional 589 ML on the site which can be used for any purpose.

Additionally, WCPL hold 150 ML in WALs. Therefore, the site has a current surplus of 739 ML including these WALs.

5.5 Water Reuse and Recycle

Peabody have recently committed to Environmental, Social and Governance (ESG) reporting in accordance with standards administered by the Global Reporting Initiative (GRI). As a subsidiary of Peabody, WCPL have commenced reporting under the GRI Standards applicable to the site.

Sustainability reporting requirements pertaining to water management are outlined within GRI Standard 303: *Water and Effluents 2018* (GRI 303) (GRI, 2018). WCPL completed reporting required under GRI 303 for the 2023 calendar year, however, were unable to report on water reuse and recycle volumes due to the lack of definitions within GRI 303. As such, this section aims to identify the proportions of water reused and/or recycled at the site during 2023 based on review of formal definitions for these terms and water management data recorded at site across the reporting period.

GRI 303 provided clear definitions for ‘water reuse and recycle’ prior to revision in 2020 where these definitions were removed. The definition given for water reuse and recycling was “the act of processing used water/wastewater through another cycle before discharge to final treatment and/or discharge to the environment” (Concawe, 2022). Three general types of water reuse/recycling practices were specified, including:

- Wastewater recycled back in the same process or higher use of recycled water in the process cycle.
- Wastewater recycled/reused in a different process, but within the same facility.
- Wastewater reused at another of the reporting organisation’s facilities.

This former definition has been compared with definitions given by other organisations with an ESG focus (**Table 10**). The review found that some groups define water reuse/recycle collectively, while others distinguish the terms primarily based on the level of treatment and/or the manner of reuse. Overall, where the terms are delineated, there appears to be common ground that 'water reuse' involves minimal or no treatment before water is used again for an activity, while 'water recycle' entails treatment targeted at salinity reduction or meeting other water quality criteria prior to using water for a subsequent activity.

Table 10: Definitions for Water Reuse and Recycle external to GRI Standards

Source	Water Reuse	Water Recycled
Environmental management – Water footprint – Principles, requirements and guidelines (ISO, 2015)	Water reuse/recycling is the use of reclaimed water for beneficial use under controlled conditions for beneficial purposes, such as agricultural or landscape irrigation etc.; synonymous to water reclamation.	
Sustainability Reporting Guidance for the Oil and Gas Industry (IPIECA, 2020a)	Water reused/recycled: water that has been used more than once in a single process or used in other processes, with treatment as appropriate, to reduce freshwater withdrawal.	
Reuse of produced water from the onshore oil and gas industry (IPIECA, 2020b)	Treated water/wastewater that is used more than once before it passes back into the water cycle.	Used water/wastewater employed through another process cycle after treatment.
Business Guide to Circular Water Management (WBCSD, 2017)	Water with minimal or no treatment, within and outside the fence for the same or different processes.	Recycled resources and wastewater (treated by membrane or reverse osmosis to a very high quality) within and outside the fence.
2012 Guidelines for Water Reuse (US EPA, 2012)	All water reuse applications that do not involve potable reuse.	Municipal wastewater that has been treated to meet specific water quality criteria with the intent of being used for a range of purposes. The term recycled water is synonymous with reclaimed water.
Water in the Energy Industry (BP, 2013)	Used water and wastewater that is used again before discharged for final treatment and/or discharge to the environment. Reuse includes wastewater used for irrigation within a facility boundary. It also includes harvesting of rainwater within a facility boundary.	Water that undergoes significant treatment (to reduce salinity and/or other contaminants), such that the water quality is sufficient for other uses that require fresh or near-fresh water.
A Practical Guide to Consistent Water Reporting (ICMM, 2017)	Worked water[1] that is used in a task[2] without treatment beforehand.	Worked water that is treated before it is used in a task.

<u>**Note:**</u> [1] Worked water: is water that has been through a task.
[2] Task: an activity that uses water.

In line with the consensus of **Table 10** definitions, mine water subject to Reverse Osmosis (RO) treatment at the site prior to discharge would meet the definition of recycled water. This water enters the site Water Treatment Facility (WTF) in poor quality, then exits the facility as a permeate in compliance with the following criteria specified in EPL 12425:

- Electrical conductivity not exceeding 500 µS/cm;
- pH between 6.5 and 8.5;
- Oil and grease concentration not exceeding 10 mg/L; and
- Total Suspended Solids (TSS) concentration not exceeding 50 mg/L.

Throughout 2023, the site recorded approximately 1,720 ML of water treated via RO before being discharged to Wilpinjong Creek. This volume is considered reportable as recycled water usage.

The WTF also yields a reject water by-product through the RO process. Based on historic lab data, the reject is understood to typically have EC around 14,000 µS/cm. Given this water quality, reject is not directly discharged to the environment and is pumped to either the RWD or Pit 2W for reuse in feed water or other industrial tasks. As this water does not experience treatment sufficient to meet the EPL criteria, reject water is categorised under water reuse here rather than water recycle. The site measured approximately 397 ML of reject water production across 2023.

Overall, total volumes for water reuse and recycle at WCM for 2023 were 397 ML and 1,720 ML, respectively. It should be noted that water discharged from the WTF incorporates a proportion of feed water, meaning a blend of permeate and mine water is effectively ‘recycled’. However, as the quantity of reject water that eventually comprises off-site discharge is not recorded, it is considered appropriate to report these volumes under separate use forms.

6.0 Water Treatment Facility

6.1 Overview

WCM operate a Water Treatment Facility (WTF), which is used to treat excess mine water, and discharge a blend of permeate and mine water to Wilpinjong Creek in accordance with conditions outlined in EPL 12425. The WTF comprises a Reverse Osmosis (RO) treatment plant which has the capacity to release at a rate of 6.5 ML/day as of 2023.

For the period between January 2017 and January 2018, a secondary RO treatment plant leased from General Electric (GE) was in operation, increasing the prescribed maximum release rate to 15 ML/day. The second RO treatment plant was decommissioned at the beginning of 2018 once the site's mine water inventory had been sufficiently reduced. Following decommission, the capacity of the WTF reverted back to the original capacity of 5 ML/day. Due to considerable drought conditions experienced during 2018 and 2019, the RO treatment plant was decommissioned for the period between November 2018 and November 2020. The RO plant was recommissioned following considerable rainfall throughout 2020 resulting in significant surplus water within the site inventory.

Current license conditions require a maximum release water electrical conductivity of 500 µS/cm, a pH range between 6.5 and 8.5, oil and grease not to exceed 10 mg/L and total suspended solids not to exceed 50 mg/L.

The WTF is located adjacent to and east of Pit 2W (location marked in **Figure 1**). Feed water is extracted from Pit 2W (EC 3,500 to 4,000 ≈ S/cm), and then passes through a process of strainers, UF filters and RO membranes to produce a low EC permeate stream (typically ≈180 µS /cm). The permeate stream is blended with a small amount of feed water prior to release to achieve a mixed EC closer to the 500 µS /cm limit prescribed in the EPL. The EC of the RO reject by-product varies depending on permeate recovery but is typically around 14,000 µS /cm EC. Prior to Q4 2018, reject was pumped to Pit 1S. Reject is now pumped to either the RWD or Pit 2W given that Pit 1S has been taken offline (mined through). Some permeate is also used for RO back-flushing/cleaning.

A conceptual schematic of the WTF and river discharge process is presented in **Figure 8** (based on the configuration prior to Q4 2018).

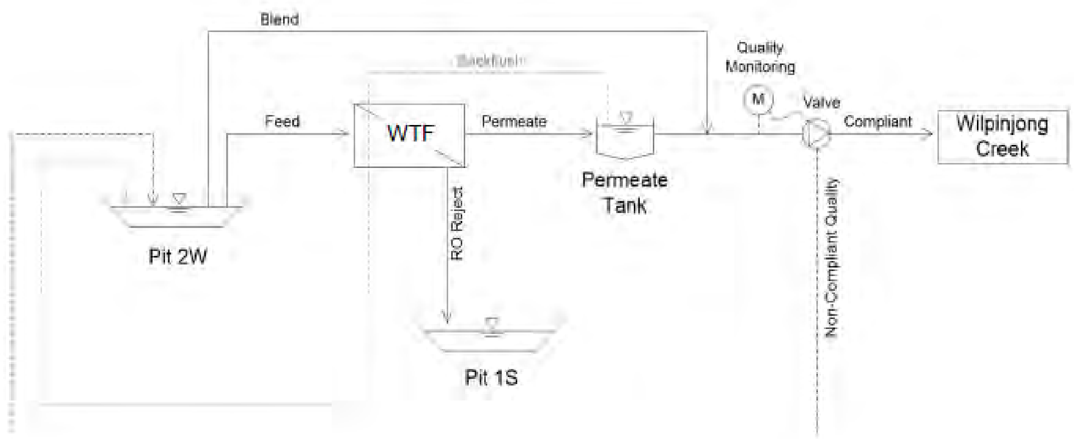


Figure 8: Conceptual Schematic – WTF and River Discharge Process (Configuration Prior to Q4 2018 (Source, Hatch, 2017)

The WCPL WTF is currently capable of producing enough permeate to discharge a blended stream of water to Wilpinjong Creek at up to 3 ML/day. With both the WCM and GE WTFs operating, the combined rate of discharge had the capacity to reach up to approximately 8 ML/day. The capacity of the WCPL WTF was increased to discharge 5 ML/day from July 2021 due to significant rainfall experienced at WCM throughout 2020 and 2021. As of June 2023, the WCPL WTF is equipped to discharge up to 6.5 ML/day in line with an update to the site EPL in October 2022.

6.2 Historical Performance

WCPL have provided records of daily discharge volumes to Wilpinjong Creek (from both plants) for the period January 2016 to December 2023. This data is presented in **Figure 9**.

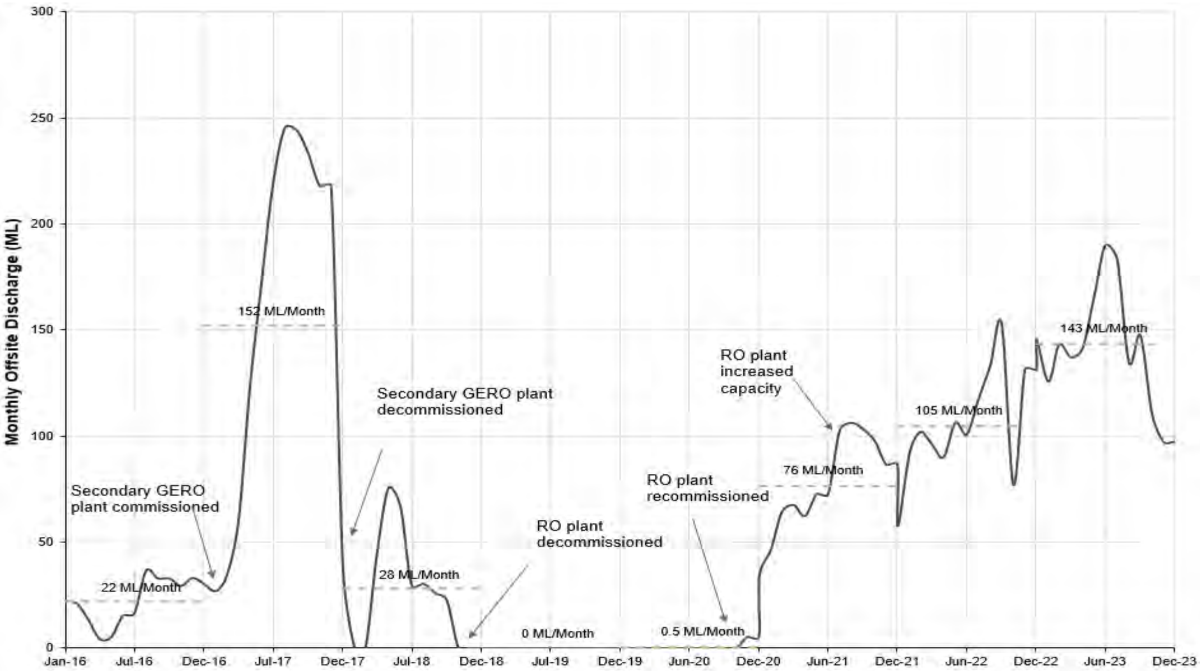


Figure 9: Historical WTF Discharge Volumes

Review of **Figure 9** shows the following:

- Discharge volumes significantly increase after March 2017, following a significant wet period, modification of the Site's EPL discharge limit, optimisation of the WCPL WTF, and installation/ramp-up of the GE WTF;
- Slightly higher discharge volumes in 2018 compared to 2016, given a comparable WTF configuration. However, it is understood that the WCPL WTF was upgraded/optimised in 2016 to rectify performance problems associated with out- of-spec feed water.
- The WTF facility was not operated during 2019 and majority of 2020 due to low levels within the site inventory and very low rainfall throughout 2019;
- Discharge volumes increased in July 2021 following an increase in WTF discharge capacity after significant rainfall in 2020 and 2021;
- Significant discharge occurred throughout 2021 to 2023 as a result of significant rainfall over consecutive years from 2020 to 2022;
- Average monthly discharge to Wilpinjong Creek in 2023 was the highest observed since 2017, with more months than not recording over 143 ML/month in release.

6.3 Model Configuration

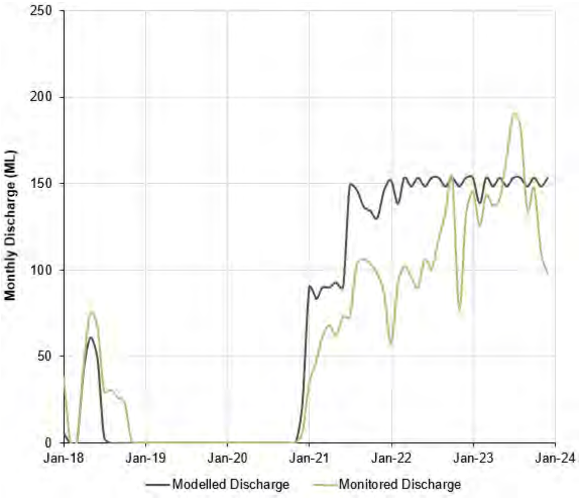
The WBM has been constructed to be used for future studies with the following defined as part of the previous model updates, assuming the GE plant is offline:

- WTF capacity: 4 ML/day and 6.6 ML/day from July 2021;
- Permeate recovery: 75% of feed;
- Permeate EC: 180 µS/cm;
- Reject EC: calculated in model based on feed water EC;
- Discharge water EC: 350 µS/cm EC (per recent historical sampling – see **Table 16**);
- Blend water volume: assumed 0.3 ML/day based on average feed water EC and required discharge EC; and
- Assumed no reduction in RO recovery due to increasing feed water EC.

As part of the previous model updates, a set of operating rules were established within the WBM which aim to reflect onsite decisions regarding the WTF for use in future studies. These updates included adjustment of the WTFs deactivation trigger to 2,000 ML rather than the previously adopted 1,000 ML in the WRM (2019) WBM, and incorporation of the relationship between climatic conditions (i.e. rainfall) and feed water flow. These changes have been further verified as part of this update.

Operation of the WTF is based on both site mine water inventory and rainfall forecasts. From historical monitoring data it is also observed that discharge flows vary and may not always operate at full capacity. Due to limited software capabilities, predicting rainfall beyond the current timestep cannot be determined. Rather, daily feed water flows within the WBM are determined by the previous 5-day rainfall and the level within the site mine water inventory. Application is cancelled if site inventory exceeds the nominated minimum threshold of 2,000 ML.

Inflow rates to the WTF have been based on discharge flows and their associated rainfall and site inventory levels given in the January 2018 to December 2023 monitoring data. The results of this process are shown in **Figure 10**.



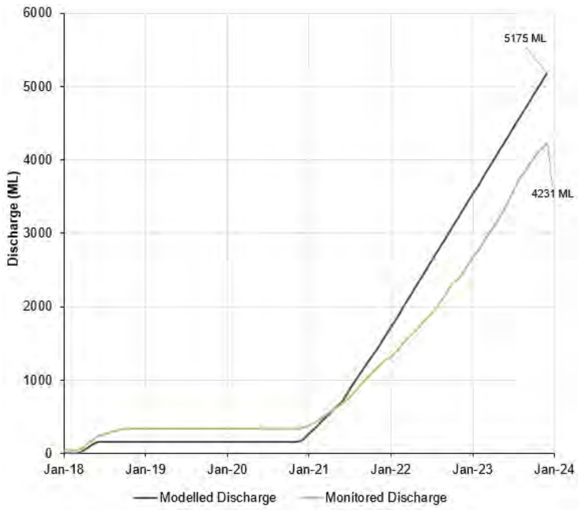


Figure 10: WTF Sub Model: Modelled vs Monitored Values

Review of **Figure 10** shows relatively good agreement between calculated and measured data. Results have been derived using the relationship described in **Table 11.**

Table 11: Feedwater Flow Rate Relationship

Site Inventory (ML)	5-Day Rainfall (mm)	Feedwater Flow (ML/day) (Post July 2021)
>3500	-	4 (6.6)
3500 - 3250	-	4 (6.3)
3250 - 3000	-	4 (6.0)
3000 - 2900	>1.5	4 (5.5)
	≤1.5	3.8
2900 - 2800	>1.5	3.7
	≤1.5	3.3
2800 - 2700	>1.5	3.5
	≤1.5	3.1
2700 - 2600	>1.5	2.9
	≤1.5	2.0
2600 - 2500	>1.5	2.8
	≤1.5	0.9
2500 - 2400	>1.5	2.5
	≤1.5	0.8
2400 - 2350	>20	0.9
	20 – 1.5	0.7
	≤1.5	0.3
2350 - 2000	>20	0.3
	≤20	0
<2000	-	0

The WTF operating rules have sought to better simulate inflows and associated outflows for the WTF based on climate variation and site inventory levels for use in predictive studies. The WBM has been verified with six years of data and should continue to be refined and validated using observed site data.

7.0 Discharge

7.1 Controlled Discharge

In 2021 following the development of Pit 8, WCPL sought a variation to EPL 12425 to allow the clean water collected by the diversion upstream of Pit 8 to discharge to Wilpinjong Creek under various water quality conditions. The approved LDP 30 permits water to be discharged from the Pit 8 CWD if the value of turbidity does not exceed the turbidity value measured at the Wilpinjong Creek upstream gauging station. When there is no flow within Wilpinjong Creek at the upstream gauging station, the value of turbidity measured at point LDP 30 must not exceed 50 Nephelometric Turbidity Units (NTU).

Monitored controlled discharged from Pit 8 CWD is shown in **Figure 11**.

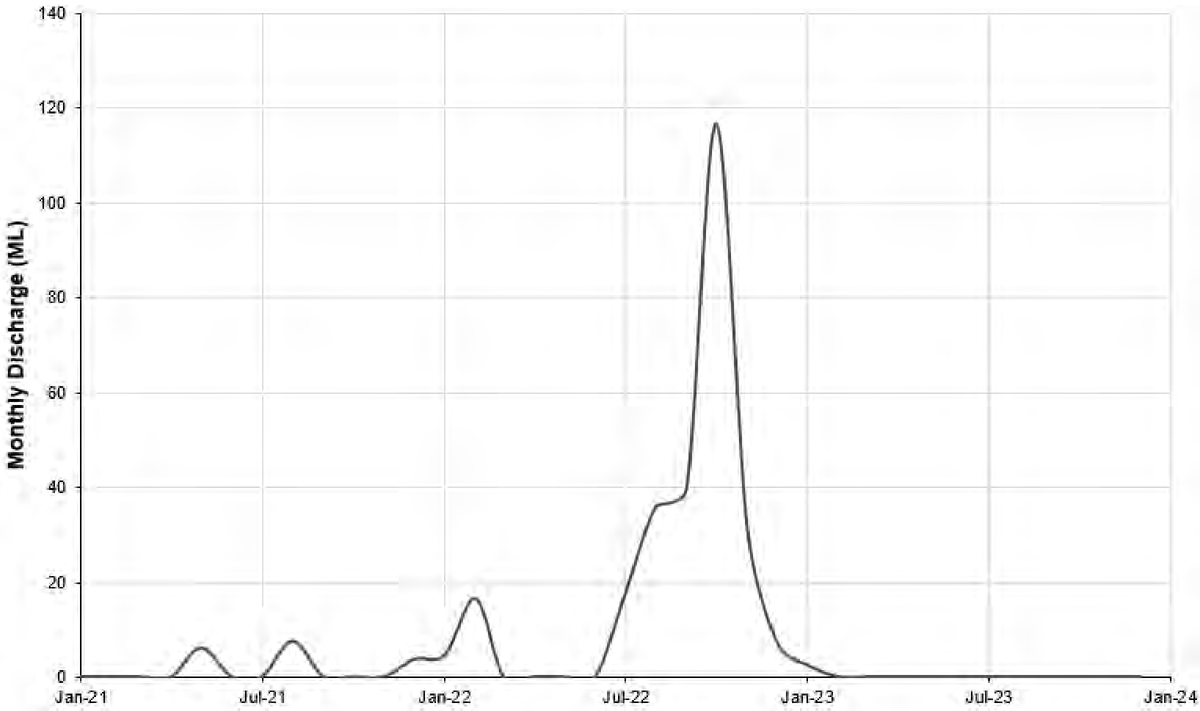


Figure 11: Pit 8 CWD Controlled Discharge to LDP 30

7.1.1 Model Configuration

The WBM has been configured to model a net 17.3 ML/day (200 L/s) water extraction from Pit 8 CWD. Discharge occurs when the volume in the CWD is above 80% full.

7.2 Emergency Discharge

In October 2022 WCPL sought an exemption under S.284 of the *Protection of the Environment Operations Act* (POEO Act) to allow for the emergency offsite discharge of mine water due to above average rainfall associated with the third consecutive La Nina year.

The total cumulative annual rainfall recorded for 2022 was 987 mm, for 2021 was 942 mm and for 2020 was 916 mm. This represents three consecutive years of annual rainfall above 90^{th} percentile annual rainfall.

Licence Variation Notice 1623919 to discharge from the premises, under emergency conditions, from surplus rainwater captured and stored in open cut pits and associated dams was approved on the 31 October 2022. *Licence Condition E1 Emergency Water Discharge* permitted discharge from several LDPs up the following volumes:

- EPL daily discharge limit of 71 ML, including:
  - LDP30 – 18 ML/d
  - LDP31 – 18 ML/d
  - LDP32 – 35 ML/d

Emergency discharge occurred from 31 October 2022 to 25 November 2022 (Phase 1) and 15 December 2022 to 1 January 2023 (Phase 2). A summary of water discharged is given in **Table 12**. A total of 1,607 ML was discharged between 31 October 2022 and 1 January 2023.

Table 12: Summary of Emergency Discharge

Discharge Point	Daily Average (ML)	Daily Maximum (ML)	Daily Limit (ML)	Total Volume (ML)	Permitted Under EPL
Phase 1					
LDP 30 (Pit 8)	11	14	18	243	71 ML/d
LDP 31 (Pit 4)	15	16.6	18	389	
LDP 32 (Pit 2W)	25.2	33.5	35	655	
Phase 2					
LDP 30 (Pit 8)	4.65	4.95	5	85	90 ML
LDP 32 (Pit 2W)	13.05	15.32	15	235	270 ML

7.2.1 Model Configuration

Due to the nature of the discharge and the requirement for changes to approvals, emergency discharge is not included in the WCPL WBM. Rather model results have been adjusted following calibration to account for the emergency release of water from the water management system as described in **Section 11.3**.

8.0 External Water Import

WCM have access to external water supply bores that are operated when required. Given the recent surplus mine water in storage at the site, WCM did not require this source until the extreme drought conditions that occurred during 2018 and 2019. External water was sourced from the water supply bores during May 2019 to March 2020. Accessible external water supply sources are outlined below:

- WCM water supply system includes a water supply borefield;
- It is understood that WCPL are licensed to collectively take up to 3,121 ML annually (equivalent to 8.55 ML/day) including water pumped from mining pits, inferred groundwater and water supply bores;
- Based on the 2019-2020 monitoring data a maximum of 27.3 L/s of water was supplied to the mine via the water supply borefield; and
- WCPL has an in-principle agreement with the nearby Moolarben Coal Mine to source excess water from this mining operation (by pipeline) if required in the future (subject to approval).

