

Appendix I: Red Dog Tailings Basin Water Mass Balance

Major Flows for Red Dog Tailings Basin Water Mass Balance 2016

Location	Flow	Concentrations									Comment
	2016 Flow Mgal	Ca mg/L	Cu mg/L	Zn mg/L	Mg mg/L	Mn mg/L	Fe mg/L	Al mg/L	SO ₄ mg/L	TDS mg/L	
<i>Red Dog Creek Pumpback to Pond</i>	737.04	458.3	0.1	858.0	199.0	50.9	94.7	2.7	3,825.0	5,820.2	
<i>Red Dog Creek Pumpback to WTP3</i>	2.07	458.3	0.1	858.0	199.0	50.9	94.7	2.7	3,825.0	5,820.2	
<i>Main Waste Stockpile to WTP3</i>	83.43	428.0	6.0	7,239.0	1,495.0	380.0	1,801.0	658.0	31,282.0	45,652.0	Flow to WTP 3 and 1 from MWD
<i>Main Waste Stockpile bypass WTP3</i>	1.43	428.0	6.0	7,239.0	1,495.0	380.0	1,801.0	658.0	31,282.0	45,652.0	
<i>Overburden Pumpback</i>	23.29	296.0	0.0	5.0	243.0	6.8	6.6	0.0	1,381.0	2,225.0	average of east and west sump
<i>Bons Water non Potable</i>	94.21	43.5		0.0	16.5		0.2	0.0	55.1	186.0	
<i>Bons Water to Potable Water</i>	52.90	43.5		0.0	16.5		0.2	0.0	55.1	186.0	
<i>Ore Moisture</i>	19.13	458.3	0.1	858.0	199.0	50.9	94.7	2.7	3,825.0	5,820.2	Assumed to be the same as mine pumpback water
<i>Precipitation directly to pond</i>	320.58	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
<i>Runoff into pond</i>	271.27	37.8	0.0	1.0	21.2	0.1	0.4	0.1	133.7	237.5	Concentration from station 140 values
<i>Runoff into seepage pond</i>	16.00	37.8	0.0	1.0	21.2	0.1	0.4	0.1	133.7	237.5	Concentration from station 140 values
<i>Seepage-Seepage pumpback</i>	2.94	446.0	0.0	940.0	349.0	102.0	237.0	7.8	5,195.0	7,845.0	
<i>Seepage Pond Pumpback</i>	440.64	417.8	0.0	424.5	234.7	54.6	63.4	0.8	2,880.0	4,449.2	Includes minor runoff water
<i>Reclaim Water to Mill</i>	2868.30	576.0	0.0	366.0	218.0	48.1	3.1	0.6	3,345.0	4,851.0	
<i>Reclaim Water to WTP2/Pond</i>	970.35	576.0	0.0	366.0	218.0	48.1	3.1	0.6	3,345.0	4,851.0	
<i>Reclaim Water to WTP2/Discharge</i>	1252.60	576.0	0.0	366.0	218.0	48.1	3.1	0.6	3,345.0	4,851.0	
<i>Reclaim Water to WTP1</i>	138.08	576.0	0.0	366.0	218.0	48.1	3.1	0.6	3,345.0	4,851.0	
<i>WTP2 effluent to pond</i>	52.92	565.9	0.0	48.0	106.0	0.1	0.5	0.0	2,972.8	4,310.4	No new samples in 2016
<i>WTP3 effluent</i>	40.46	806.0	0.0	0.1	56.9	0.1	0.1	0.1	2,252.0	3,380.0	
<i>WTP1 effluent</i>	0.47	749.0	0.0	38.6	14.6	0.0	0.7	0.2	1,786.0	3,763.8	No new samples in 2016
<i>Tailings water</i>	2772.00	604.0	0.0	217.0	212.0	47.5	0.1	0.0	3,110.0	4,570.0	
<i>Evaporation</i>	13.08	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
<i>WTP2 Discharge Water</i>	1252.60	847.0	0.0	0.1	111.0	0.0	0.0	0.0	2,824.0	4,117.0	No new samples in 2016
<i>Retained pore water</i>	266.42	576.0	0.0	366.0	218.0	48.1	3.1	0.6	3,345.0	4,851.0	Assume same concentration as reclaim
<i>Concentrate water</i>	34.93	604.0	0.0	208.5	212.0	46.8	0.1	0.0	3,109.0	4,559.0	Assume same concentration as tailings
<i>Seepage from T-pond</i>	365.90	576.0	0.0	366.0	218.0	48.1	3.1	0.6	3,345.0	4,851.0	Assume same concentration as reclaim
<i>Pond water end 2015 (12/31/15)</i>	4169.00	597	0.01	427	234	54.5	2.5	1	3470	4960	Avg of water balance value and bathymetry
<i>Pond water end 2016 (12/31/16)</i>	3718.00	576	0.0	366	218	48.1	3.1	0.6	3,345	4,851	Avg of water balance value and bathymetry

Red Dog Tailings Basin Water Mass Balance 2016

	Load								
	Ca tonnes	Cu tonnes	Zn tonnes	Mg tonnes	Mn tonnes	Fe tonnes	Al tonnes	SO4 tonnes	TDS tonnes
WTP1 Net to Pond	-300	0	-191	-114	-25	-2	0	-1,745	-2,529
WTP2 Net to Pond	-2,002	0	-1,335	-780	-177	-11	-2	-11,691	-16,955
WTP3 Net to Pond	-15	-2	-2,293	-465	-120	-570	-208	-9,564	-13,946
Net Mill to pond	144	0	-1,731	-124	-21	-40	-7	-3,534	-4,479
Red Dog Creek Pumpback to Pond	1,279	0	2,394	555	142	264	8	10,672	16,238
Main Waste Stockpile bypass WTP3	2	0	39	8	2	10	4	169	247
Overburden Pumpback	26	0	0	21	1	1	0	122	196
Runoff into pond	39	0	1	22	0	0	0	137	244
Seepage System Net to pond	-108	0	191	85	23	99	0	110	608
Reclaim Water to WTP2/Discharge	-2,731	0	-1,735	-1,034	-228	-15	-3	-15,861	-23,002
Retained pore water	-581	0	-369	-220	-49	-3	-1	-3,373	-4,892
Net Change in Tailings Pond loads	-4,247	-2	-5,029	-2,045	-452	-266	-209	-34,560	-48,269

Change in Pond Chemistry Load Calculation

	Load								
	Ca tonnes	Cu tonnes	Zn tonnes	Mg tonnes	Mn tonnes	Fe tonnes	Al tonnes	SO4 tonnes	TDS tonnes
Pond water end 2015 modeled	9,421	0	6,739	3,693	860	39	16	54,761	78,276
Pond water end 2016 modeled	8,107	0	5,151	3,068	677	44	9	47,078	68,274
Annual Change Pond water loads	-1,315	0	-1,588	-625	-183	4	-7	-7,683	-10,002

2016 Major TDS Sources and sinks

Tonnes TDS