WCM have provided records of water import volumes for the January 2019 to December 2023 period. All imported water is sourced from the Wilpinjong borefiled.

This information is presented in **Figure 12**. It is understood that the external water supply bores were not utilised during 2023 due to adequate water holdings/supply on site.

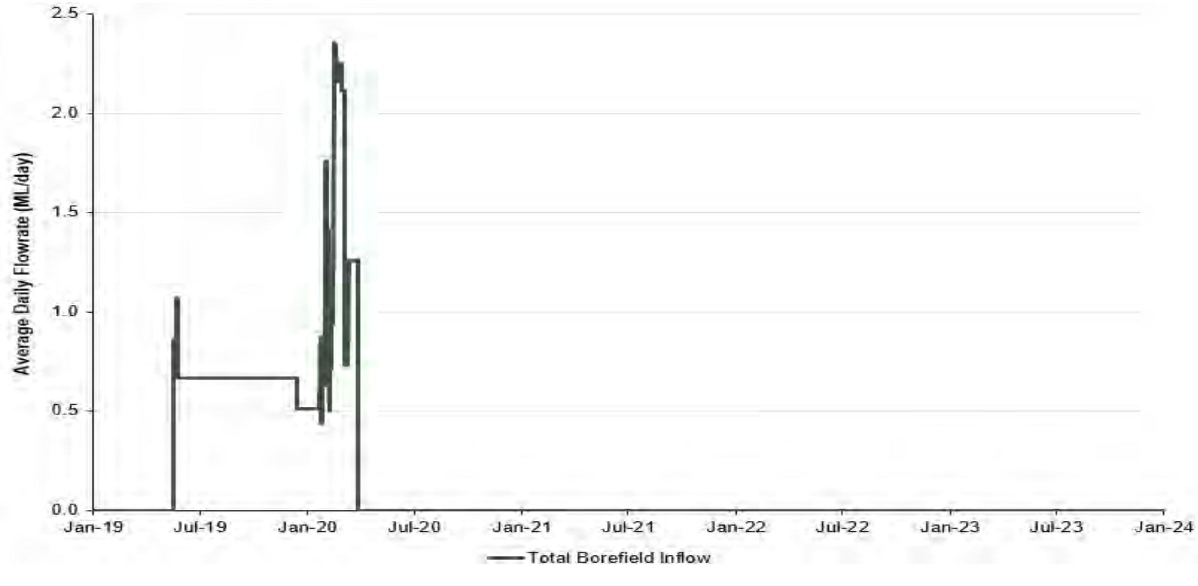


Figure 12: Average Daily Import Rates

A review of **Figure 12** shows a consistent supply of water from the 17 May 2019 to 26 March 2020 with an average flowrate of 0.67 ML/day (7.8 L/s) in 2019 and 1.16 ML/day (13.4 L/s) in 2020. The external supply bores were not operated in 2021, 2022 or 2023.

8.1 Model Configuration

The WBM has been configured to import water from an external source if the combined mine water inventory falls below a specified minimum threshold. This threshold was increased from 500 ML in the WRM (2019) update to 2,000 ML in the previous model updates to reflect observed operations during dry periods. Additionally, a series of pump operation rules have been established to relate the rate of external supply into the WMS to the site inventory levels. These operating rules have been further refined during this model update by altering the pump rate for the set benchmark values. The external supply operating rules included in the WBM are as follows:

- External water is supplied at a varying rate depending on combined mine water inventory levels;
- Benchmark values are set as:
    - o Combined mine water inventory 2,000 ML - assumed pumping rate of 5.1 L/s (0.44 ML/day).
    - o Combined mine water inventory 1,000 ML - assumed pumping rate of 9.9 L/s (0.86 ML/day).
    - o Combined mine water inventory 500 ML - assumed pumping rate of 27.3 L/s (2.35 ML/day).
- External water supply pump rates are linearly interpolated between the benchmark values based on the combined mine water inventory; and
- Water is assumed to be sourced from the borefield and pumped into the CWD storage, where it is then pumped on to supply tasks as required.

Modelled external supply volumes determined using the above operating rules have been compared to the measured water supply volumes during the January 2019 to December 2023 period. The results of this process are presented in **Figure 13**.

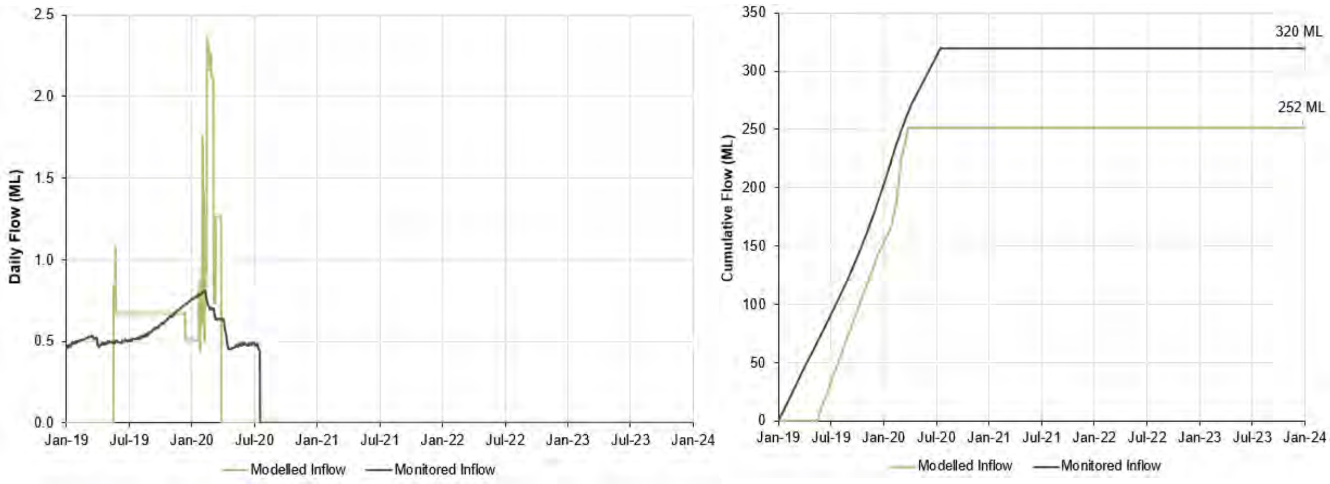


Figure 13: External Water Supply: Modelled vs Monitored Values

As shown in **Figure 13** modelled data shows reasonable correlation to measured data where external water supply is active. Although anomalies are observed between the modelled inflows and that of the monitored data, the intent of this operation is to allow predictive studies to better determine reliance on external water sourcing. The modelled operating rules provide a more reflective simulation during dry conditions as opposed to a single threshold trigger as previously applied within the WBM.

9.0 Groundwater

9.1 Groundwater Inflows

9.1.1 Definition

Groundwater inflows are defined as waters reporting to the WMS from aquifers external to the current extent of disturbance. This generally includes seepage from coal seams and in-situ rock and alluvial aquifers, and water released from cracks and pores within coal and rock as it is broken as part of the mining process (WRM, 2019).

9.1.2 Previous Estimates

Previous estimates of groundwater inflow to the WCM include the following:

- WEP EIS (2015): net groundwater inflow rates adopted as part of the WEP surface water assessment (WRM, 2015) were derived by applying highwall evaporative losses to gross inflow rates determined through hydrogeological modelling as part of the groundwater assessment (HydroSimulations, 2015);
- Previous 2016 model update (Hatch, 2017): net groundwater inflow rates were inferred at a constant rate of 3.8 ML/day through the period January 2014 to January 2017 as part of the water balance model calibration process;
- Previous 2019 model update (WRM, 2019): net inflow rates determined through model calibration exercise varying from 3.51 ML/day in 2014 to 2.00 ML/day in 2018;
- Previous 2020 model update (SLR, 2020a): net inflow rates determined through model calibration exercise as 1.8 – 2.0 ML/day in 2023; and
- Groundwater Model Update (SLR, 2020b): net groundwater inflow rates determined from hydrogeological modelling as 2.5 ML/day.

9.1.3 Current Estimates (This Study)

Groundwater inflow rates have previously been inferred for a given year through historical model calibration (WRM, 2019). However, during a previous model update an operation within the model was established that varies groundwater inflow depending on the state of groundwater influences therefore allowing the model to be more effectively used as a predictive tool for determining future onsite water volumes. This operation allows groundwater inflows to be adjusted based on recent rainfall trends to align simulated mine water inventory trends during dry and wet periods. The degree to which groundwater inflows are adjusted has been determined using historical model calibration. Updated adjustment factors include the following:

- Mean 6-monthly rainfall (300 mm) correlates to the mean modelled groundwater inflow (SLR, 2020a) of 2.0 ML/day;
- 6-monthly rainfall greater than 25% of the mean correlates to a 15% increase in groundwater inflow (2.2 ML/day) to reflect increased groundwater recharge; and
- 6-monthly rainfall less than 25% of the mean correlates to a 15% decrease in groundwater inflow (1.7 ML/day) to reflect reduced groundwater recharge.

Based on the above operation average groundwater inflow for the calibration period are as shown in **Table 13**. It should be noted that assessment of inferred groundwater take for WCM licence conditions is assessed based on the water year (period 1 July to 30 June).

Table 13: Summary of Average Daily Groundwater Inflow

Calendar Year			Water Year		
Period	Modelled Groundwater Inflow (ML/day)	Groundwater Model (SLR, 2020b) (ML/day)	Period	Modelled Groundwater Inflow (ML/day)	Groundwater Model (SLR, 2020b) (ML/day)
2018	1.8	3.3	2018-2019	1.8	2.1
2019	1.8	3.1	2019-2020	1.7	1.7
2020	2.0	2.4	2020-2021	2.3	2.5
2021	2.3	1.9	2021-2022	2.3	2.4
2022	2.0	2.2	2022-2023	2.5	1.8
2023	2.2	1.7	2023-2024	1.9	1.5

Groundwater inflows in 2023 were estimated at an annual average of 1.9 ML/day for the 2023-2024 water year. This is above predictions made in the current groundwater model which equate to 1.5 ML/day (SLR, 2020b).

9.1.4 Model Configuration

The WBM has been configured to simulate a future net inflow rate based on 6-monthly rainfall trends as described in **Section 9.1.3**, reporting to the site WMS.

Note that the 2019 WBM model configuration does not include any groundwater inflow to Pit 8. Activities in the Pit 8 extraction area began during 2019, predominantly during the early stages of mining (i.e. pre-stripping) with limited pit development. It is therefore expected that Pit 8 was elevated above the groundwater table throughout 2019 hence no direct groundwater interception would have occurred. Groundwater inflow to Pit 8 was expected to occur during 2020 with the commencement of mining within Pit 8. As described in the Groundwater Update Model (SLR, 2020b) inflow during 2022 and 2023 is expected to be predominantly to Pit 6 and Pit 8.

The model configuration for groundwater inflow is given in **Table 14**.

Table 14: Groundwater Intake Model Configuration

<table>
<tr><th rowspan="2">Year</th><th colspan="4">Inflow to Pit (%)</th></tr>
<tr><th>Pit 1/5/6</th><th>Pit 2/4</th><th>Pit 3/7</th><th>Pit 8</th></tr>
<tr><td>2018</td><td rowspan="2">25</td><td rowspan="2">25</td><td rowspan="2">25</td><td rowspan="2">-</td></tr>
<tr><td>2019</td></tr>
<tr><td>2020</td><td rowspan="2">30</td><td rowspan="2">20</td><td rowspan="2">20</td><td rowspan="2">30</td></tr>
<tr><td>2021</td></tr>
<tr><td>2022</td><td rowspan="2">50</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">50</td></tr>
<tr><td>2023</td></tr>
</table>

Groundwater operations within the model are used as a preliminary tool to determine groundwater inflows, however, there remains scope to improve measurement of groundwater inflow to the pits to further validate groundwater inflow within the WBM. It is recommended that inflow assumptions continue to be revised/adjusted as further information becomes available.

9.2 Spoil Aquifers

9.2.1 Overview

Mining operations have extracted coal from three distinct voids, termed Pit 1/5/6, Pit 2/4 and Pit 3/7 with the addition of Pit 8 in 2019 (refer **Section 3.1** and **Figure 1**). In-pit spoil placement areas have been formed within Pit 1/5/6 and Pit 2/4 for creation of most the mining landform. These in-pit placement areas are porous and highly permeable. The drainage characteristics of the spoil are such that up-dip pits (such as Pit 5S, Pit 1 and Pit 2S) do not need to be pumped out following rainfall events, as they freely drain down the dip of the coal (through the spoil) to the down-dip pits (i.e. Pit 5N and Pit 4). Pit 2W is also observed to seep at a high rate to Pit 4, through the interconnecting spoil placement areas, due to the large water level difference between these two areas. As mining commenced within Pit 8 during 2020, some groundwater interaction is expected to have taken place, however, is not expected to interact with the spoil aquifers.

Storage of water in-pit is expected to result in flow of water from the open water body into the adjoining spoil placement area, forming a saturated zone within the spoil in which significant volumes of water may be stored. In the event of a pit filling with water, leakage to the adjoining spoil aquifer will prolong the filling process, and conversely, leakage from the aquifer will prolong the subsequent dewatering process.

9.2.2 Properties

Spoil aquifer extents have been estimated based on comparison between end of year 2017 surface topography and deepest mined topographic survey (WRM, 2019). Spoil aquifer storage capacity is a function of the spoil extent and the spoil porosity.

The previous 2016 water balance model update (Hatch, 2017) adopted a spoil aquifer porosity of 30%, determined through model calibration (January 2014 to January 2017). The 2017 water balance update (WRM, 2018) extended the model calibration to include data recorded between January 2017 and December 2017, which includes the drawdown of Pit 5N and its adjacent spoil aquifer. A reduction in the spoil aquifer porosity value from 30% to 20% was found to be required. The 2018 water balance update (WRM, 2019) assumes a further reduction in the Pit 5N spoil aquifer porosity to 10% to replicate the observed rate of drawdown in Pit 5N during 2018. The 2018 water balance update (WRM, 2019) assumes values of 20% and 10% porosity for Pit 2 and Pit 4 spoil aquifers respectively. The porosity of spoil aquifers in this model update has been assumed as consistent with the 2018 values.

9.2.3 Model Configuration

Spoil aquifers have been modelled in the Wilpinjong WBM in accordance with the following:

- Spoil aquifers have been modelled adjacent to Pit 5N, below Ed's Lake, Pit 2W and Pit 4;
- Recharge and discharge occur to balance water levels between the pit lake and the adjacent spoil aquifer. Rates of transfer are governed by head difference but are typically in the order of 10 ML/day – 20 ML/day when flowing (model assumption);
- Pit 2W spoil aquifer drainage to Pit 4 (via Pit 4 spoil aquifer) modelled at a constant rate of ~10 ML/day;
- Storage characteristics have been modelled assuming 10-20% spoil porosity. Stage-storage characteristics have been provided for reference in **Appendix D**; and
- Seepage from up-dip pits into spoil aquifers, and back out into down-dip pits (e.g., Pit 5S to Pit 5N, or Pit 2E to Pit 2W), at relatively unconstrained flow rates.

10.0 Water Quality

Water quality sampling at WCM is undertaken at various locations with samples analysed for the standard suite of quality indicators. Monthly average measurements of EC for selected surface water locations have been summarised for 2023 in **Table 16** with long-term data provided in **Appendix C**. Note that limited EC data for the WMS dams or pits was provided from 2020 to 2023. Review of available information shows the following:

- Water circulating through the WMS is typically within the EC range of 3,000 to 4,000 µS /cm (see Pit 2W and CWD);
- The EC of water within CWD increased slightly in 2019, coinciding with input from external bore supplies;
- During 2019 and 2020 EC of water within the RWD increased to slightly above average levels;
- The EC of water within Pit 1S prior to 2018 is higher than the water in the rest of the WMS, due to inflow of RO reject. Concentrations of salt within this storage appear to have been diluted with upstream clean catchment runoff (RO reject EC sampled at 14,000 µS/cm in Feb-17 vs. Pit 1S EC of around 7,850 µS/cm in October 2017).
- The EC of the blended discharge stream to Wilpinjong Creek is typically around 300 to 350 µS/cm vs the 500 µS/cm EC end-of-pipe limit specified in EPL 12425.

The WBM maintains a running account of salt mass in all water storages which is equated to and reported as EC. Salt mass inflows are typically estimated by assigning salinity concentrations to runoff from various land use types, and to point water sources (e.g., groundwater, pipeline water).

Water quality model parameters were initially defined as part of the WEP surface water assessment (WRM, 2015). This water balance model update confirmed that these parameters continued to produce reasonable estimates of EC in the circulating WMS inventory (based on Pit 2W data). The current investigation has retained water quality parameters from these earlier studies.

Adopted water quality parameters are summarised in **Table 15**.

Table 15: Adopted Salinity Generation Rules

Item	Salinity (EC) (µS/cm)
Catchment Runoff Source	
Natural / undisturbed	1,600
Roads / industrial / hardstand / pit	3,000
Spoil / overburden / cleared	2,500
Rehabilitated overburden	2,000
Point water sources	
Groundwater	3,000
External water supply (e.g., borefield)	3,000

Table 16: Average Electricity Conductivity (µS/cm) by Month and Sampling Location

Year	Month	Monthly Rainfall (mm)	Dams						Pits				WTF				Reference (Waterways)		
			Pit 2W	Pit 1S	Pit 5 FP	CWD	RWD	Ed's Lake	Pit 5	Pit 2 NB	Pit 4	Pit 3	Feed	Permeate	Discharge (ML)	Concentrate	Wilp. Ck Upstream	Wilp. Ck Downstream	Cumbo Creek
2023	Jan	49											3,562		406		1,755	1,673	2,188
	Feb	25											3,853		411		791	1,145	2,409
	Mar	65											3,883		412		1,040	1,098	3,056
	Apr	48											3,915		405		787	1,311	3,087
	May	3											3,916		393		728	1,352	2,965
	Jun	29											4,023		388		586	1,370	3,008
	Jul	23	4,188												376		568	1,312	2,875
	Aug	30	4,322												378		708	1,234	3,037
	Sep	18	4,533												382		935	1,057	3,255
	Oct	36	4,724												374		1,209	804	3,777
	Nov	94	4,705												375		1,338	936	3,532
	Dec	59	4,785												378		1,431	703	3,867

Note: Wilpinjong Creek and Cumbo Creek EC values are flow-weighted averages, calculated for that month. Rainfall totals were calculated based on the data obtained from the SILO Data Drill service.

11.0 Water Balance Model

11.1 Overview

The WBM has been designed to simulate the operation of all major components of the water management system, including catchment runoff, water inventory fluctuation and overflow, pump and gravity transfers, coal mining operations usage and return, climatic influence, groundwater inflow, open cut mine dewatering, external water supply, discharge of water to Wilpinjong Creek (via the WTF), and interaction with spoil aquifers.

Key components of the WMS are generally described and quantified in the preceding report sections.

11.2 Model Schematisation

A representative schematic of the WBM has been provided in **Appendix A**. Review of **Figure 1A** shows the model is comprised of a collection of inter-connected nodes. Nodes represent key components of the water management system (dams, wash plant, pits, etc.).

11.3 Model Calibration

11.3.1 Overview

The GoldSim model has been constructed to represent the operations taking place at WCM in the period 2018 – 2023 hence calibration of the model has been undertaken using the monitoring data provided by WCPL for the January 2018 to December 2023 period. Water level data has been converted to estimates of water volume using storage characteristics as described in **Section 3.2.2**. Inventory data and water usage data/discharge data has been utilised for model calibration.

The model calibration exercise has specifically focused on reproducing the measured inventory in the combined WMS (Pit 2W, Pit 1S, RWD, CWD, Pit 5N, Pit 4 and Pit 3) with particular focus on behaviour of the water inventory during drought conditions experienced during 2018 and 2019 followed by recovery of the water inventory during the 2020 – 2022 wet period. The objective of the exercise was to infer or establish key model inputs and parameters, and to demonstrate that the WBM suitably replicates observed site inventory trends.

11.3.2 Configuration

The following inflows and outflows were hard-coded into the model as time-series data:

- Extraction of water from the RWD and CWD to supply demands in the MIA/CHPP area, including the CHPP and miscellaneous MIA demands (modelled as per metered stream in **Section 5.1**);

The following processes were simulated within the model:

- Climatic influence: evaporation, evapotranspiration, direct rainfall and catchment runoff based on daily rainfall data at the BoM Wollar Gauge and Site AWS (see **Section 4.2.3**) and SILO Data Drill evaporation data (refer to **Section 4.3**);
- Water extraction from Pit 2W, the RWD and Pit 5 FP Dam for dust suppression (per **Section 5.2**);
- Transfer of water between storages, pit dewatering etc (refer to **Table 4**);

- Seepage from up-dip pits into down-dip pits via spoil aquifers (e.g., Pit 5S seepage to Pit 5N);
- Saturation and drainage of spoil aquifers adjacent to open cut pits (spoil aquifers modelled adjacent to Pit 5N, Pit 2W and Pit 4) (refer to **Section 9.2**);
- WTF inflow and outflow rates (refer to **Section 6.3**);
- Offsite discharges (refer to **Section 7.0**);
- Groundwater inflow rates (refer to **Section 9.1**); and
- External water supply rates (refer to **Section 7.0**).

The following parameters were adjusted to improve the overall agreement between simulated and observed historical WMS performance:

- WTP operating rules;
- Groundwater adjustment factors and groundwater inflow apportioning to Pits; and
- Incorporation of operations regarding Pit 8 CWD.
- Other settings and configuration assumptions include:
  - Catchment and land use information described in **Section 3.2.4**;
  - Catchment and land use data in 2018 and 2019 based on data in the previous model updates; and
  - Stage storage updates given in **Appendix D.**

11.3.3 Outcomes

Model simulated volumes have been compared against historical measurements in **Figure 14** for the period January 2018 to December 2023. Results have been plotted for the combined water inventory in the WMS (comprising Pit 2W, Pit 1S, RWD, CWD, Pit 5N, Pit 4 and Pit 3).

Review of **Figure 14** found discrepancies in modelled and monitored inventory levels during the period July 2019 and May 2020. Investigation found a significant drop in site inventory occurred in July as a result of gaps in Pit 4 monitoring, monitoring then resumed in May 2020 resulting in a sudden spike in site inventory. To account for these discrepancies, the model results have been adjusted for the sudden loss and gain of volume associated with Pit 4 monitoring results, as shown in **Figure 14**. By adjusting these values to match monitoring variances **Figure 14** shows that the simulated WMS inventory is well aligned with historical inventory measurements throughout the 2018 to 2022 calibration period.

Similarly, the model has been adjusted for the emergency discharge of water via licence discharge points as described in **Section 7.2**. An average discharge rate for the discharged volume has been applied over the discharge periods.

Following a significant rainfall event in March 2021, a rapid increase in the site inventory was observed. This increase was seen to have caused a greater effect on the modelled mine water management system than that monitored. This response results in elevated levels modelled before levels are distributed within the water management system, although discrepancies are shown the general trend in water inventory remain consistent following this event. Following incorporation of the capacity increase of the WTP event the modelled inventory returns to similar levels to that monitored. Given the relatively good correlation of the WBM prior to this event, this may be attributed to immediate site water management, including storage transfers, following this event that are not consistent with those within the site WBM.

At the start of 2023, the site water inventory was high due to accumulated rainfall from 2021-2022. Inventory levels reached substantial volumes which possibly resulted in immediate site water management inconsistent with modelling assumptions within the site WBM. However, during 2023 model results return to similar levels monitored within the site inventory. Reduced rainfall during 2023 results in a declining site inventory throughout the period.

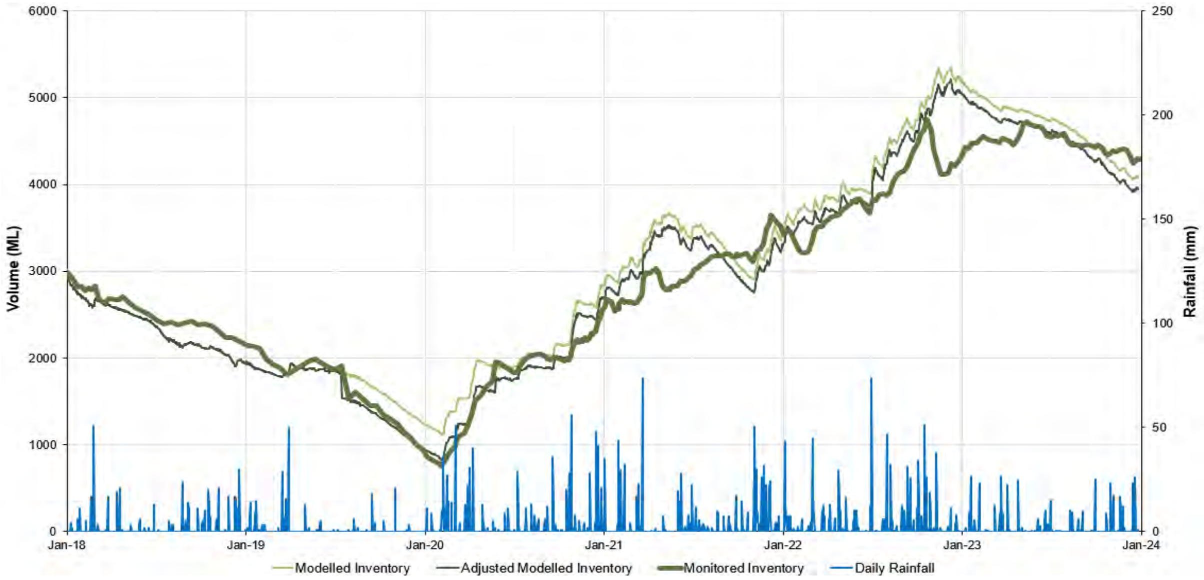


Figure 14: WBM Calibration Simulated vs Measured Combined Site Inventory

Key outcomes of the calibration process include:

- Effective representation during significantly dry conditions and during subsequent water recovery;
- Effective representation of inventory reduction through measures such as evaporators and operation of the RO plant; and
- Verification of a series of operating rules regarding groundwater inflow rates, WTF operation and external allow the model to be more effectively used as a predictive tool for onsite water behaviour.

11.4 Salt Balance Verification

The WBM maintains a running account of salt mass in all water storages which is equated to and reported as EC. Model verification of the salt balance has been undertaken using salinity monitoring for the 2023 calibration period (1 January 2018 to 31 December 2023) specifically this includes storages CWD, RWD and Pit 2W due to the limited availability of monitoring data for this period. The objective of this verification is to establish that salt transfer is effectively being captured within the WBM.

Salt mass inflows are typically estimated by assigning salinity concentrations to runoff from various land use types, and point water sources (e.g., groundwater, pipeline water) as described in **Section 10.0**. Increased salt concentrations are also recirculated into the WMS via the concentrate return from the WTF, directed to the RWD following decommissioning of Pit 1S. No salinity is lost via evaporation from storages.

From available monitoring data, it is found that water circulating through the Water Management System (WMS) is typically within the EC range of 3,000 and 4,000 µS/cm. Where data is unavailable, the initial conditions within storages was assumed to be within this range. Model simulated salinity has been compared against historical measurements in

Figure 15 to **Figure 17** for the period January 2018 to December 2023. The results have been plotted for the storages CWD, RWD and Pit 2W.

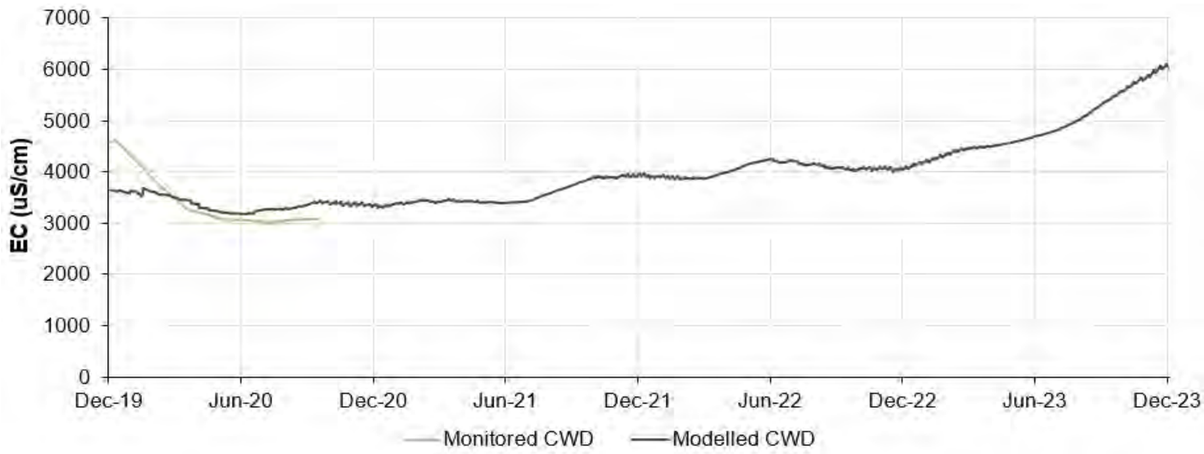


Figure 15: Salinity Verification Simulated vs Measured – CWD

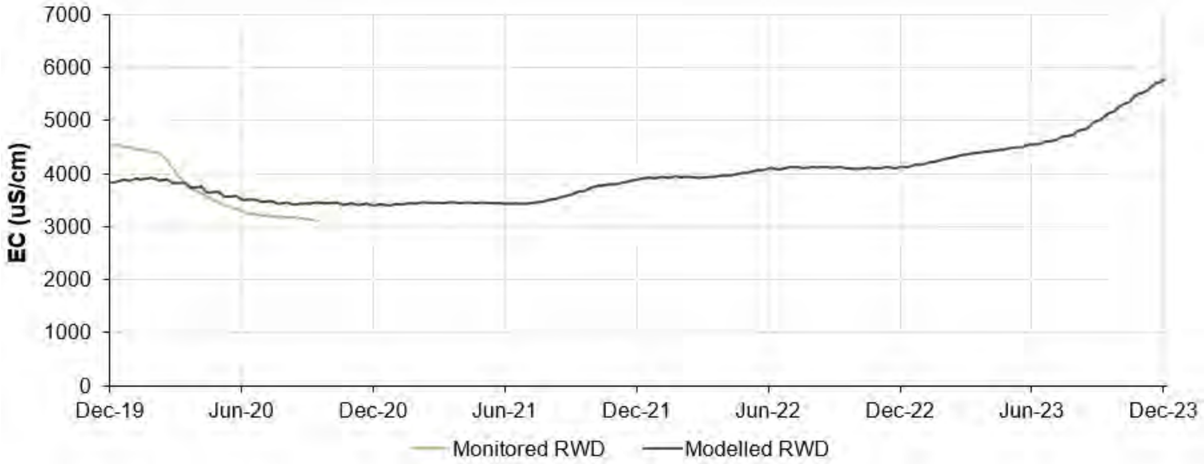


Figure 16: Salinity Verification Simulated vs Measured – RWD

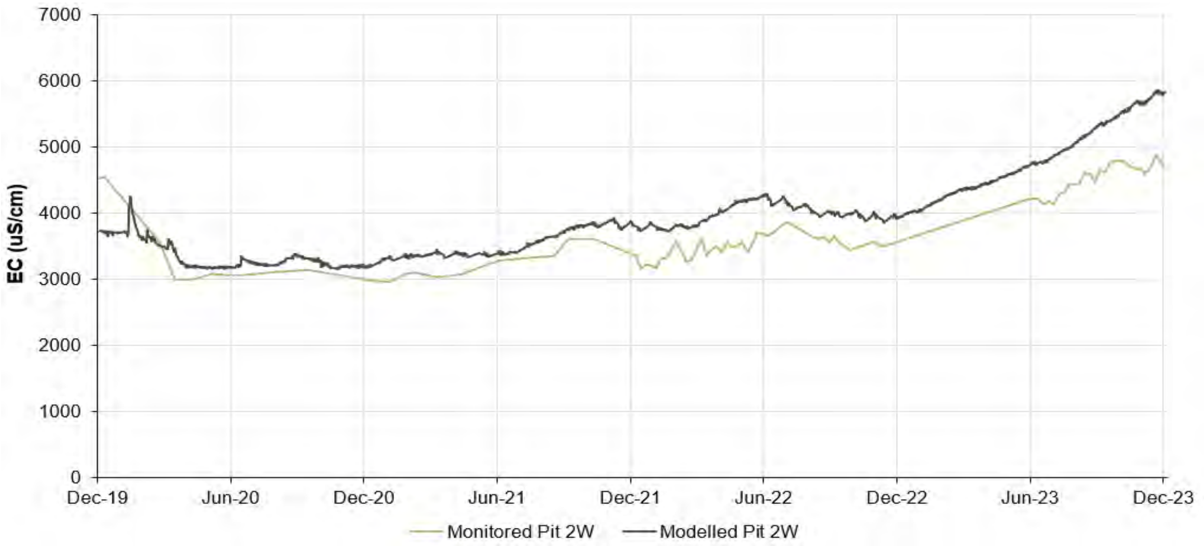


Figure 17: Salinity Verification Simulated vs Measured – Pit 2W

Key outcomes of this verification process include:

- Effective representation of salinity that aligns with trends in monitored data (where available).

11.5 Base Case Model Operating Rules

Representative operating rules that define the Wilpinjong WBM are summarised in **Table 17**. The operating rules have been refined by calibration against monitored data over a 5-year period.

Table 17: Wilpinjong WBM Operating Rules

Item	Description	Operating Rules
1.0	**External Water Supply**	
1.1	External Water Supply	• Water imported from an external source to sustain mine water demands during prolonged drought periods • External water supplied when site inventory below 2,000ML, import rate dependent on site inventory level and ranges from 5.1L/s to 27.3L/s (see **Section 8**) • Inflow directed to CWD
2.0	**Supply to Demands**	
2.1	CHPP	• Modelled as a net water extraction of 139 ML/month (4 ML/day) sourced evenly between the CWD and RWD • Usage consistent with CHPP water balance and forecast production (WRM, 2019) (see Section **5.1.1.4**) • No return from demand
2.2	Miscellaneous Industrial Area	• Modelled as a net water extraction of 20 ML/month (0.66 ML/day) sourced evenly between the CWD and RWD • Assumed loss rate of 0.274 ML/day (100 ML/year) • Balance assumed to return to Pit 2W
2.3	Dust suppression	• Water usage calculated daily in model as a function of climate and application area. (Refer to **Section 5.2.2**) • No dust suppression if rainfall exceeds 1.5 mm/day • Demand supplied based on the following breakdown: • ROM FP (RWD) – 75.08% • Pit 2 FP (Pit 2W) – 24.91% • Pit 5 FP (Pit 5 FP Dam) – 0.01% • No return from demand modelled
2.4	Evaporators	• Modelled as a net 0.25 ML/day loss from Pit 2W • Outflow stream assumed to be water only, no salt removed from Pit 2W • Disabled if site water inventory is less than 4,000 ML
2.5	WTF	• Used to draw down mine water inventory. Operated if inventory in WMS exceeds 2,000 ML • Supplied from Pit 2W at up to 6.6 ML/day, flowrate modelled dependent of previous 5-day rainfall (see Section 6.3) • Permeate recovery modelled as 75% of feed. No reduction in recovery modelled due to high feed water EC • Permeate EC modelled at 180 µS/cm

Item	Description	Operating Rules
		• WTF reject EC modelled as a function of feed water EC based on salt mass balance • WTF reject pumped to Pit 1S prior to Q4 2018 after which reject pumped to RWD. If Pit 1S/RWD full, reject pumped to Pit 2W. Following recommission in December 2020 reject is pumped to Pit 2W • Discharge water EC modelled at 350 µS/cm, achieved by adding Pit 2W water to the residual permeate stream assumed 0.3 ML/day based on average EC of Pit 2W and discharge water
3.0	**Operation of Key Storages**	
3.1	**Water Storages**	

3.1.1	Pit 2W	• Primary hub mine water storage
		• Supplies makeup water to the following locations as required:
		  o RWD and CWD
		  o Pit 2 FP
		  o Pit 5 FP Dam
		• Receives pumped dewatering from Pit 5N, Pit 4, Pit 3N, Pit 6, Pit 8 and Pit 8 CWD
		• Pumps to Pit 3 at 90 L/s (7.78 ML/day). If Pit 3 is full, Pit 2W pumps to Pit 4, and then to Pit 5 as a last resort at 100L/s (8.64 ML/day)
		• Seeps to Pit 4 via Pit 2/4 spoil aquifer
		• Supplies water to WTF for treatment and discharge to Wilpinjong Creek under EPL 12425
		• Feed water for evaporator spray system
		• Exchanges water with adjacent Pit 2/4 spoil aquifer to maintain equalised water levels (exchanges water with Pit 2 half of spoil aquifer only)
		• No spillway overflows modelled

3.1.2	RWD	• Mine water dam in the CHPP/MIA area
		• Supplies water to the following locations:
		  o CHPP process water makeup
		  o MIA/CHPP miscellaneous water usage
		  o ROM FP
		• Sources water from Pit 2W to maintain water level at 412.6 mAHD (295 ML)
		• Receives reject from WTF following decommission of Pit 1S in Q4 2018
		• No spillway overflow modelled

3.1.3	CWD	• Mine water dam located north of CHPP/MIA, within the rail loop
		• Supplies water to the following locations:
		  o CHPP process water makeup
		  o MIA/CHPP miscellaneous water usage
		• Sources water from Pit 2W to maintain water level at 395.7 mAHD (30 ML)
		• No spillway overflow modelled

3.1.4	Pit 1S (offline as of Q4 2018)	• RO reject storage dam • Receives pumped inflow of reject from WTF • Maximum operating level defined as 421.4 mAHD (295 ML) to minimize seepage to downstream areas within the WMS • Constant seepage rate of 1 mm/d modelled. Seepage assumed to report to Pit 1/5/6 spoil aquifer • Additional seepage of 0.45 ML/day to Pit 1/5/6 spoil aquifer modelled if water level exceeds 422.4 mAHD (345 ML)

Item	Description	Operating Rules
3.1.5	Pit 5 FP Dam	• Water supply for Pit 5 FP • Receives pumped inflows from Pit 5N and Ed's Lake • Sources makeup water from Pit 2W to maintain a minimum water level of 391.5 mAHD (3 ML) • Spillway overflow to Pit 5N at 392.2 mAHD (full storage volume 8.5 ML)
3.1.6	Ed's Lake	• Residual void left within backfilled and rehabilitated Pit 1N void • Supplies makeup water to Pit 5 FP Dam • Pumps excess water to Pit 2W at 100 L/s (8.64 ML/day) • Seepage to underlying Pit 1/5/6 spoil aquifer modelled at 0.5 ML/day • Spillway overflow to Wilpinjong Creek at 375.3 mAHD (storage capacity nominally 110 ML)
3.1.7	Pit 8 Clean Water Dams	• Constructed in 2020 • Capture water from the Pit 8 upstream diversion • Excess water pumped to Pit 2W at 160L/s when volume reaches 6.5 ML prior to 2021, after which water is discharge via a licenced discharge point at up to 200L/s
3.2	**Tailings Storage Facilities**	
3.2.1	All TD's	• Old tailings storage cells • All receive local catchment runoff with no pumped inflows • No pumped outflows modelled. Standing water left to evaporate, or seep to Pit 2/4 spoil aquifer (at an assumed rate of 2 mm/day)
3.3	**Mining Pits**	
3.3.1	Pit 5N	• Pumps to Pit 5 FP Dam if it requires water. Excess water pumped to Pit 2W at 180 L/s (15.6 ML/day) unless receiving storage is above its maximum operating level • Maximum water level of 369 mAHD modelled. If water level exceeds this threshold, pumping to Pit 2W will occur regardless of downstream inventory (this will trigger filling of next pit in sequence) • Receives groundwater inflow of 25% of total inflow prior to 2020, receives 30% groundwater inflow following the commencement of mining Pit 8 (modelled via Pit 1/5/6 spoil aquifer). No groundwater inflow is assumed after 2022 • Exchanges water with adjacent Pit 1/5/6 spoil aquifer to maintain equalised water levels • Receives seepage from up-dip pits (Pit 5S, Pit 6 and Pit 1) via spoil aquifer
3.3.2	Pit 5S	• Seepage to Pit 5N (via Pit 1/5/6 spoil aquifer) modelled as a depth loss rate of 300 mm/day • No pumped dewatering
3.3.3	Pit 4	• Receives seepage from Pit 2W via Pit 2/4 spoil aquifer • Excess water pumped to Pit 2W at 160 L/s (14.0 ML/day) unless receiving storage is above its maximum operating level • Maximum water level of 362.0 mAHD modelled. If water level exceeds this threshold, pumping to Pit 2W will occur regardless of downstream inventory (this will trigger filling of next pit in sequence) • Receives groundwater inflow of 25% of total inflow prior to 2020, receives 20% groundwater inflow following the commencement of mining Pit 8. No groundwater inflow is assumed after 2022 • Exchanges water with adjacent Pit 2/4 spoil aquifer to maintain equalised water levels (exchanges water with Pit 4 half of spoil aquifer only)
3.3.4	Pit 1	• Seepage to Pit 1/5/6 spoil aquifer modelled as a depth loss rate of 300 mm/day

Item	Description	Operating Rules
		• No pumped dewatering
3.3.5	Pit 2S	• Seepage to Pit 2/4 spoil aquifer modelled as a depth loss rate of 300 mm/day • No pumped dewatering
3.3.6	Pit 3	• Receives drainage from Pit 7 • Excess water pumped to Pit 2W at 90 L/s (7.8 ML/day) unless receiving storage is above its maximum operating level • Maximum water level of 358.0 mAHD modelled. If water level exceeds this threshold, pumping to Pit 2W will occur regardless of downstream inventory • Receives groundwater inflow of 50% of total inflow prior to 2020, receives 20% groundwater inflow following the commencement of mining Pit 8
3.3.7	Pit 7	• Passively drains to Pit 3 • No pumped dewatering
3.3.8	Pit 6	• Seepage to Pit 5N (via Pit 1/5/6 spoil aquifer) modelled as a depth loss rate of 300 mm/day • Receives groundwater inflow of 50% of total inflow from 2023 with increased pit development • No pumped dewatering
3.3.9	Pit 8	• No pumped dewatering prior to 2020 • Excess water pumped to Pit 2W at 100L/s • Receives groundwater inflow of 30% of total inflow from 2020, receives 50% groundwater inflow from 2023. Does not receive groundwater inflow prior to 2020
3.4	**Spoil Aquifers**	
3.4.1	Pit 1/5/6 Aquifer	• Modelled as two separate cells: Pit 5 spoil aquifer and Pit 1 spoil aquifer • Pit 5 spoil aquifer equalises with Pit 5N open cut above 351 mRL • Pit 5 spoil aquifer equalises with Pit 1 spoil aquifer above 354 mRL
3.4.2	Pit 2/4 Aquifer	• Modelled as two separate cells: Pit 2 spoil aquifer and Pit 4 spoil aquifer • Pit 2 spoil aquifer equalises with Pit 2W open cut above 350.75 mRL. • Pit 4 spoil aquifer equalises with Pit 4 open cut above 331 mRL. • Pit 2 spoil aquifer seeps to Pit 4 spoil aquifer at a fixed rate of 10 ML/day (seepage calculation based on level difference cannot be modelled within OPSIM due to large head difference – i.e., unstable calculation)
4.0	**Other**	
4.1	Climate	• All water storages receive catchment runoff and lose water to evaporation.
4.2	Groundwater Inflow	• Passive groundwater inflow is experienced due to active mining • Groundwater inflow is determined using adjustment factors to simulate rainfall and recharge responses (see **Section 9.1.4**) • Inflow directed to downdip pits within void areas, Pit 5N (pre 2023), Pit 4 (pre 2023), Pit 3 (pre 2023), Pit 6 (post 2023) and Pit 8 (Post 2019). The total expected rate is apportioned as follows: o Pit 1/5/6 void: 25% (prior to 2020), 30% (from 2020), 50% (from 2023) o Pit 2/4 void: 25% (prior to 2020), 20% (from 2020), 0% (from 2023) o Pit 3/7 void: 50% (prior to 2020), 20% (from 2020), 0% (from 2023) o Pit 8 void: 30% (from 2020), 50% (from 2023)

11.6 Performance of Site WMS During Drought Conditions

As discussed in **Section 4.0**, during 2018 and 2019 significant drought conditions were experienced in the region. As a result, water within the site water inventory was seen to decrease to a minimum of 760 ML during this period. In order to preserve site water supplies a number of strategies have been implemented at WCPL including:

- Operation of the revised CHPP model which includes a Belt Filter Press (BFP) (as opposed to direct pumping into tailings dams); and
- The use of Dust-a-side (DAS) to reduce dust generation on roads, hardstand and laydown areas and reduces the need for water carts.

As discussed in **Section 5.1.1**, the CHPP tailings circuit was modified in April 2015 to include a BFP, which dewaters the tailings stream and allows this material to be disposed of as a dry waste stream with the coarse reject. Any moisture bleed-off from within the BFP process is captured and re-circulated to the clarified water tank, thereby reducing the net water usage of the CHPP.

In order to reduce water resources required in times of increased demand for dust suppression, WCPL implemented the use of DAS in 2019. During 2019, minimal rainfall fell at the site (equivalent to a 1st percentile historical rainfall) which increased the need for dust suppression significantly, as illustrated in **Section 5.2**. It is considered that this water consumption and associated loss of site water to evaporation would have increased without DAS usage.

Although the site water inventory reduced significantly during this drought period, the above practices along with reduced discharge from the WTF, import of external water sources and effective management of site water storages ensured the site could operate effectively throughout this period.

11.7 Performance of Site WMS During Very Wet Conditions

As discussed in **Section 4.0**, during 2020, 2021 and 2022 significant rainfall conditions were experienced in the region. As a result, water within the site water inventory was seen to increase to a maximum of 4723 ML during this period.

To relieve excess water supply, several strategies have been implemented at WCPL including:

- Utilisation of water disposal infrastructure including site WTF and evaporation sprays;
- Discharge of clean water via Pit 8 CWD; and
- EPL licence variation notice to emergency discharge via three LDPs (30, 31, 32).

As discussed in **Section 7.2**, emergency discharge was undertaken from October 2022 to January 2023. During the period 2020 to 2022 above 90th percentile annual rainfall was experienced in all years with 97th percentile annual rainfall in 2022. Consecutive wet climatic conditions significantly increased the need for water reduction. However, effective site management measures ensured the site could operate effectively throughout this period.

12.0 Forecast of Site Water Behaviour

12.1.1 Overview

The Wilpinjong WBM, as described in the preceding sections, has been utilised to investigate the behaviour of the site water inventory for the 3-year forecast period from 1 January 2024 to 31 December 2026.

12.1.2 Model Configuration

The WBM has been configured to account for changes required to simulate site operations proceeding current conditions. The WBM primarily operates as per the configuration described in this report, however, adjustments have been made to the simulation methodology, catchment breakdown, CHPP Demand, site WMS operations. These elements are described in the following sections.

12.1.2.1 Simulation Methodology

The WBM was run on a daily timestep for the period between 1 January 2024 and 31 December 2026. As described in **Section 4.2** and **4.3**, 124 years of climate data sourced from the SILO Data Drill is available for WCM for use in analysis in long-term climate trends. Stochastic climate data has been used to determine rainfall patterns for the forecasted years.

The purpose of stochastic rainfall generation is to develop a wide range of climate sequences based on the recorded rainfall data of the area. These sequences have the similar statistical distribution to that of the historical data set for a range of parameters, including mean, variance, skew, and number of wet days or dry days. Each sequence has an order in which the rainfall has occurred. For example, one sequence may have wetter years at the start of the sequence, where another sequence may have the wetter years towards the end of the sequence. Some sequences may be wetter or dryer than others in order to account for the variability of the climate which may occur during the mine life. The probabilistic rainfall data replicates the seasonality of the historical rainfall data.

The probabilistic climate data for the WBM was used to predict the rainfall at the site during the forecast period to determine the volume of water on site which needs to be managed. The probabilistic rainfall sequences were produced through the use of the Stochastic Climate Library (SCL) software (eWater CRC).

Stochastic rainfall data was produced for 500 replicates of 3-year rainfall data (1500 years of probabilistic data). This allows a wide range of climatic conditions to be simulated, which then gives the mean and median of the assessment. The assessment also yields percentiles which are interpreted as a percentage exceedance probability (i.e., the risk of an event occurring).

Monthly evaporation rates have been utilised for the forecast period as per **Section 4.3**. Due to limitations in the number of stations in the region, long-term average values were used in the WBM as opposed to stochastic evaporation data.

The stored volumes prior to the simulated forecast period (to 31 December 2023) were estimated based on monitored water level data recorded by WCPL. The combined site volume on 29 December 2022 was 4290 ML.

The results of the site water inventory are presented in terms of the following climatic conditions:

- Very Wet Climatic – 99th Percentile results of the volume predicted using the 500 probabilistic climatic sequences;
- Wet Climatic – 90th Percentile results of the volume predicted using the 500 probabilistic climatic sequences;
- Median Climatic – 50th Percentile results of the volume predicted using the 500 probabilistic climatic sequences;
- Dry Climatic – 10th Percentile results of the volume predicted using the 500 probabilistic climatic sequences; and
- Very Dry Climatic – 1st Percentile results of the volume predicted using the 500 probabilistic climatic sequences.

12.1.2.2 Catchment Breakdown

Catchment boundaries for water storages within WCM along with land use classifications for the years 2024, 2025 and 2026 have been delineated based on the most recent available catchment areas and land types provided by WCPL and the long-term mine forecast. A breakdown of land use type per water storage catchment area and catchment and land use maps, have been provided in **Appendix B**.

12.1.2.3 Site Water Management System Operations

The operations within the site water management system for the forecast period are expected to be generally consistent with the arrangement described throughout this report. Catchment areas for the forecast period are shown in **Appendix B**.

Evaporator sprays were commissioned once again in 2022, and therefore are allowed to draw water from Pit 2W in accordance with threshold rules described in **Section 5.3**.

12.1.2.4 CHPP Demand

As the model has been updated to include a time series of CHPP water demand based on the monitored usage, for model forecasting an annual average across the calibration period of 4.0 ML/day has been adopted.

12.1.3 Outcomes

12.1.3.1 Water Balance

Model simulated volumes have been forecast for the period 1 January 2024 to 31 December 2026. Results have been plotted for the combined water inventory in the WMS (comprising Pit 2W, Pit 1S, RWD, CWD, Pit 5N, Pit 4 and Pit 3).

Figure 18 shows the forecasted total site inventory and associated WTF discharge for the period 1 January 2024 to 31 December 2026 through varying climatic conditions.

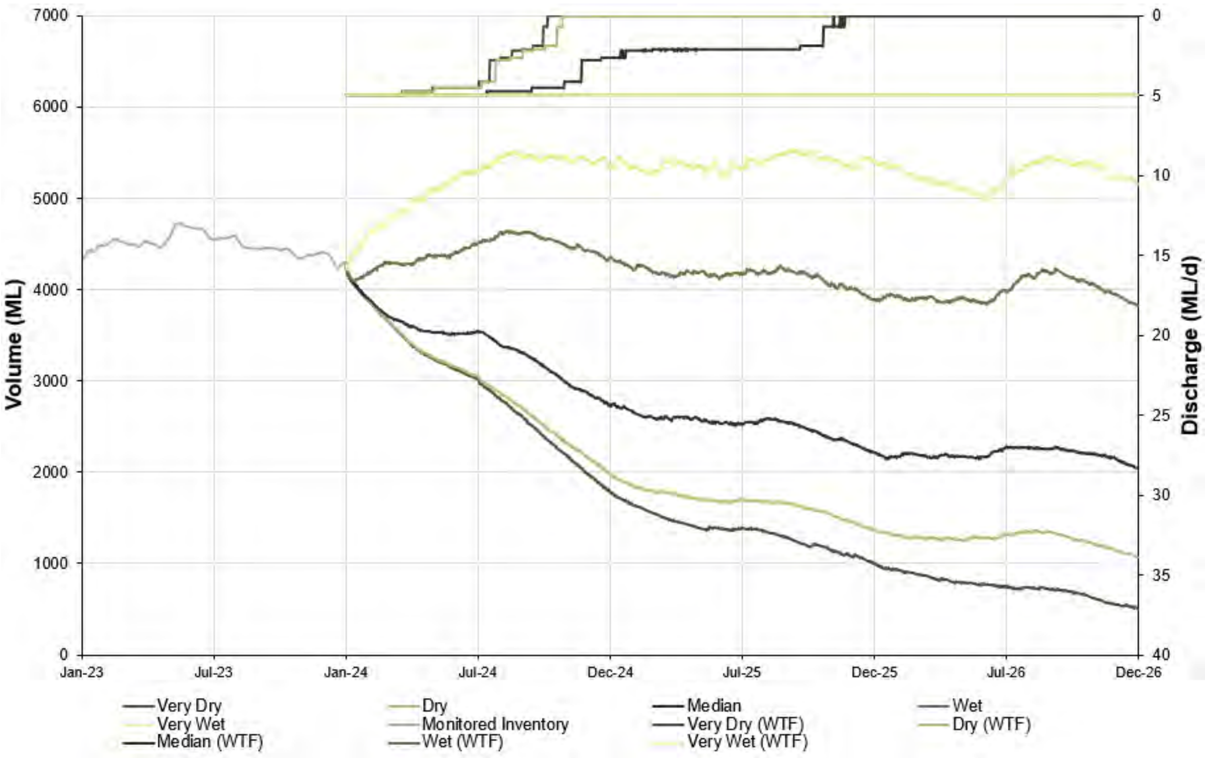


Figure 18: Forecast Site Water Inventory – 2024 to 2026

Review of **Figure 18** shows the following:

- The 1%ile (very dry climatic conditions) results in a total site water decrease to 1,793 ML at the end of 2024, 1,005 ML at the end of 2025, and 505 ML at the end of 2026;
- The 10%ile (dry climatic conditions) results in a total site water decrease to 1,987 ML at the end of 2024, 1,369 ML at the end of 2025, and 1,068 ML at the end of 2026;
- The 50%ile (median climatic conditions) results in a total site water decrease to 2,740 ML at the end of 2024, 2,221 ML at the end of 2025, and 2,045 ML at the end of 2026;
- The 90%ile (wet climatic conditions) results in a total site water decrease to 4,345 ML at the end of 2024, 3,886 ML at the end of 2025, and 3,814 ML at the end of 2026; and
- The 99%ile (very wet climatic conditions) results in a total site water increase to 5,352 ML at the end of 2024, 5,407 ML at the end of 2025, and 5,143 ML at the end of 2026.

Overall, the forecast indicates that there is adequate water security during dry conditions, with opportunities to reduce inventory destruction. Water inventory during very wet years will be manageable, however, similar strategies implemented following the 2022 wet period may be necessary.

12.1.3.2 Salt Balance

Model simulated salinity have been forecast for the period 1 January 2024 to 31 December 2026. Results have been plotted for the primary transfer storages within the combined water inventory in the WMS (i.e., CWD, RWD, Pit 2W).

Salinity has been presented in terms of salinity percentile of salinity levels that may result from the varying climatic conditions simulated and provides an indication of the range of salinities that may be experienced within storages. Hence, the 99th percentile salinity is the highest 99 percent of possible salinity levels occurring in the water storage and therefore does not necessarily correlate to very wet (99th percentile) rainfall.

Where water within storages becomes significantly low, such as during very dry or dry conditions described in **Section 12.1.3.1**, The model does not capture all of the processes associated with the movement and transfer of salt. For this reason, the salt concentration of the site water storages has been capped at a maximum of 25,000 mg/L (EC of 37,313 µS/cm). This rarely activates in the model and typically only applies to very dry or dry climate conditions when storages dry out or reach very low water levels. In these instances, the mass of salt predicted is small but as the volume of water modelled is also small this is reported as a very high salt concentration. In reality, a proportion of the salts would be lost to seepage or settle as sediment in the storage.

Figure 19 shows the forecasted salinity of the CWD throughout the forecast period.

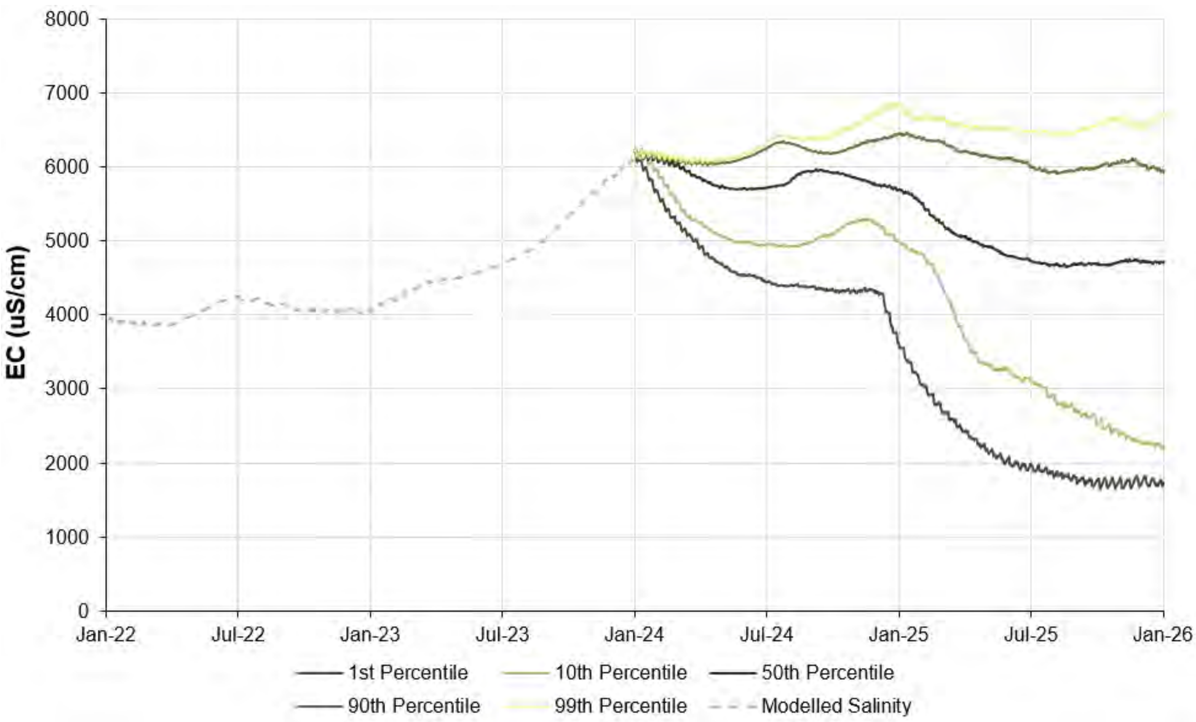


Figure 19: CWD Forecast Salinity – 2024 to 2026

Review of **Figure 19** shows that median salinity within the CWD fluctuates between 4,650 µS/cm to 6,050 µS/cm throughout the simulation.

Figure 20 shows the forecasted salinity of the RWD throughout the forecast period.

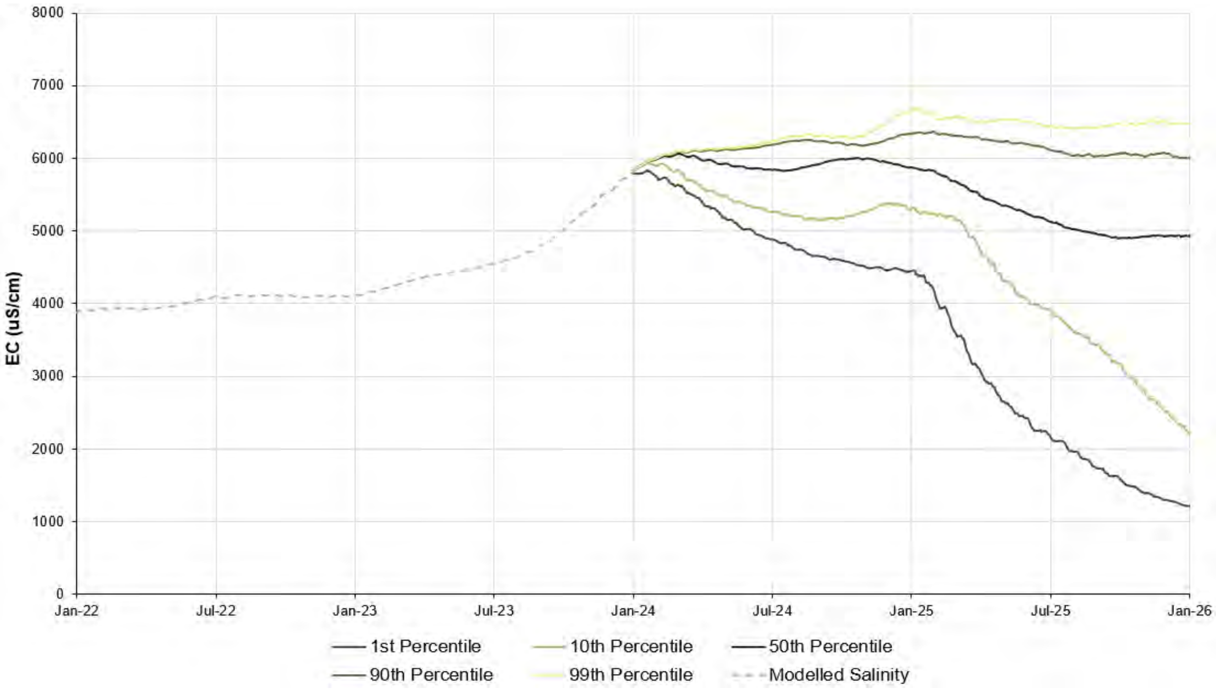


Figure 20: RWD Forecast Salinity – 2024 to 2026

Figure 20 shows that median salinity within the RWD fluctuates between 4,900 µS/cm to 6,100 µS/cm throughout the simulation.

Figure 21 shows the forecasted salinity for Pit 2W throughout the forecast period.

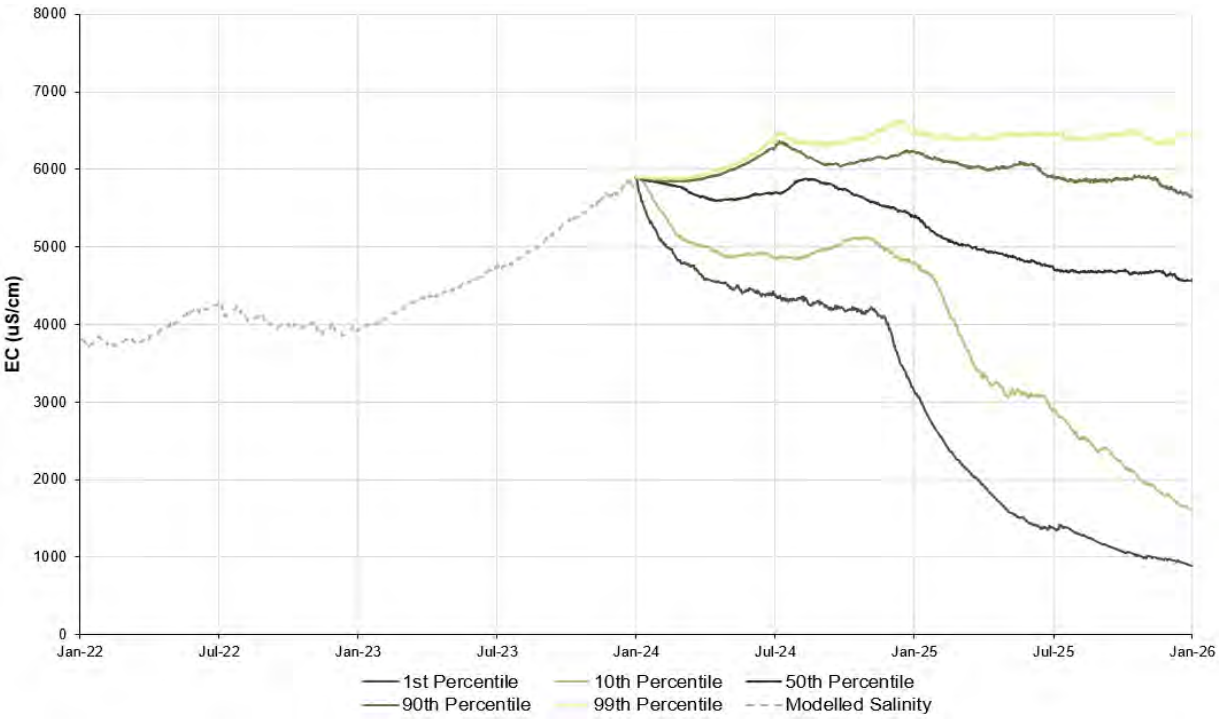


Figure 21: Pit 2W Forecast Salinity – 2024 to 2026

Figure 21 shows that median salinity within Pit 2W fluctuates between 4,550 µS/cm to 5,860 µS/cm throughout the simulation.

13.0 Conclusion and Recommendations

The current investigation has updated the WCM WBM to reflect changes in the WMS and additional monitoring data recorded during 2023. Key outcomes of current investigations include:

- Updated catchment schedule and land use classifications based on information current as at the end of year 2023;
- Overall, the WBM provides a good correlation between monitored and predicted water inventory and provides a sound platform for future studies;
- The salt balance incorporated within the WBM effectively tracks overall salt mass within the site storages; and
- Forecast site mine water inventory behaviour for the period 2024-2026 under different site operating scenarios and climatic conditions. Overall, the forecast indicates that the site water inventory is likely to be able to be reduced unless rainfalls exceeding 10th percentile occur; that water inventory is manageable during very wet years; and that there is adequate water security during dry conditions,

It is recommended that WCM implement improved monitoring of groundwater inflows which will allow for improved calibration on this aspect of the WBM in future studies. Groundwater inflow has previously been inferred by reviewing monitored volumes of water extracted from the WCM open cut pits. It is recommended that pumping records are again reviewed to measure/ estimate groundwater inflow. This will enable validation and improved calibration of the WBM and numerical groundwater model in future studies. Specifically, Pit 8 could be a good indicator for groundwater inflows as it has minimal interaction with spoil aquifers and pumped inflows.

The updated WBM is considered to be well suited for planning studies, infrastructure sizing and operational decision making, provided these studies incorporate sensitivity analysis (as any robust study should).

It should be noted that the content of this report may be subject to revision with any future improved understanding of the operational and response characteristics of the WCM water management system.

13.1 Model Limitations

Climatic data (rainfall and evaporation), supply, demand, and transfer volumes have been modelled as daily totals. The model assumes that daily data can be distributed over 24 hours. The model does not accurately represent events with durations less than 24 hours. For example, storm runoff events with durations less than 24 hours cannot be accounted for using the WBM.

The WBM has been developed and calibrated with a focus on the water management system as a whole. Model accuracy is considered better for design applications of wider scope (e.g., site water balance) relative to studies of narrower focus (e.g., single dams). Although the model is well suited for undertaking smaller studies, inputs and controls should always be first understood and then modelled to a level of detail suitable to the task at hand.

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Appendix A Model Schematic

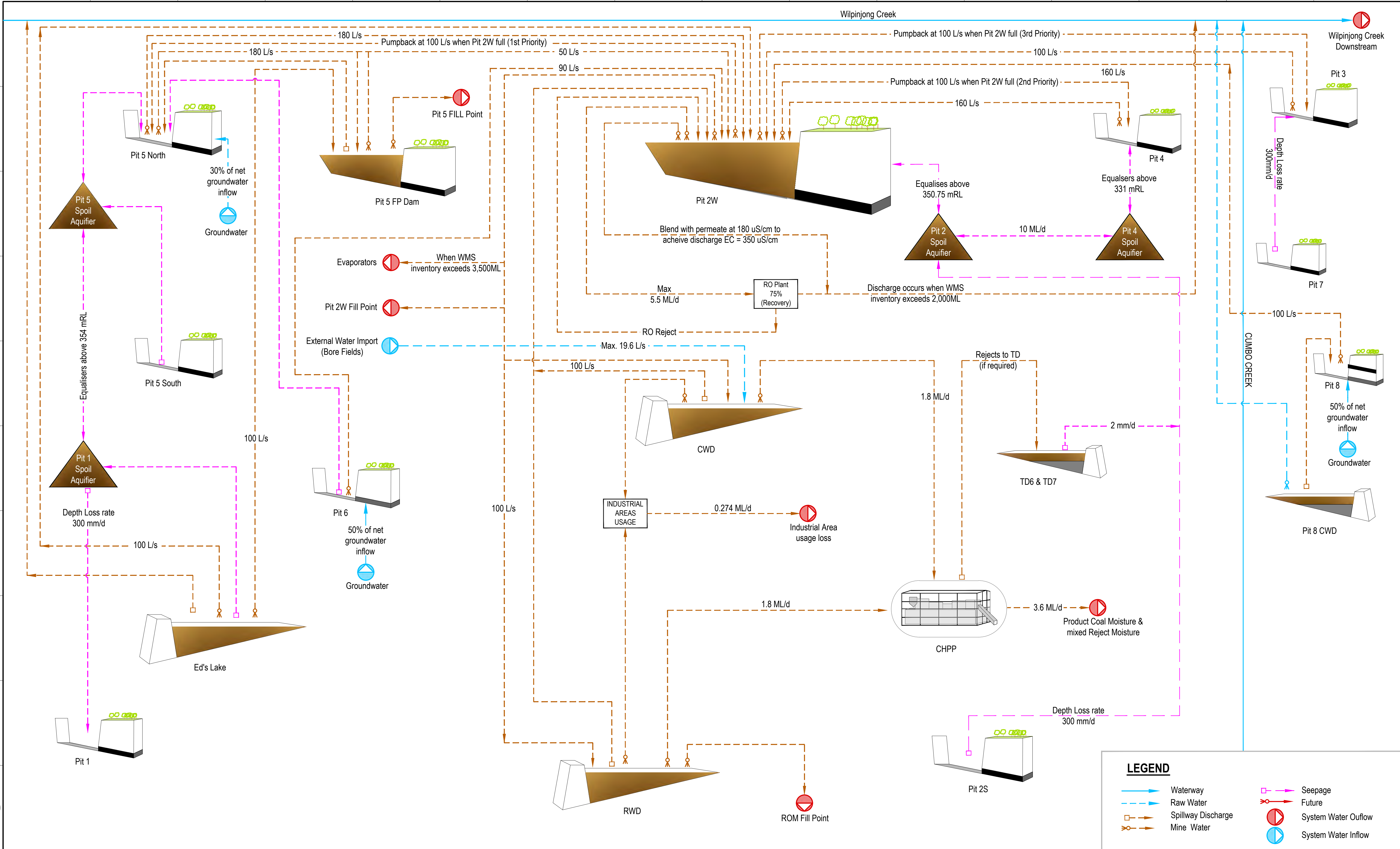
Water Balance Model Update 2024

Wilpinjong Coal Mine

Wilpinjong Coal Pty Ltd

SLR Project No.: 630.031405.00001

27 March 2024



	DATE	DESCRIPTION	
G	27.03.2024	PRELIMINARY ISSUE	MS
F	31.03.2023	PRELIMINARY ISSUE	MS
E	28.03.2022	PRELIMINARY ISSUE	MS
D	25.03.2022	PRELIMINARY ISSUE	MS
C	18.03.2021	PRELIMINARY ISSUE	MS
B	24.08.2020	PRELIMINARY ISSUE	MS
A	17.08.2020	PRELIMINARY ISSUE	MS

REVISIONS

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PROJECT: WATER BALANCE UPDATE 2022

DRAWING TITLE: SITE SCHEMATIC

DRAWING NUMBER: FIGURE 1A

ISSUE: G

CONSULTANT PROJECT 665.10014

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Appendix B Catchment and Land Use

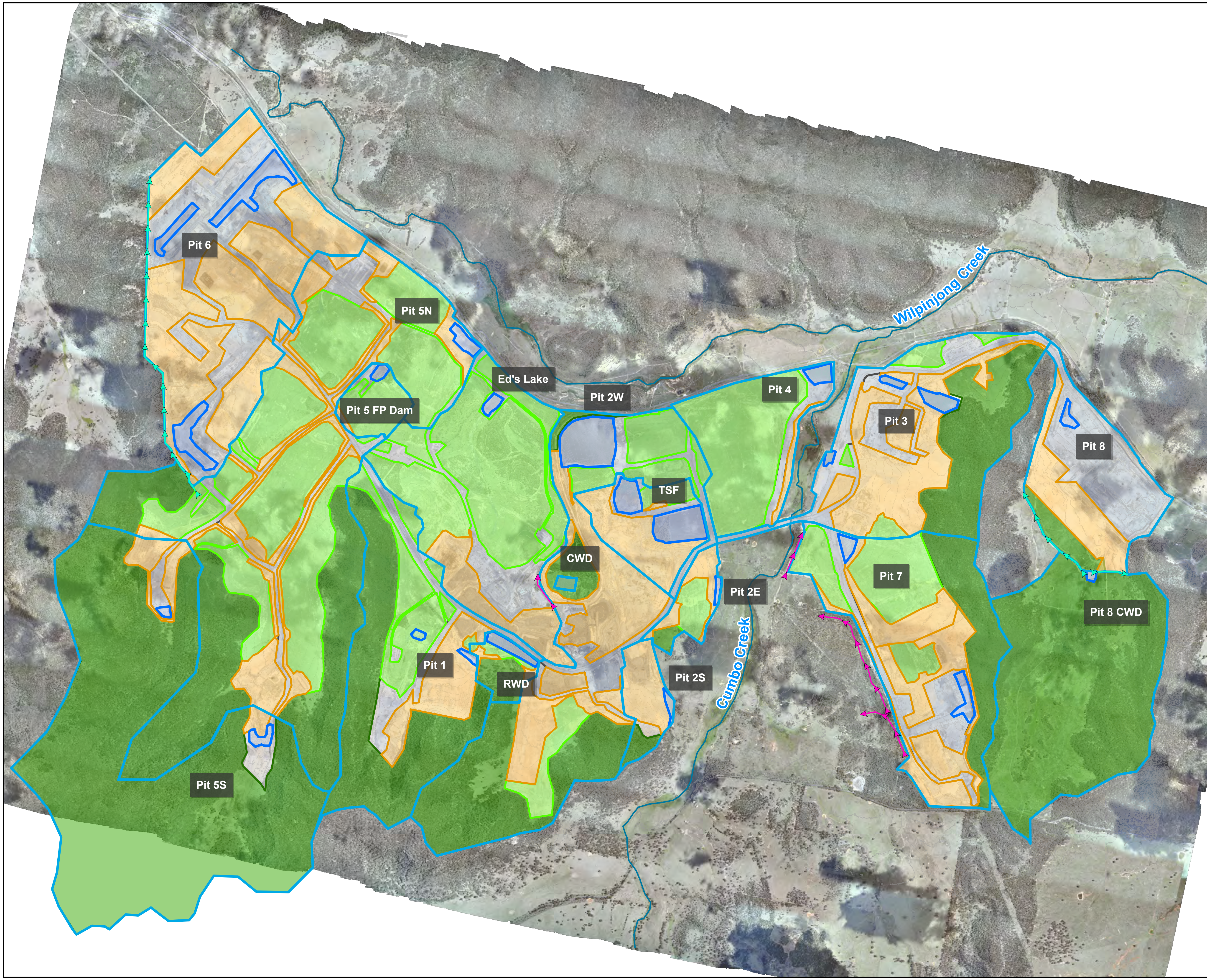
Water Balance Model Update 2024

Wilpinjong Coal Mine

Wilpinjong Coal Pty Ltd

SLR Project No.: 630.031405.00001

27 March 2024



WILPINJONG MINE
WATER BALANCE UPDATE

END OF YEAR 2023
CATCHMENT PLAN

FIGURE 1B

LEGEND

- Catchment Boundary
- Water Storage
- Natural Areas
- Active Pit / Hardstand Areas
- Rehabilitation Areas
- Spoil Areas
- Clean Water Diversion
- Levee
- Watercourse
- Existing Contours (5m intervals)

DISCLAIMER: All information within this document may be based on external sources. SLR Consulting Pty Ltd makes no warranty regarding the data's accuracy or reliability for any purpose.

0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:32,000 at A4
Project Number:	630.031405
Date Drawn:	25-Mar-2024
Drawn by:	JH

SLR

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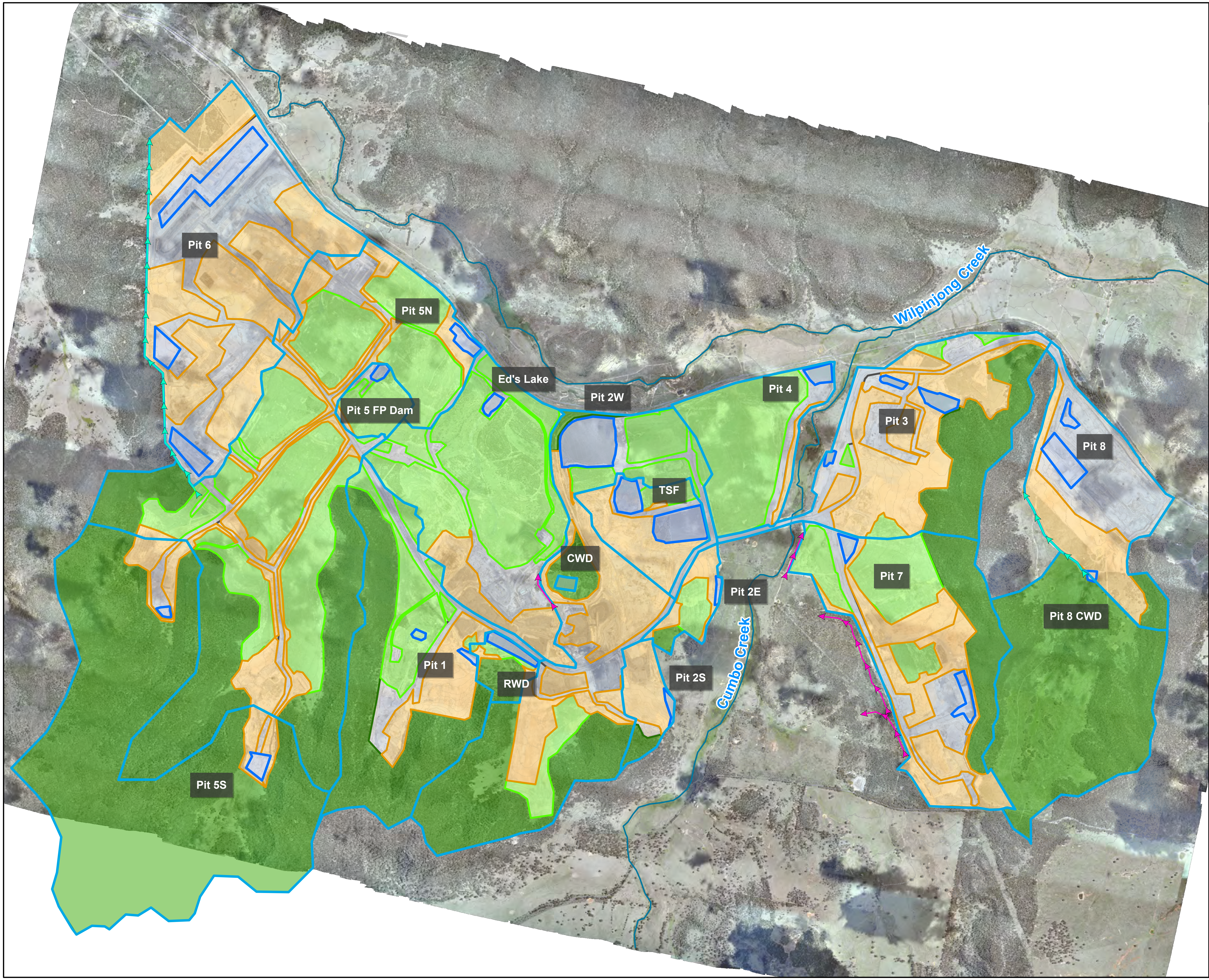
Table B1: 2023 Catchment and Land Type Areas (Based on 2023 End of Year Conditions)

Name	Natural (ha)	Rehabilitation (ha)	Spoil (ha)	Hardstand/ Active Pit (ha)	Total (ha)
Water Storages					
Pit 2 West	149.4	69.3	117.5	76.7	**412.9**
Clean Water Dam (CWD)	-	-	-	2.1	**2.1**
Ed's Lake	-	192.2	43.8	56.3	**286.7**
Pit 1S	-	-	-	-	**-**
Pit 5 FP Dam	-	27.4	1.3	4.5	**33.2**
Recycled Water Dam (RWD)	14.5	3.8	3.0	5.4	**26.7**
Pit 8 Mine Water Dams (CWD)	309.4	0.0	0.0	0.8	**310.2**
Sediment Dams					
Including in respective pit catchments.					
Mining Pits					
Pit 1	151.9	58.3	46.0	41.5	**297.7**
Pit 2 East	4.4	13.3	14.1	1.3	**33.1**
Pit 2 South	6.6	-	27.3	4.0	**38.0**
Pit 3	98.8	16.5	100.5	83.0	**298.8**
Pit 4	0.0	107.6	6.1	18.6	**132.3**
Pit 5 North	235.5	329.0	101.8	65.3	**731.6**
Pit 5 South	549.5	-	22.2	20.3	**592.0**
Pit 6	-	-	222.3	161.4	**383.7**
Pit 7	67.7	80.4	93.5	53.7	**295.3**
Pit 8	16.5	-	48.5	85.1	**150.0**
Other					
Combined (6 & 7) Tailings Dams	-	8.8	42.6	27.3	**78.7**

WILPINJONG MINE
WATER BALANCE UPDATE

END OF YEAR 2024
CATCHMENT PLAN

FIGURE 2B



LEGEND

- Catchment Boundary
- Water Storage
- Natural Areas
- Active Pit / Hardstand Areas
- Rehabilitation Areas
- Spoil Areas
- Clean Water Diversion
- Levee
- Watercourse
- Existing Contours (5m intervals)

0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:32,000 at A4
Project Number:	630.031405
Date Drawn:	25-Mar-2024
Drawn by:	JH

SLR

Path: H:\Projects-SLR\630-SrvNTL\630-NTL\630.031405.00001 Wilpinjong AR23 - Water Balanc\06 SLR Data\01 CADGIS\630031405_Wilpinjong_MineWaterBalance\630031405_Wilpinjong_MineWaterBalance.aprx\630031405_AppB_F02B_CatchmentPlan_EoY2024

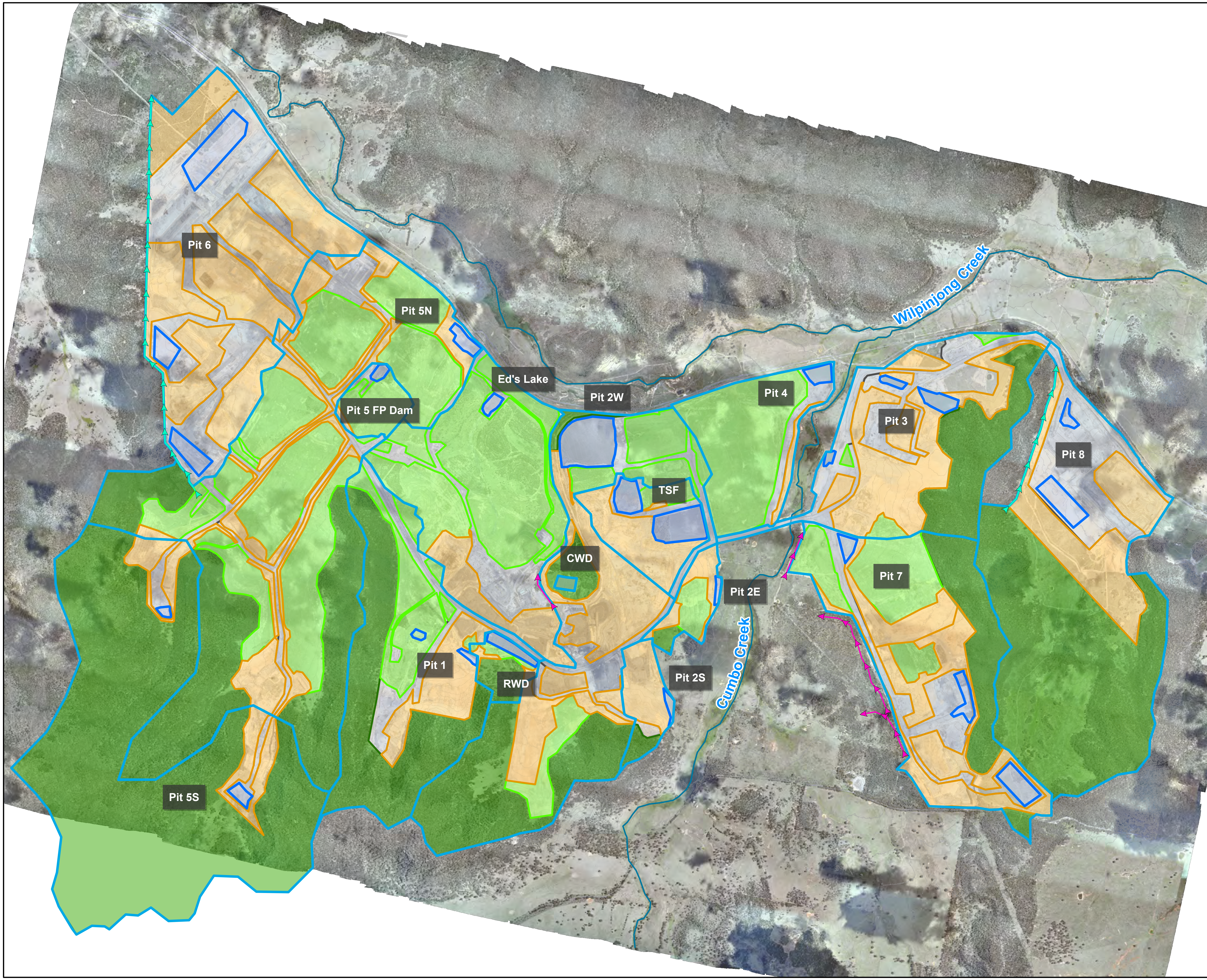
Table B2: 2024 Catchment and Land Type Areas

Name	Natural (ha)	Rehabilitation (ha)	Spoil (ha)	Hardstand/ Active Pit (ha)	Total (ha)
Water Storages					
Pit 2 West	149.4	69.3	117.5	76.7	**412.9**
Clean Water Dam (CWD)	-	-	-	2.1	**2.1**
Ed's Lake	0.0	192.2	43.8	56.3	**292.3**
Pit 1S	-	-	-	-	**-**
Pit 5 FP Dam	-	27.4	1.3	4.5	**33.2**
Recycled Water Dam (RWD)	14.5	3.8	3.0	5.4	**26.7**
Pit 8 Mine Water Dams (CWD)	282.7	-	-	0.8	**283.4**
Sediment Dams					
Including in respective pit catchments.					
Mining Pits					
Pit 1	151.9	58.3	46.0	41.5	**297.7**
Pit 2 East	4.4	13.3	14.1	1.3	**33.1**
Pit 2 South	6.6	-	27.3	4.0	**38.0**
Pit 3	83.4	11.6	123.5	80.9	**299.4**
Pit 4	0.0	107.6	6.1	18.6	**132.3**
Pit 5 North	235.5	329.0	101.8	65.3	**731.6**
Pit 5 South	548.0	-	30.6	13.4	**592.0**
Pit 6	-	-	223.5	189.3	**412.8**
Pit 7	64.5	80.4	101.2	53.7	**299.7**
Pit 8	10.7	0.0	60.4	102.0	**173.1**
Other					
Combined (6 & 7) Tailings Dams	-	8.8	42.6	27.3	**78.7**

WILPINJONG MINE
WATER BALANCE UPDATE

END OF YEAR 2025
CATCHMENT PLAN

FIGURE 3B



LEGEND

- Catchment Boundary
- Water Storage
- Natural Areas
- Active Pit / Hardstand Areas
- Rehabilitation Areas
- Spoil Areas
- Clean Water Diversion
- Levee
- Watercourse
- Existing Contours (5m intervals)

0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:32,000 at A4
Project Number:	630.031405
Date Drawn:	25-Mar-2024
Drawn by:	JH

SLR

Path: H:\Projects-SLR\630-SrvNTL\630-NTL\630.031405.00001 Wilpinjong AR23 - Water Balanc\06 SLR Data\01 CADGIS\630031405_Wilpinjong_MineWaterBalance\630031405_Wilpinjong_MineWaterBalance.aprx\630031405_AppB_F03B_CatchmentPlan_EoY2025

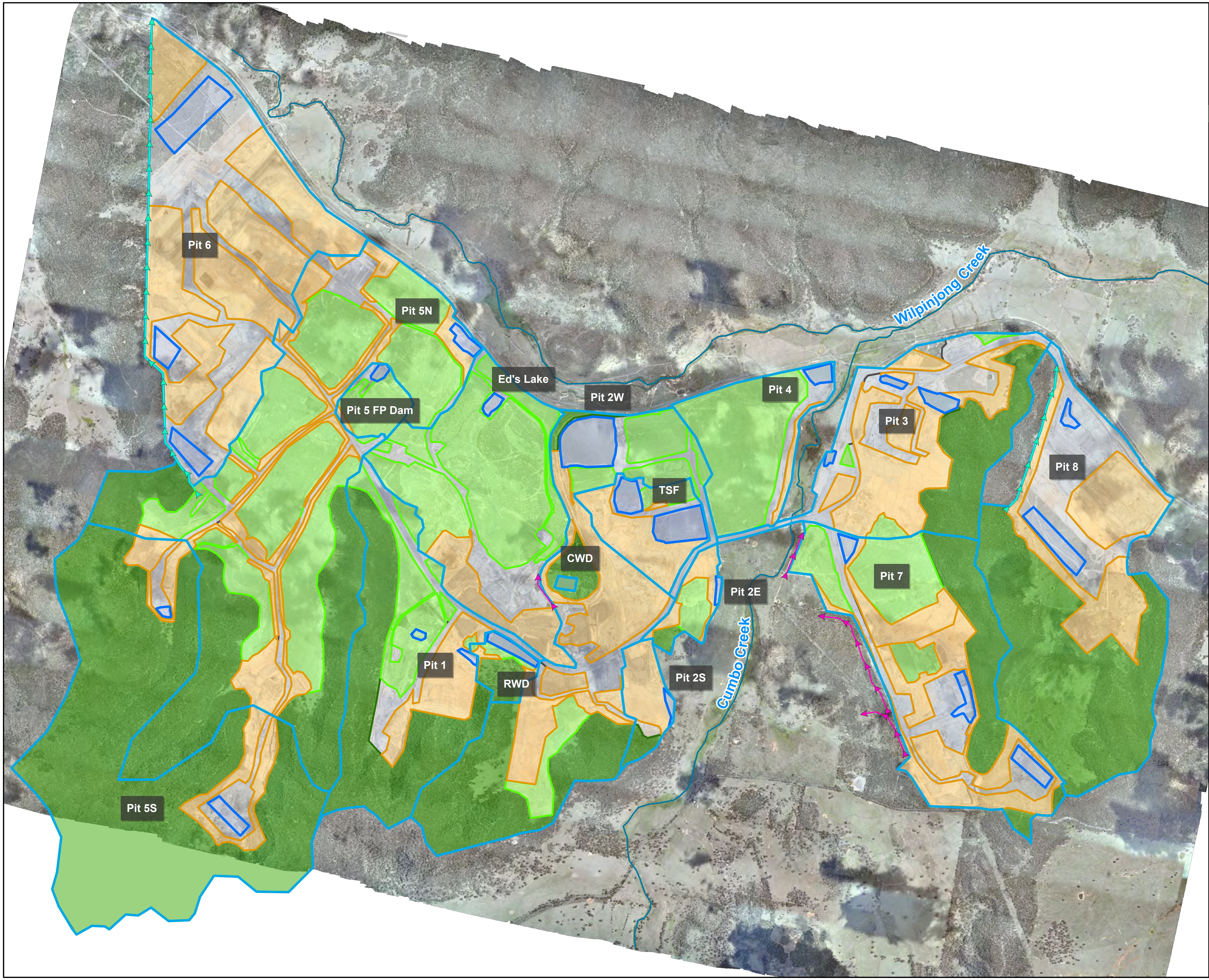
Table B3: 2025 Catchment and Land Type Areas

Name	Natural (ha)	Rehabilitation (ha)	Spoil (ha)	Hardstand/ Active Pit (ha)	Total (ha)
Water Storages					
Pit 2 West	149.4	69.3	117.5	76.7	**412.9**
Clean Water Dam (CWD)	-	-	-	2.1	**2.1**
Ed's Lake	-	192.2	43.8	56.3	**292.3**
Pit 1S	-	-	-	-	**-**
Pit 5 FP Dam	-	27.4	1.3	4.5	**33.2**
Recycled Water Dam (RWD)	14.5	3.8	3.0	5.4	**26.7**
Pit 8 Mine Water Dams (CWD)	-	-	-	-	**-**
Sediment Dams					
Including in respective pit catchments.					
Mining Pits					
Pit 1	151.9	58.3	46.0	41.5	**297.7**
Pit 2 East	4.4	13.3	14.1	1.3	**33.1**
Pit 2 South	6.6	-	27.3	4.0	**38.0**
Pit 3	79.3	8.6	112.1	96.2	**296.2**
Pit 4	-	107.6	6.1	18.6	**132.3**
Pit 5 North	235.5	329.0	101.8	65.3	**731.6**
Pit 5 South	535.8	-	40.2	15.9	**591.9**
Pit 6	-	-	243.0	186.2	**429.1**
Pit 7	72.5	80.4	108.3	65.3	**326.5**
Pit 8	297.8	-	93.3	88.8	**479.9**
Other					
Combined (6 & 7) Tailings Dams	-	8.8	42.6	27.3	**78.7**

WILPINJONG MINE
WATER BALANCE UPDATE

END OF YEAR 2026
CATCHMENT PLAN

FIGURE 4B



LEGEND

- Catchment Boundary
- Water Storage
- Natural Areas
- Active Pit / Hardstand Areas
- Rehabilitation Areas
- Spoil Areas
- Clean Water Diversion
- Levee
- Watercourse
- Existing Contours (5m intervals)

0 0.5 1 km

Coordinate System:	GDA 1994 MGA Zone 55
Scale:	1:32,000 at A4
Project Number:	630.031405
Date Drawn:	25-Mar-2024
Drawn by:	JH

SLR

Table B4: 2026 Catchment and Land Type Areas

Name	Natural (ha)	Rehabilitation (ha)	Spoil (ha)	Hardstand/ Active Pit (ha)	Total (ha)
Water Storages					
Pit 2 West	149.4	69.3	117.5	76.7	**412.9**
Clean Water Dam (CWD)	-	-	-	2.1	**2.1**
Ed's Lake	0.0	192.2	43.8	56.3	**292.3**
Pit 1S	-	-	-	-	**-**
Pit 5 FP Dam	-	27.4	1.3	4.5	**33.2**
Recycled Water Dam (RWD)	14.5	3.8	3.0	5.4	**26.7**
Pit 8 Mine Water Dams (CWD)	-	-	-	-	**-**
Sediment Dams					
Including in respective pit catchments.					
Mining Pits					
Pit 1	151.9	58.3	46.0	41.5	**297.7**
Pit 2 East	4.4	13.3	14.1	1.3	**33.1**
Pit 2 South	6.6	0.0	27.3	4.0	**38.0**
Pit 3	79.3	8.6	112.1	96.2	**296.2**
Pit 4	0.0	107.6	6.1	18.6	**132.3**
Pit 5 North	235.5	329.0	101.8	65.3	**731.6**
Pit 5 South	513.3	0.0	48.9	29.7	**591.9**
Pit 6	0.0	0.0	266.6	192.4	**459.1**
Pit 7	77.1	80.4	117.1	69.5	**344.1**
Pit 8	251.9	0.0	109.8	102.4	**464.1**
Other					
Combined (6 & 7) Tailings Dams	0.0	8.8	42.6	27.3	**78.7**

Appendix C Long-Term Water Quality Data

Water Balance Model Update 2024

Wilpinjong Coal Mine

Wilpinjong Coal Pty Ltd

SLR Project No.: 630.031405.00001

27 March 2024

Year	Month	Monthly Rainfall (mm)	Dams						Pits				WTF				Reference (Waterways)		
			Pit 2W	Pit 1S	Pit 5 FP	CWD	RWD	Ed's Lake	Pit 5	Pit 2 NB	Pit 4	Pit 3	Feed	Permeate	Discharge (ML)	Concentrate	Wilp. Ck Upstream	Wilp. Ck Downstream	Cumbo Creek
2015	Jan	115.7													325				
	Feb	17.5								5,290									
	Mar	16.3	3,048							4,790					310				
	Apr	109.3	3,390	6,670		3,330	3,510	880	1060	4,940	3,960				285				
	May	43.2													210				
	Jun	45.8		9,180						4,100					221				
	Jul	38.4								4,620					144				
	Aug	51.5													185		739	530	5,112
	Sep	10.6	3,490	5,690	2,110	3,440	3,580		2,290		4,250	3,030			158		1,296	365	5,203
	Oct	46.9			3,540					5,190					176		1,957	379	6,005
	Nov	90.3													212		1,007	352	4,694
	Dec	105.1								4,290					269		883	446	
2016	Jan	99.9	3,280	5,770		3,470	3,440	2,210	2,330	4,940	3,640				267		1,053	431	
	Feb	9.1													255		1,351	441	
	Mar	19.2													235			590	
	Apr	4.4													232				
	May	67.9													195				3,620
	Jun	107.7		7,700											176			386	6,254
	Jul	83													208		497	1,082	3,987
	Aug	43.3													201		792	562	5,582
	Sep	172	3,310	6,180		3,280	3,320		2,740		3,880				199		313	73	1,942
	Oct	71.3													235		430	1,100	2,530
	Nov	44.9													284		536	976	
	Dec	35.6													276		1,446	465	
2017	Jan	34.4	3,545												294			486	
	Feb	25.8	3,520												305	14,000		539	
	Mar	130.4	3,670												301	13,400		686	
	Apr	19.4	3,620												307			539	1,431
	May	23.4	3,660												276			359	4,804
	Jun	11.8	3,630												347			344	5,796
	Jul	1.9	3,580												372			272	5,716
	Aug	26.4													357			285	5,365
	Sep	76.3													336			26	5,745
	Oct	33.3	3,710	3,710			7,610								321			290	6,280
	Nov	76.3	3,950	3,950											335			310	
	Dec	82.3													342			384	
2018	Jan	15.7															4,110	599	
	Feb	60.7																1,500	476

Year	Month	Monthly Rainfall (mm)	Dams						Pits				WTF				Reference (Waterways)		
			Pit 2W	Pit 1S	Pit 5 FP	CWD	RWD	Ed's Lake	Pit 5	Pit 2 NB	Pit 4	Pit 3	Feed	Permeate	Discharge (ML)	Concentrate	Wilp. Ck Upstream	Wilp. Ck Downstream	Cumbo Creek
	Mar	45.2															4,360	2,020	3,690
	Apr	37.4															2,363	590	237
	May	13.4															2,147	424	6,950
	Jun	24.2															1,805	351	3,776
	Jul	7.5													288		1,726	375	6,820
	Aug	29													312		1,656	356	3,655
	Sep	48.9													229		1,600	385	3,521
	Oct	51.3													328		1,781	418	3,629
	Nov	49.6													365		2,001	437	3,977
	Dec	105													367				
2019	Jan	82.3	4,350																
	Feb	4.8	4,290																
	Mar	107.3	4,340																
	Apr	0	4,250																
	May	18.9	4,170																
	Jun	7.2	4,010																7,860
	Jul	3.2	4,120																7,077
	Aug	7.5	4,120			4,100	3,990												6,956
	Sep	25.1	4,260			4,180	4,250												7,580
	Oct	5.6	4,400																
	Nov	26.2				4,350	4,370												
	Dec	4.2	4,430																
2020	Jan	27	4,550			4,610	4,550												
	Feb	137																1,190	4,940
	Mar	92	3,560			3,740	4,390											2,650	4,025
	Apr	117	2,990			3,260	3,750										532	510	5,850
	May	16	3,000			3,140	3,530										660	744	6,270
	Jun	23	3,080			3,060	3,410										698	835	5,575
	Jul	70	3,050			3,050	3,240										467	545	5,500
	Aug	36	3,080			3,000	3,190										260	311	4,330
	Sep	77	3,110			3,060	3,170										291	420	3,907
	Oct	151	3,140			3,070	3,100										518	492	7,120
	Nov	17															458	464	
	Dec	162															471	629	7,050
2021	Jan	53	2,970												367				
	Feb	127	3,020												390				7,220
	Mar	160													352				7,870
	Apr	2	3,100												345				6,880

Year	Month	Monthly Rainfall (mm)	Dams						Pits				WTF				Reference (Waterways)		
			Pit 2W	Pit 1S	Pit 5 FP	CWD	RWD	Ed's Lake	Pit 5	Pit 2 NB	Pit 4	Pit 3	Feed	Permeate	Discharge (ML)	Concentrate	Wilp. Ck Upstream	Wilp. Ck Downstream	Cumbo Creek
	May	9	3,050												381				6,700
	Jun	84													361				3,335
	Jul	67	3,280												371				3,115
	Aug	25	3,320										3,317		382				
	Sep	44	3,350										3,472		375				
	Oct	31	3,610										3,683		398				
	Nov	249	3,610										3,685		395				
	Dec	81											3,334		366				
2022	Jan	101											3,238				294	812	3,143
	Feb	16											3,310				432	540	3,655
	Mar	120											3,393				317	901	2,758
	Apr	95											3,483				352	1,411	2,842
	May	44											3,502				311	1,588	2,781
	Jun	13											3,693				337	1,516	2,645
	Jul	136											3,738				198	1,136	1,763
	Aug	103											3,860				175	1,026	1,374
	Sep	94											3,610				172	1,014	1,753
	Oct	185											3,535				145	754	1,170
	Nov	64											3,570				492	1,944	1,207
	Dec	27											3,513					1,787	1,885
2023	Jan	49											3,562		406		1,755	1,673	2,188
	Feb	25											3,853		411		791	1,145	2,409
	Mar	65											3,883		412		1,040	1,098	3,056
	Apr	48											3,915		405		787	1,311	3,087
	May	3											3,916		393		728	1,352	2,965
	Jun	29											4,023		388		586	1,370	3,008
	Jul	23	4,188												376		568	1,312	2,875
	Aug	30	4,322												378		708	1,234	3,037
	Sep	18	4,533												382		935	1,057	3,255
	Oct	36	4,724												374		1,209	804	3,777
	Nov	94	4,705												375		1,338	936	3,532
	Dec	59	4,785												378		1,431	703	3,867

Appendix D Storage Curves

Water Balance Model Update 2024

Wilpinjong Coal Mine

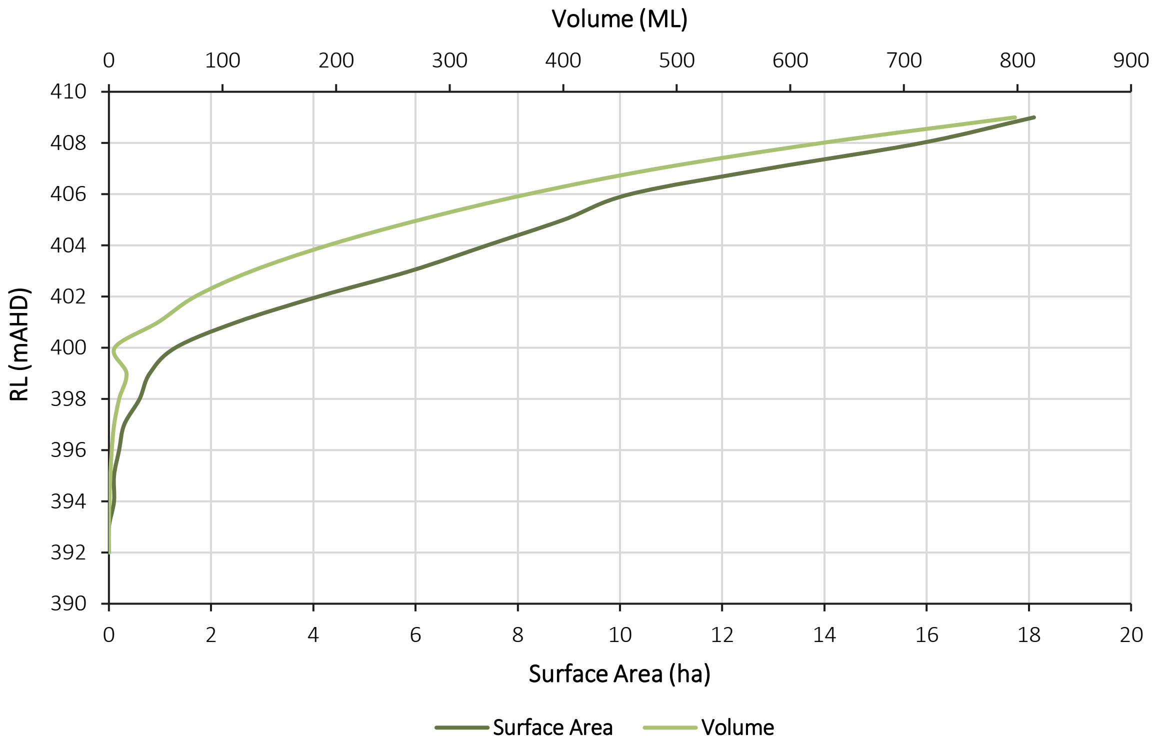
Wilpinjong Coal Pty Ltd

SLR Project No.: 630.031405.00001

27 March 2024

Pit 1

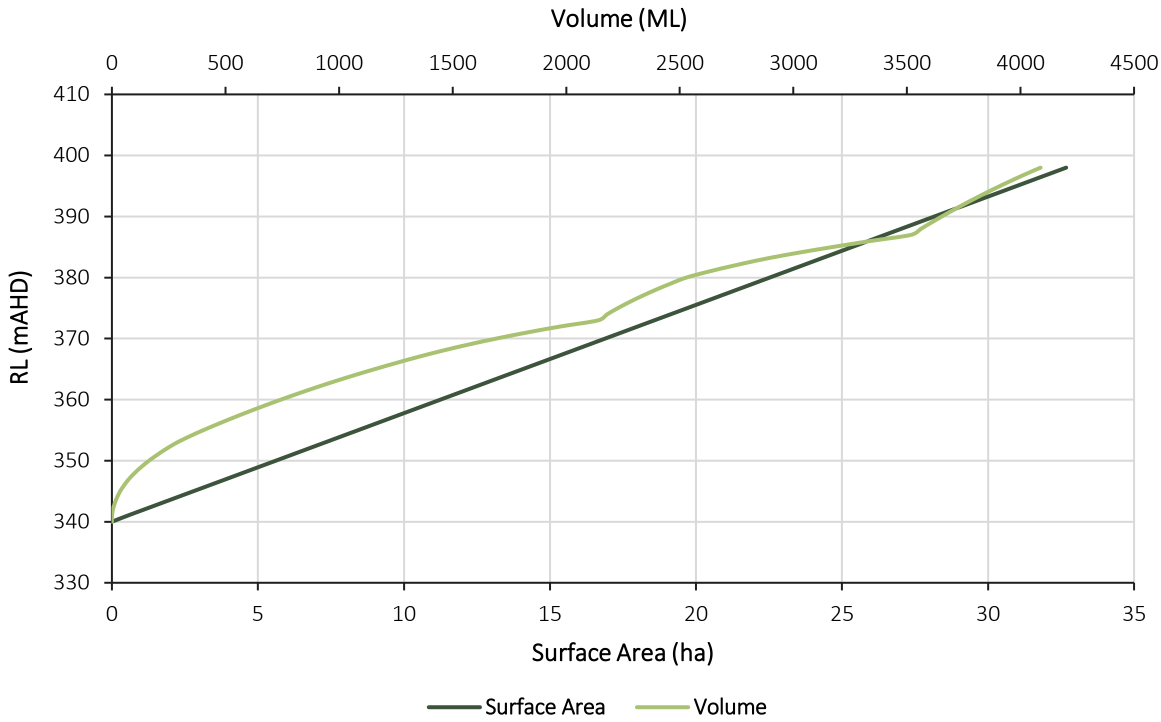
RL (mAHD)	Area (ha)	Volume (ML)
392	0	0
393	0	0
394	0.1	0.4
395	0.1	1.3
396	0.2	2.5
397	0.3	4.6
398	0.6	9
399	0.8	15.5
400	1.3	5.1
401	2.5	43.4
402	4.1	76
403	5.9	126
404	7.4	192.7
405	8.9	274
406	10.2	368.9
407	12.9	483.4
408	15.9	627.6
409	18.1	797.8



Pit 2W

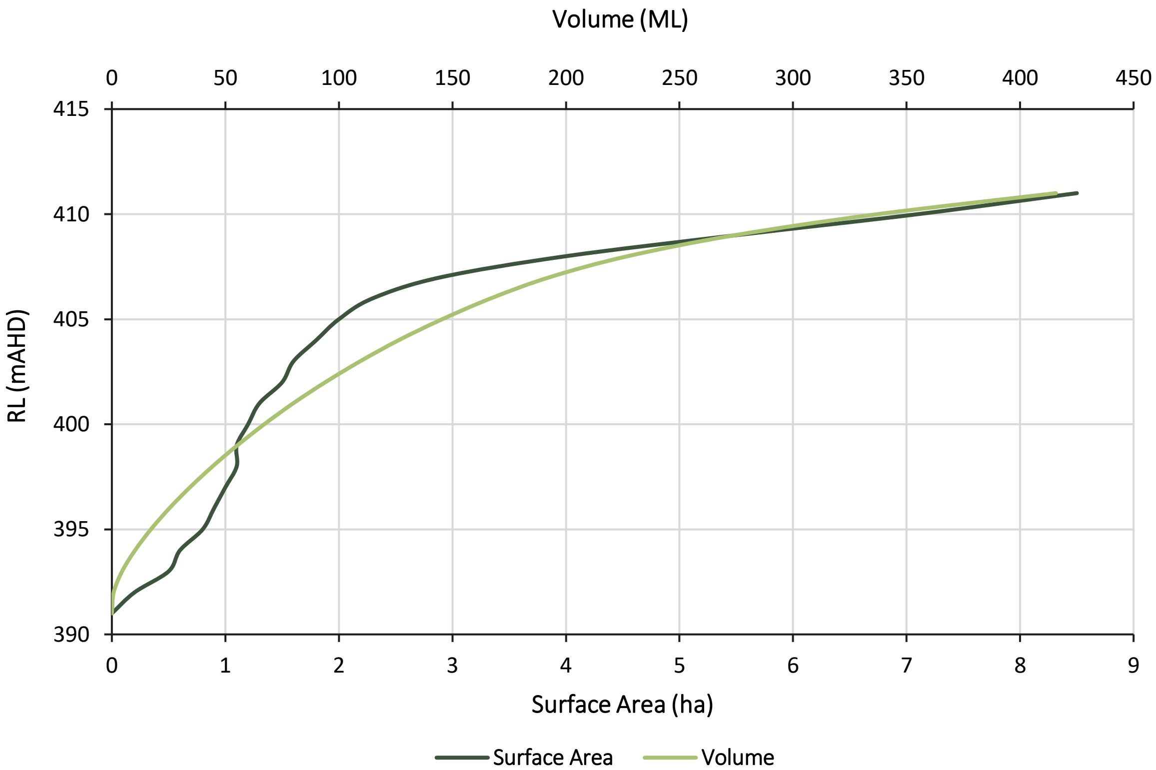
RL (mAHD)	Area (ha)	Volume (ML)
340	0	0
341	0.5	1
342	1.1	5
343	1.7	12
344	2.2	23
345	2.8	37
346	3.4	54
347	3.9	75
348	4.5	101
349	5.0	130
350	5.6	164
351	6.2	201
352	6.7	242
353	7.3	288
354	7.9	343
355	8.4	403
356	9.0	466
357	9.6	532
358	10.1	600
359	10.7	671
360	11.3	744
361	11.8	820
362	12.4	899
363	12.9	981
364	13.5	1067
365	14.1	1157
366	14.6	1251
367	15.2	1349
368	15.8	1453
369	16.3	1567

RL (mAHD)	Area (ha)	Volume (ML)
370	16.9	1692
371	17.5	1828
372	18.0	1977
373	18.6	2142
374	19.1	2181
375	19.7	2228
376	20.3	2279
377	20.8	2335
378	21.4	2395
379	22.0	2459
380	22.5	2529
381	23.1	2630
382	23.7	2744
383	24.2	2867
384	24.8	3012
385	25.3	3173
386	25.9	3342
387	26.5	3519
388	27.0	3563
389	27.6	3607
390	28.2	3654
391	28.7	3701
392	29.3	3751
393	29.9	3802
394	30.4	3855
395	31.0	3910
396	31.5	3967
397	32.1	4026
398	32.7	4088


Volume (ML)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
RL (mAHD)
410
400
390
380
370
360
350
340
330
0
5
10
15
20
25
30
35
Surface Area (ha)
Surface Area
Volume

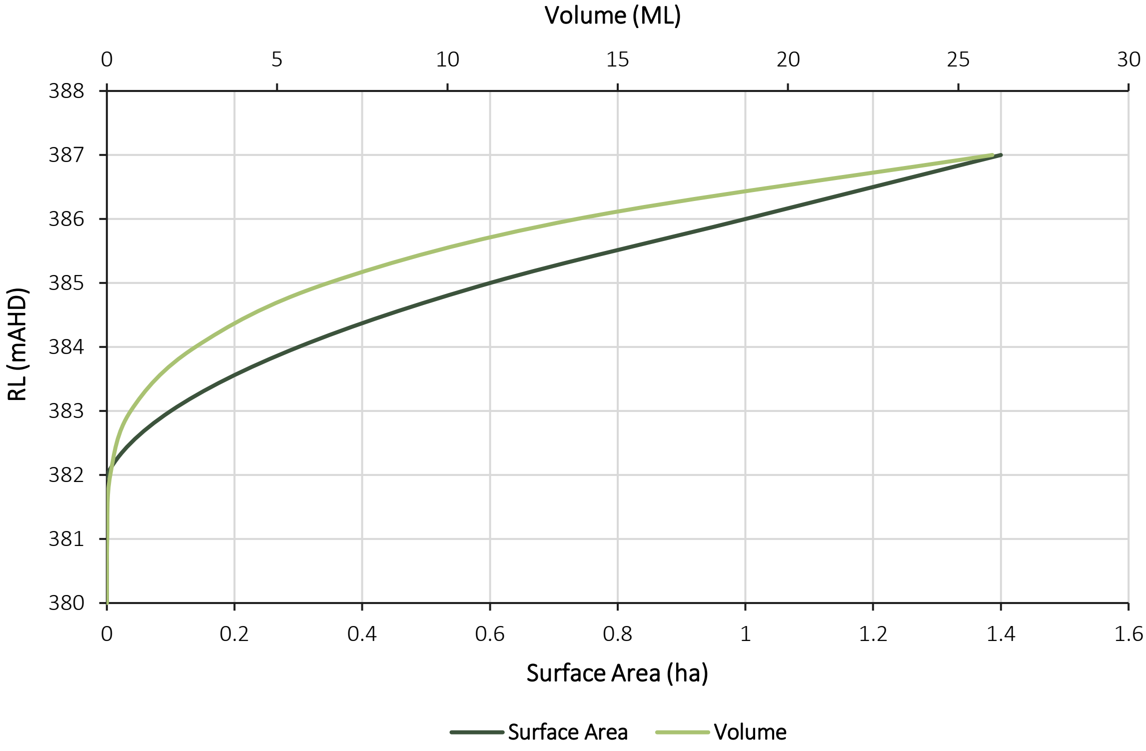
Pit 2 South

RL (mAHD)	Area (ha)	Volume (ML)
391	0	0
392	0.2	0.8
393	0.5	4.5
394	0.6	10.2
395	0.8	17.2
396	0.9	25.3
397	1	34.4
398	1.1	44.4
399	1.1	55.3
400	1.2	67.1
401	1.3	79.9
402	1.5	94
403	1.6	109.4
404	1.8	126.3
405	2	145.5
406	2.3	167.1
407	2.9	192.8
408	4	227.2
409	5.5	274.4
410	7.1	337.3
411	8.5	415.8



Pit 2 East

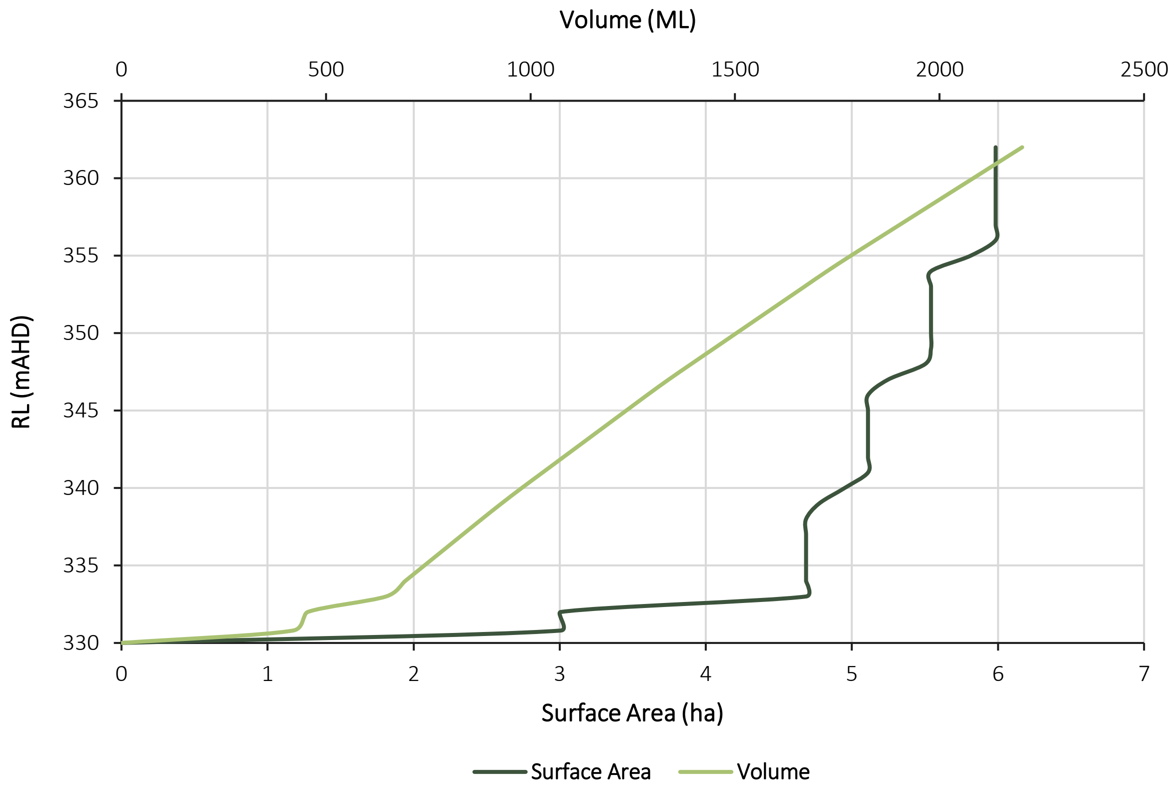
RL (mAHD)	Area (ha)	Volume (ML)
380	0	0
381	0	0.01
382	0	0.1
383	0.1	0.7
384	0.3	2.6
385	0.6	6.5
386	1	13.8
387	1.4	26



Pit 3

RL (mAHD)	Area (ha)	Volume (ML)
330	0.0	0.0
331	3.0	419.4
332	3.0	455.5
333	4.7	646.8
334	4.7	693.7
335	4.7	740.6
336	4.7	787.4
337	4.7	834.3
338	4.7	881.2
339	4.8	928.9
340	4.9	978.4
341	5.1	1029.5
342	5.1	1080.6
343	5.1	1131.7
344	5.1	1182.8
345	5.1	1233.9
346	5.1	1285.0

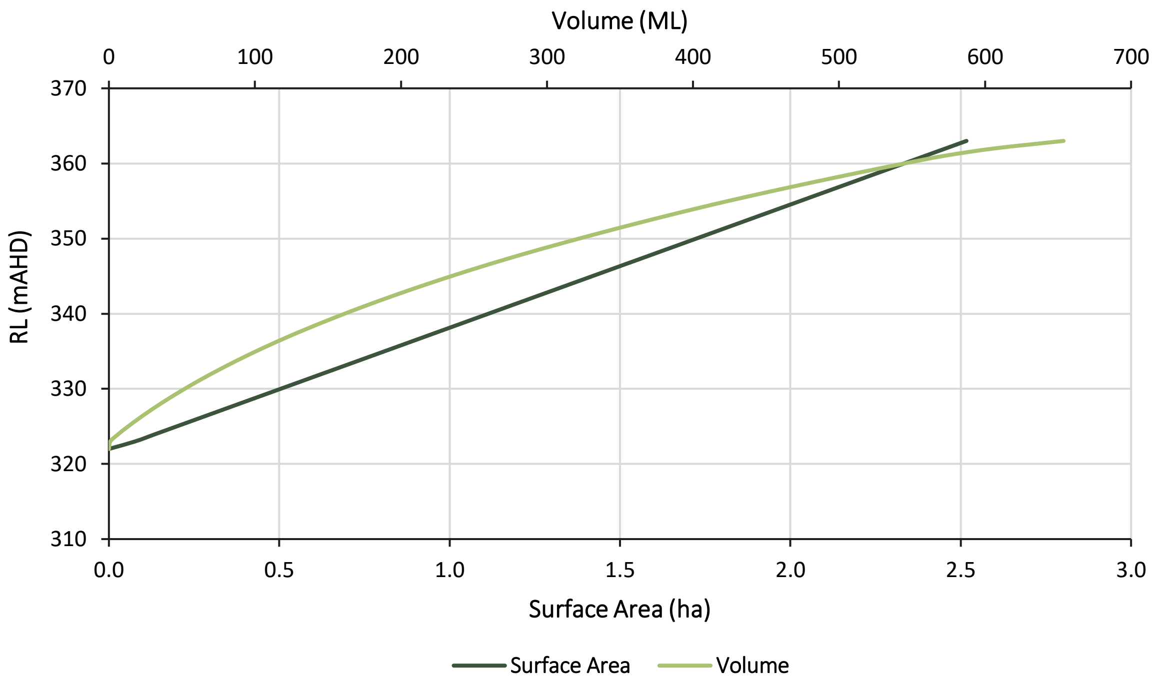
RL (mAHD)	Area (ha)	Volume (ML)
347	5.2	1,337.5
348	5.5	1,392.5
349	5.5	1,447.9
350	5.5	1,503.3
351	5.5	1,558.8
352	5.5	1,614.2
353	5.5	1,669.6
354	5.5	1,725.0
355	5.8	1,783.1
356	6.0	1,843.0
357	6.0	1,902.8
358	6.0	1,962.7
359	6.0	2,022.5
360	6.0	2,082.3
361	6.0	2,142.2
362	6.0	2,202.0



Pit 4

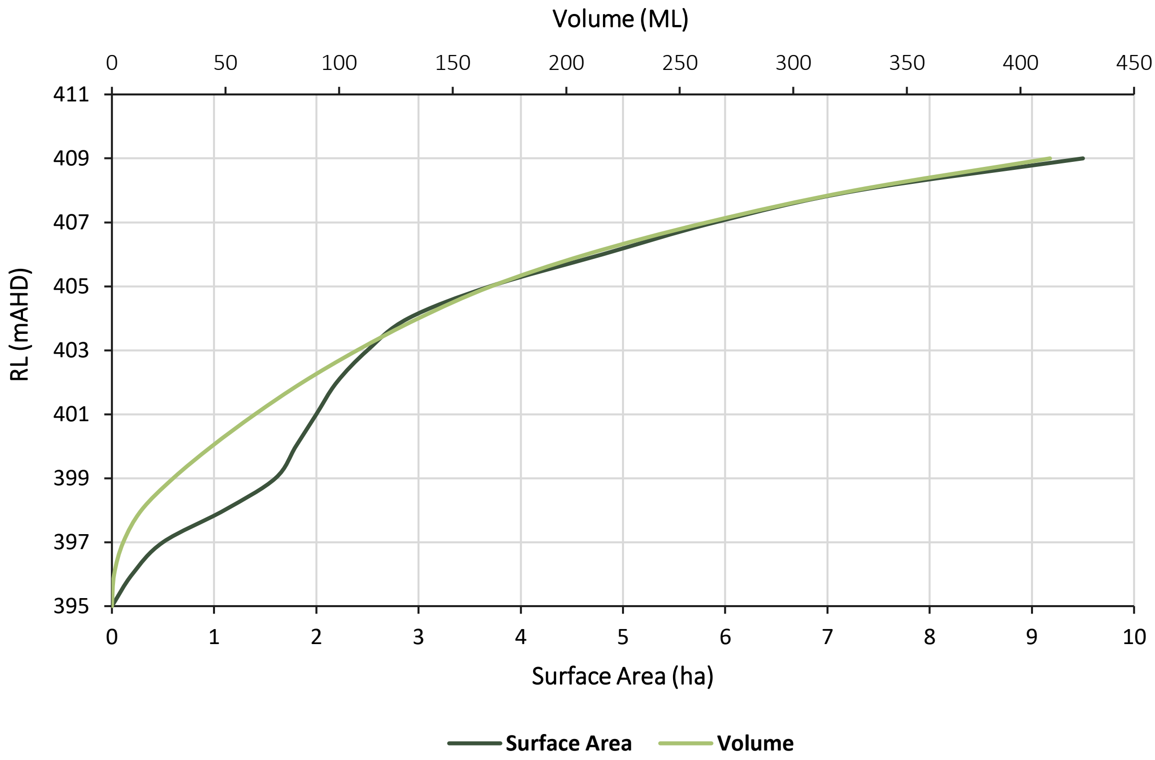
RL (mAHD)	Area (ha)	Volume (ML)
322	0.00	0.0
323	0.08	1.0
324	0.14	6.6
325	0.20	13.2
326	0.26	20.1
327	0.32	27.5
328	0.38	35.3
329	0.44	43.4
330	0.50	51.9
331	0.57	60.8
332	0.63	70.2
333	0.69	79.9
334	0.75	90.1
335	0.81	100.8
336	0.87	111.9
337	0.93	123.5
338	0.99	135.7
339	1.05	148.3
340	1.11	161.5
341	1.18	175.1
342	1.24	189.1
343	1.30	203.7
344	1.36	218.9

RL (mAHD)	Area (ha)	Volume (ML)
345	1.42	234.5
346	1.48	250.7
347	1.54	267.5
348	1.60	285.0
349	1.66	303.3
350	1.72	322.0
351	1.79	341.3
352	1.85	361.1
353	1.91	381.4
354	1.97	402.3
355	2.03	424.0
356	2.09	446.8
357	2.15	470.3
358	2.21	494.4
359	2.27	519.2
360	2.33	544.9
361	2.40	571.7
362	2.46	606.3
363	2.52	653.8
364	2.58	715.5
365	2.64	786.1
366	2.70	866.7



Pit 5 South

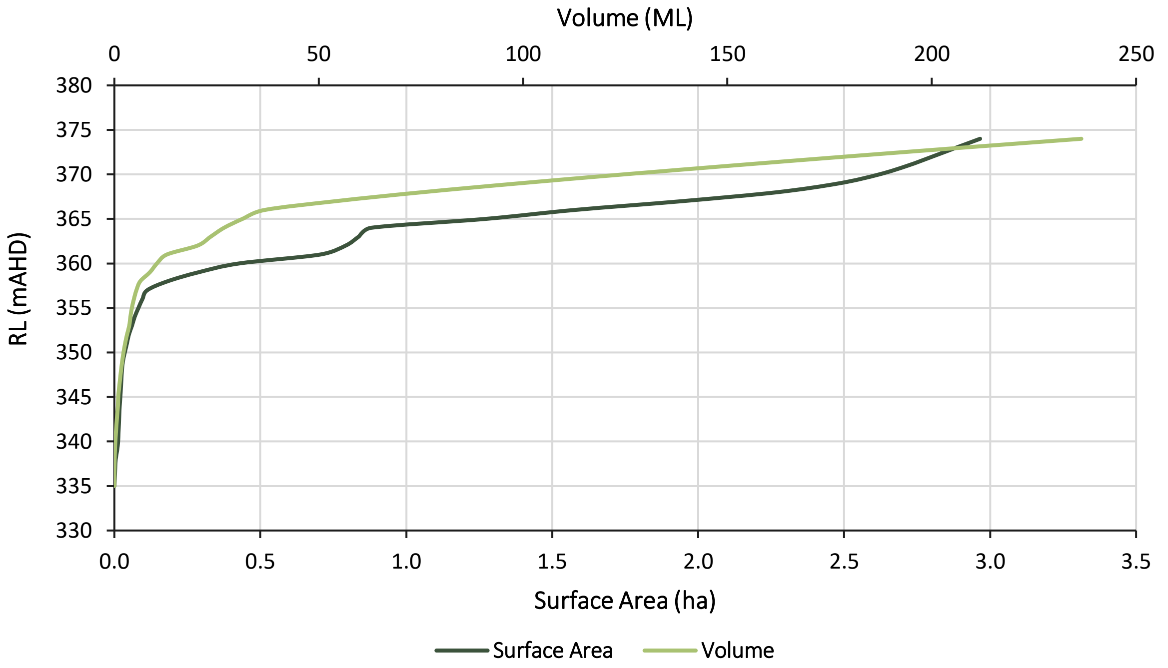
RL (mAHD)	Area (ha)	Volume (ML)
395	0	0
396	0.2	1
397	0.5	5
398	1.1	13
399	1.6	27
400	1.8	44
401	2	63
402	2.2	84
403	2.5	108
404	2.9	135
405	3.7	167
406	4.8	209
407	5.9	262
408	7.3	327
409	9.5	413



Pit 5 North

RL (mAHD)	Area (ha)	Volume (ML)
335	0.00	0.00
336	0.00	0.01
337	0.00	0.03
338	0.00	0.07
339	0.01	0.14
340	0.01	0.25
341	0.01	0.38
342	0.02	0.53
343	0.02	0.69
344	0.02	0.87
345	0.02	0.94
346	0.02	1.16
347	0.02	1.39
348	0.03	1.64
349	0.03	1.92
350	0.04	2.24
351	0.04	2.63
352	0.05	3.09
353	0.06	3.64
354	0.07	3.93
355	0.08	4.29
356	0.10	4.79
357	0.11	5.40
358	0.18	6.34

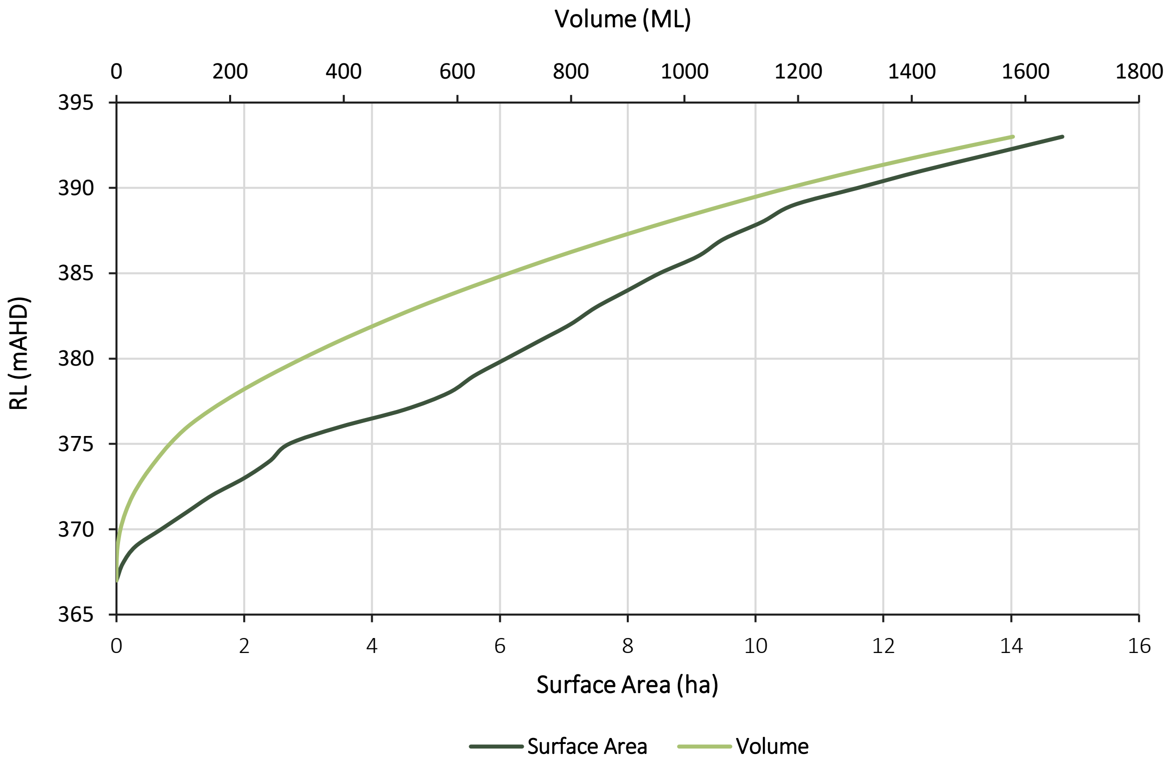
RL (mAHD)	Area (ha)	Volume (ML)
359	0.29	8.68
360	0.43	10.43
361	0.71	12.85
362	0.79	20.34
363	0.84	23.55
364	0.88	26.83
365	1.27	31.34
366	1.57	36.71
367	1.95	54.29
368	2.27	75.36
369	2.48	99.12
370	2.62	124.64
371	2.72	151.33
372	2.80	178.94
373	2.88	207.37
374	2.97	236.61
375	3.05	266.71
376	3.15	297.71
377	3.24	329.67
378	3.35	362.64
379	3.46	396.68
380	3.58	431.87
381	3.71	468.30



Pit 6

RL (mAHD)	Area (ha)	Volume (ML)
367	0	0
368	0.1	0.2
369	0.3	2
370	0.7	7
371	1.1	16
372	1.5	29
373	2	47
374	2.4	69
375	2.7	94
376	3.5	125
377	4.5	166
378	5.2	214
379	5.6	268
380	6.1	327

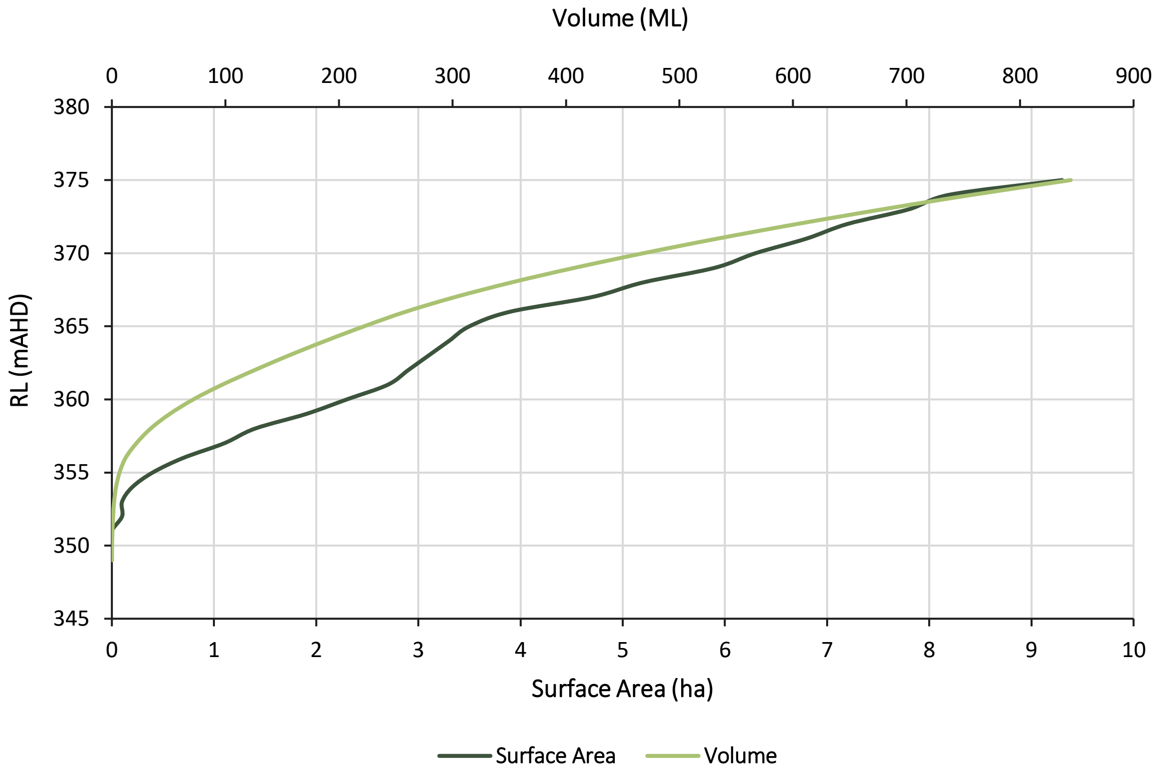
RL (mAHD)	Area (ha)	Volume (ML)
381	6.6	390
382	7.1	458
383	7.5	530
384	8	608
385	8.5	691
386	9.1	778
387	9.5	871
388	10.1	969
389	10.6	1073
390	11.6	1183
391	12.6	1304
392	13.7	1436
393	14.8	1578



Pit 7

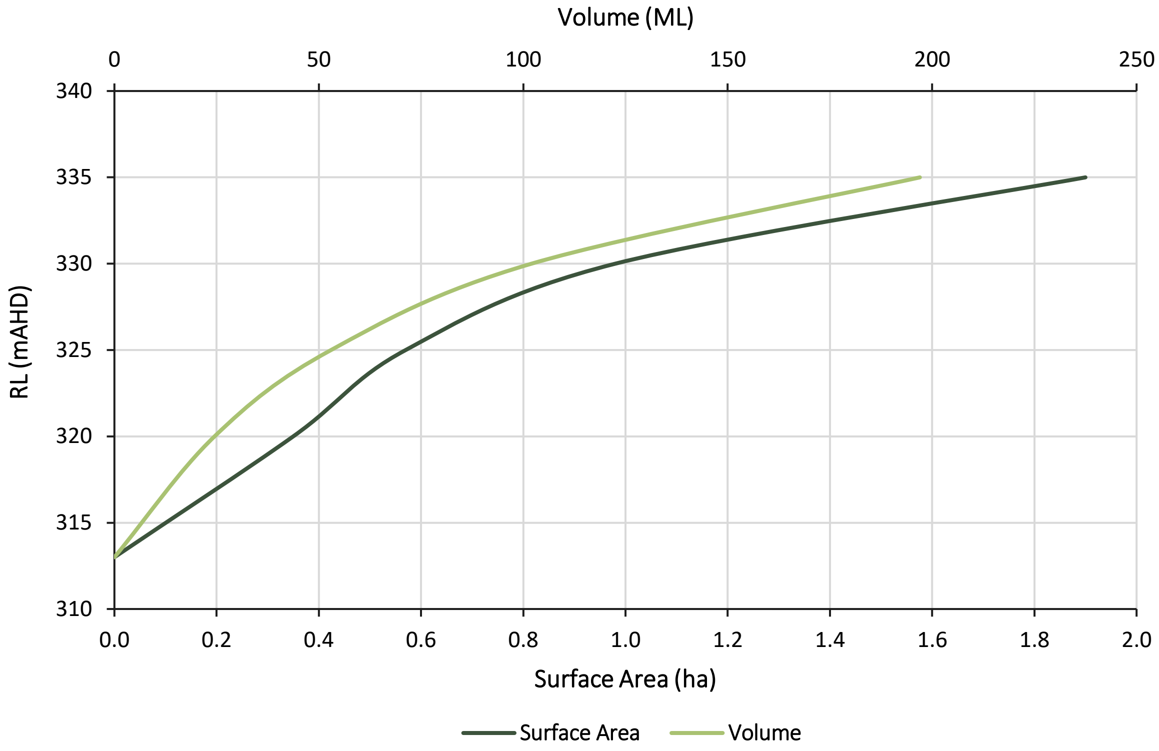
RL (mAHD)	Area (ha)	Volume (ML)
349	0	0
350	0	0.2
351	0	0.5
352	0.1	1.1
353	0.1	2
354	0.2	3.7
355	0.4	6.8
356	0.7	12.1
357	1.1	21.6
358	1.4	34.1
359	1.9	50.9
360	2.3	71.8
361	2.7	97.1
362	2.9	125.6

RL (mAHD)	Area (ha)	Volume (ML)
363	3.1	155.8
364	3.3	188
365	3.5	222.2
366	3.9	259
367	4.7	302.3
368	5.2	352
369	5.9	407.6
370	6.3	468.3
371	6.8	533.7
372	7.2	603.7
373	7.8	678.7
374	8.2	758.5
375	9.3	844.6



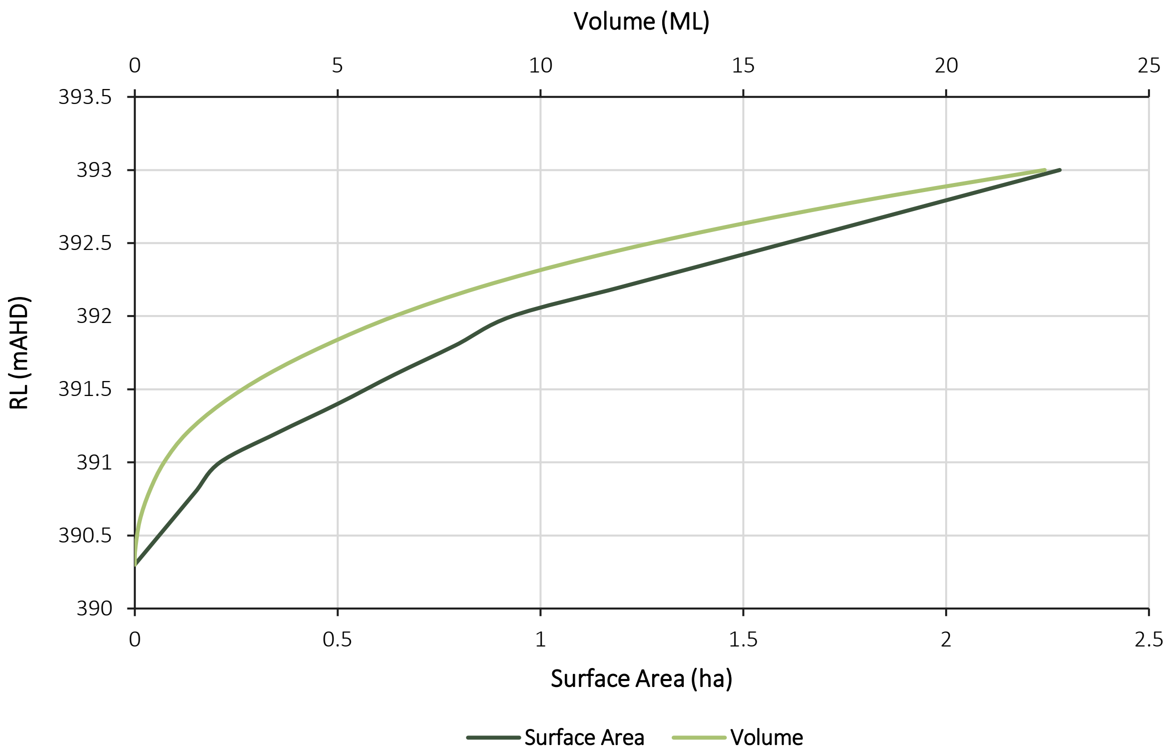
Pit 8

RL (mAHD)	Area (ha)	Volume (ML)
313	0.0	0
320	0.4	25
325	0.6	53
330	1.0	102
335	1.9	197



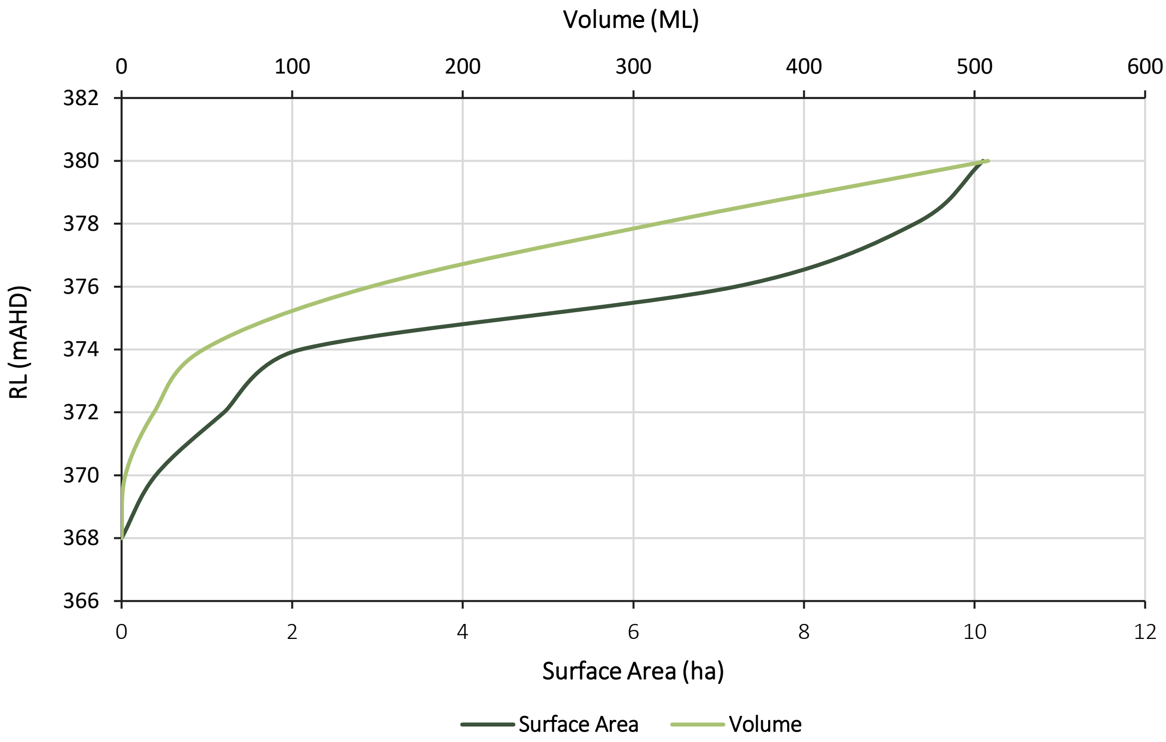
Pit 5 FP Dam

RL (mAHD)	Area (ha)	Volume (ML)
390.3	0	0
390.4	0.03	0.01
390.6	0.09	0.12
390.8	0.15	0.36
391	0.21	0.72
391.2	0.35	1.28
391.4	0.5	2.13
391.6	0.64	3.26
391.8	0.79	4.69
392	0.93	6.4
392.2	1.2	8.53
392.4	1.47	11.19
392.6	0.74	14.4
392.8	2.01	18.15
393	2.28	22.43



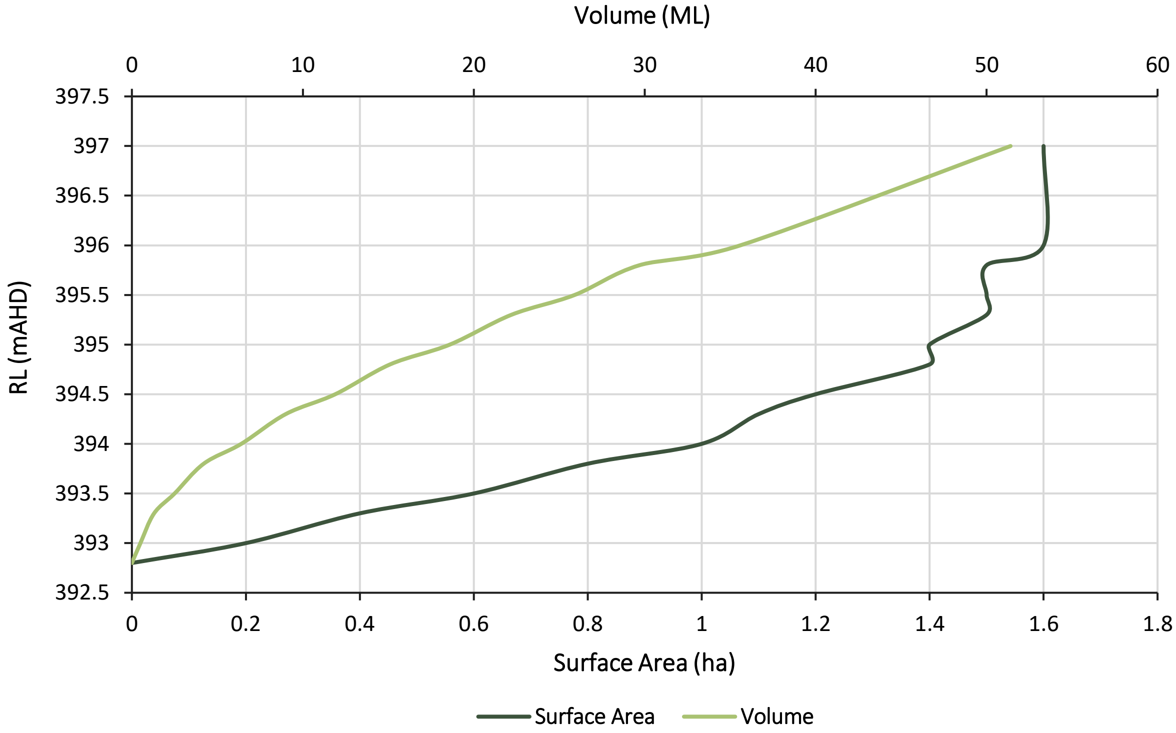
Ed's Lake

RL (mAHD)	Area (ha)	Volume (ML)
368	0	0
370	0.4	2.2
372	1.2	19
374	2.1	48
376	7.2	146
378	9.3	314
380	10.1	508



CWD

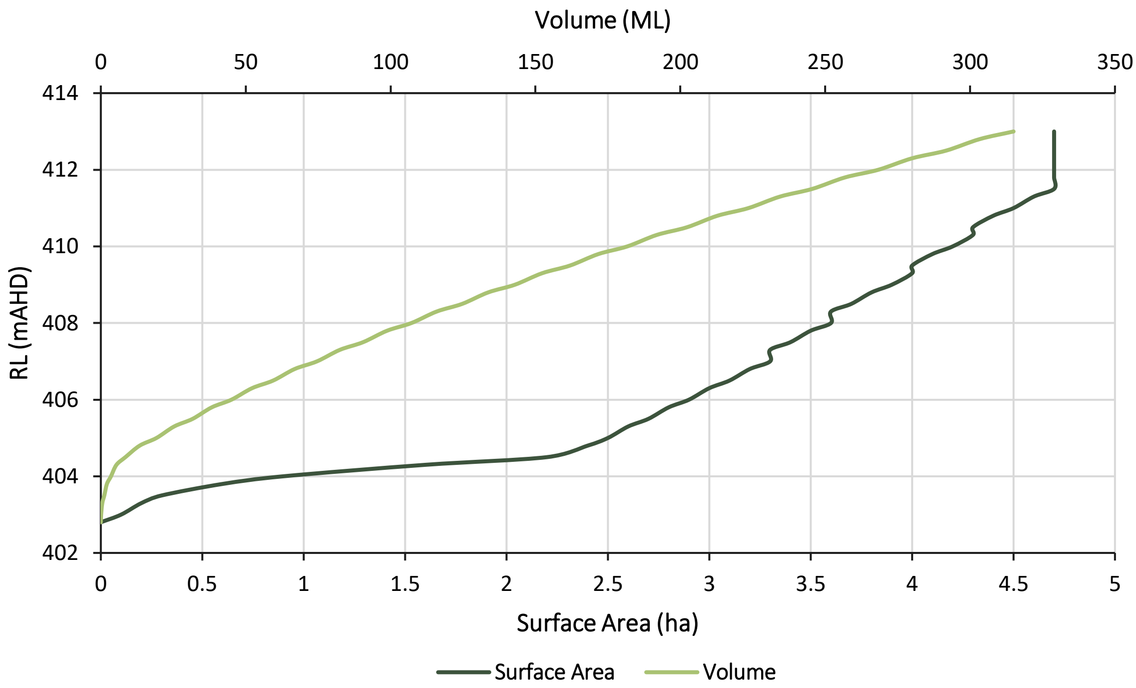
RL (mAHD)	Area (ha)	Volume (ML)
392.8	0	0
393	0.2	0.5
393.3	0.4	1.3
393.5	0.6	2.5
393.8	0.8	4.2
394	1	6.4
394.3	1.1	9
394.5	1.2	11.9
394.8	1.4	15.1
395	1.4	18.6
395.3	1.5	22.2
395.5	1.5	25.9
395.8	1.5	29.7
396	1.6	35.6
397	1.6	51.4



RWD

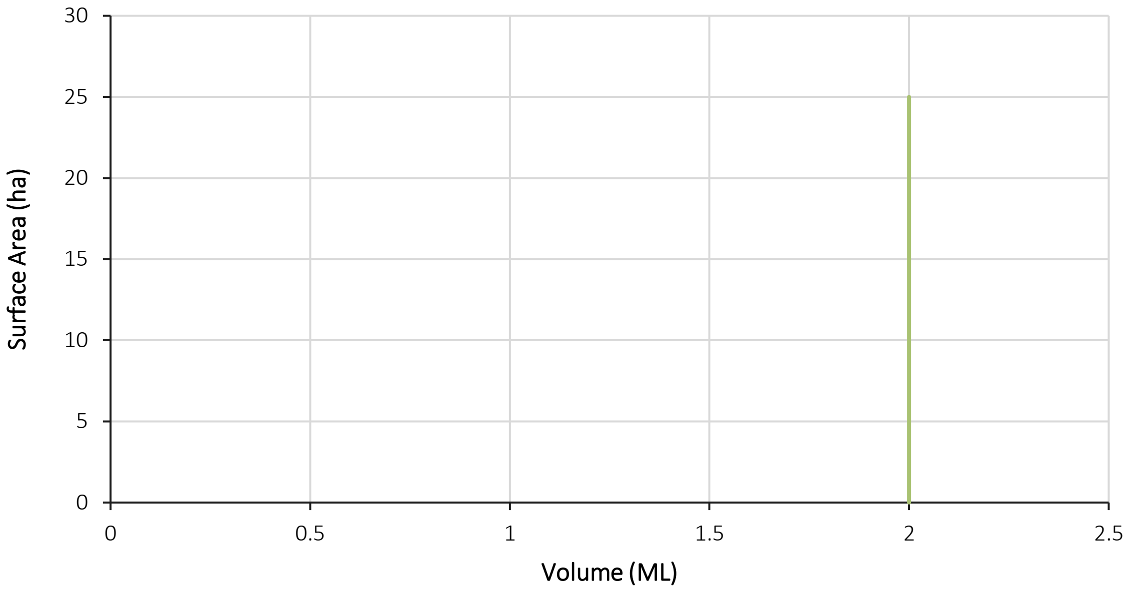
RL (mAHD)	Area (ha)	Volume (ML)
402.8	0	0
403	0.1	0.1
403.3	0.2	0.5
403.5	0.3	1.2
403.8	0.6	2.1
404	0.9	3.5
404.3	1.6	5.4
404.5	2.2	8.5
404.8	2.4	13.4
405	2.5	19.2
405.3	2.6	25.3
405.5	2.7	31.7
405.8	2.8	38.3
406	2.9	45.1
406.3	3	52.2
406.5	3.1	59.5
406.8	3.2	66.9
407	3.3	74.6
407.3	3.3	82.5
407.5	3.4	90.5
407.8	3.5	98.8

RL (mAHD)	Area (ha)	Volume (ML)
408	3.6	107.2
408.3	3.6	115.9
408.5	3.7	124.7
408.8	3.8	133.7
409	3.9	142.9
409.3	4	152.3
409.5	4	161.9
409.8	4.1	171.7
410	4.2	181.7
410.3	4.3	191.9
410.5	4.3	202.3
410.8	4.4	212.8
411	4.5	223.5
411.3	4.6	234.4
411.5	4.7	245.5
411.8	4.7	256.8
412	4.7	268.3
412.3	4.7	280
412.5	4.7	291.7
412.8	4.7	303.3
413	4.7	315



Pit 8 CWD

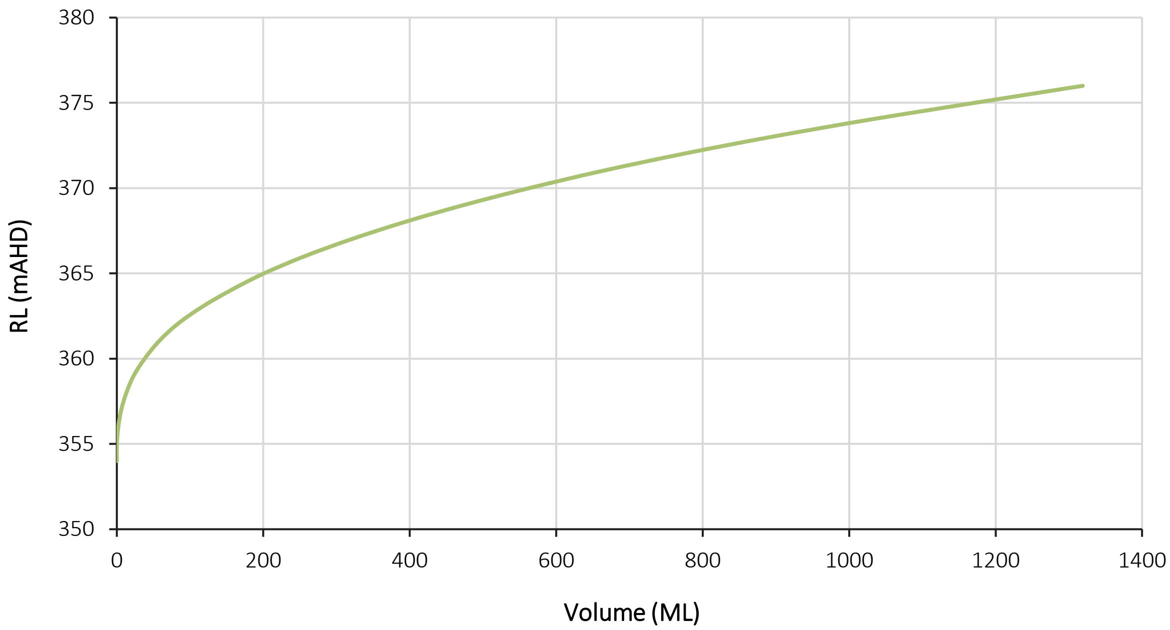
Area (ha)	Volume (ML)
2	0
2	25



Pit 1 Spoil Aquifer (20% Porosity)

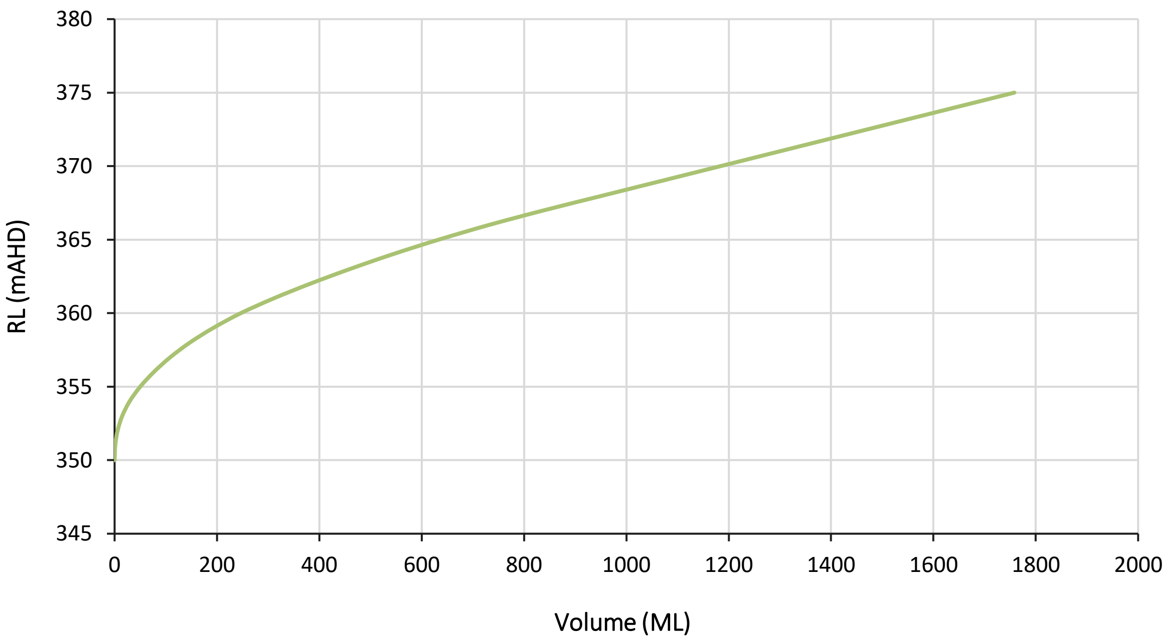
RL (mAHD)	Volume (ML)
354	0
355	0.01
356	2
357	6
358	13
359	23
360	38
361	57
362	82
363	115
364	155
365	201

RL (mAHD)	Volume (ML)
366	256
367	320
368	392
369	473
370	563
371	662
372	772
373	893
374	1026
375	1171
376	1319



Pit 2 Spoil Aquifer (20% Porosity)

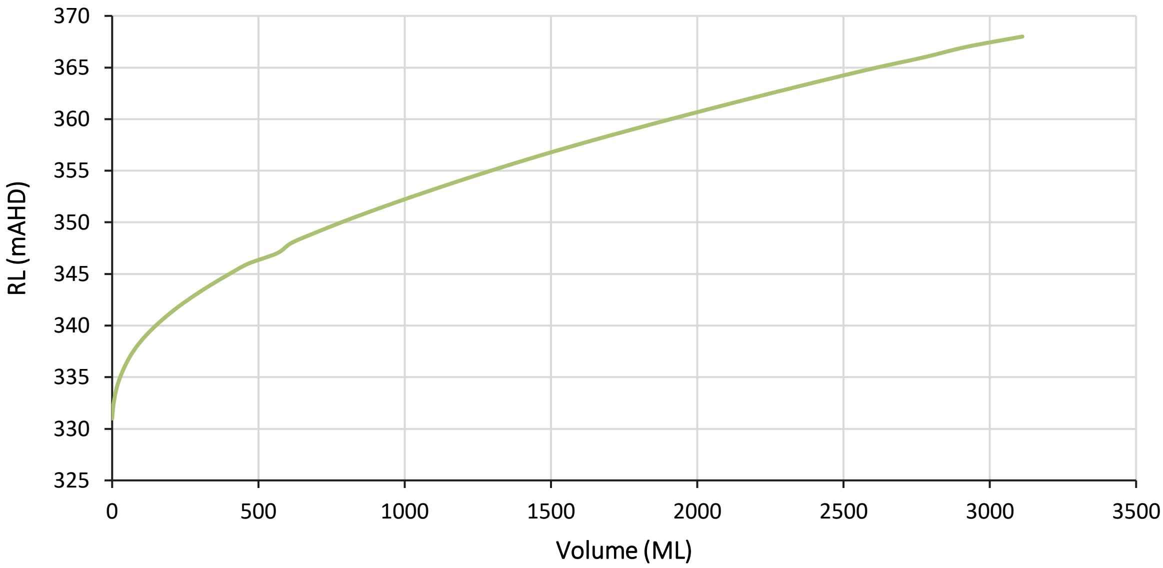
RL (mAHD)	Volume (ML)
350	0
351	1.2
352	5.8
353	14.8
354	29.3
355	50.1
356	76.8
357	108.7
358	147.1
359	193
360	246.6
361	310.5
362	381.9
363	459.6
364	542.7
365	633.3
366	31.6
367	839.3
368	954.1
369	1068.9
370	1183.8
371	1298.6
372	1413.5
373	1528.3
374	1643.2
375	1758.1



Pit 4 Spoil Aquifer (10% Porosity)

RL (mAHD)	Volume (ML)
331	0
332	3
333	8.3
334	15.8
335	27.4
336	42.4
337	60.9
338	84.6
339	114.1
340	149.3
341	189.4
342	234.7
343	285.6
344	341
345	401
346	465.7
347	563.3
348	612.9
349	695

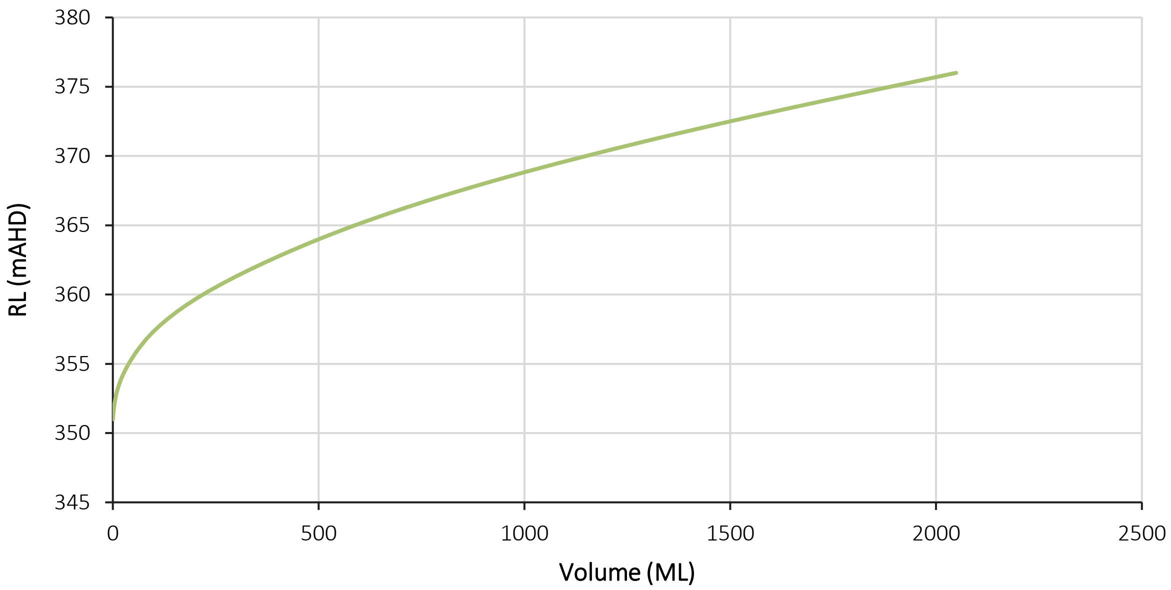
RL (mAHD)	Volume (ML)
350	783.4
351	877.6
352	976.2
353	1078.8
354	1184.7
355	1294.4
356	1408.1
357	1526.3
358	1649.9
359	1778
360	1909.5
361	2044
362	2181.4
363	2321.7
364	2466.1
365	2614.9
366	276.8
367	2920.7
368	3111.3



Pit 5 Spoil Aquifer (10% Porosity)

RL (mAHD)	Volume (ML)
351	0
352	3.5
353	10
354	21.5
355	38.5
356	60.5
357	88
358	123.5
359	167
360	219
361	279.5
362	347
363	421

RL (mAHD)	Volume (ML)
364	501
365	588.5
366	684.5
367	788.5
368	901
369	1021.5
370	1150
371	1285
372	1426.5
373	1575
374	1729.5
375	1889.5
376	2048.5



Making Sustainability Happen