

## Appendix I: Red Dog Tailings Basin Water Mass Balance

## Major Flows for Red Dog Tailings Basin Water Mass Balance 2017

Location	Flow	Concentrations									Comment
	2017 Flow Mgal	Ca mg/L	Cu mg/L	Zn mg/L	Mg mg/L	Mn mg/L	Fe mg/L	Al mg/L	SO <sub>4</sub> mg/L	TDS mg/L	
<i>Red Dog Creek Pumpback to Pond</i>	737.04	425.0	0.2	887.0	196.0	48.4	66.3	6.7	3,930.0	5,181.0	Avg 2017 data
<i>Red Dog Creek Pumpback to WTP3</i>	2.07	425.0	0.2	887.0	196.0	48.4	66.3	6.7	3,930.0	5,181.0	Avg 2017 data
<i>Main Waste Stockpile to WTP3</i>	83.43	434.4	6.3	8,532.0	1,813.0	436.7	2,241.0	788.7	37,030.0	54,921.0	Avg 2017 data, Flow to WTP 3 and 1 from MWD
<i>Main Waste Stockpile bypass WTP3</i>	1.43	434.4	6.3	8,532.0	1,813.0	436.7	2,241.0	788.7	37,030.0	54,921.0	
<i>Overburden Pumpback</i>	23.29	136.0	0.0	9.2	215.0	5.8	1.2	0.2	1,325.0	2,105.0	2017 data, average of east/west sump, Cu from 2015
<i>Bons Water non Potable</i>	130.89	29.3	0.0	0.0	14.6			0.1	53.4	166.2	Avg from 2017 data
<i>Bons Water to Potable Water</i>	51.51	29.3	0.0	0.0	14.6			0.1	53.4	166.2	Avg from 2017 data
<i>Ore Moisture</i>	18.76	425.0	0.2	887.0	196.0	48.4	66.3	6.7	3,930.0	5,181.0	Assumed to be the same as mine pumpback water
<i>Precipitation directly to pond</i>	394.53	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
<i>Runoff into pond</i>	168.72	41.0	0.0	2.2	22.0	0.3	0.6	0.2	141.0	242.0	avg data 2017, from station 140 values
<i>OB Runoff pumpback</i>	26.72	41.0	0.0	2.2	22.0	0.3	0.6	0.2	141.0	242.0	avg data 2017, from station 140 values
<i>Seepage-Seepage pumpback</i>	4.11	355.0	0.0	315.4	203.9	46.6	52.2	0.3	2,659.7	3,848.9	Avg from 2017 data
<i>Seepage Pond Pumpback</i>	454.41	351.5	0.0	312.0	202.0	46.1	53.7	0.3	2,638.0	3,824.0	Avg from 2017 data, includes some runoff
<i>Reclaim Water to Mill</i>	3359.70	541.0	0.0	468.3	210.8	46.8	3.8	1.0	3,382.0	4,945.0	Avg from 2107 data
<i>Reclaim Water to WTP2/Pond</i>	2567.07	541.0	0.0	468.3	210.8	46.8	3.8	1.0	3,382.0	4,945.0	
<i>Reclaim Water to WTP2/Discharge</i>	1891.08	541.0	0.0	468.3	210.8	46.8	3.8	1.0	3,382.0	4,945.0	
<i>Reclaim Water to WTP1</i>	348.24	541.0	0.0	468.3	210.8	46.8	3.8	1.0	3,382.0	4,945.0	
<i>WTP2 effluent to pond</i>	46.63	565.9	0.0	48.0	106.0	0.1	0.5	0.0	2,972.8	4,310.4	No new samples in 2017
<i>WTP3 effluent</i>	59.65	777.0	0.4	0.4	85.3	1.6	4.7	0.6	2,640.0	4,093.0	Avg from 2107 data
<i>WTP1 effluent</i>	0.11	749.0	0.0	38.6	14.6	0.0	0.7	0.2	1,786.0	3,763.8	No new samples in 2017
<i>Tailings water</i>	2758.09	592.0	0.0	767.6	209.0	49.0	0.2	0.0	3,958.0	6,050.0	Same as concentrate water, avg data from 2017
<i>Evaporation</i>	119.12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
<i>WTP2 Discharge Water</i>	1891.08	809.6	0.0	0.1	125.6	0.1	0.0	0.0	2,686.0	3,939.0	No new samples in 2016
<i>Retained pore water</i>	265.04	541.0	0.0	468.3	210.8	46.8	3.8	1.0	3,382.0	4,945.0	Assume same concentration as reclaim
<i>Concentrate water</i>	33.13	592.0	0.0	767.6	209.0	49.0	0.2	0.0	3,958.0	6,050.0	Assume same concentration as tailings
<i>Seepage from T-pond</i>	454.27	541.0	0.0	468.3	210.8	46.8	3.8	1.0	3,382.0	4,945.0	Assume same concentration as reclaim
<i>Pond water end 2016 (12/31/16)</i>	3718.00	576	0.00	366	218	48.1	3.1	0.6	3,345	4,851	Avg data from 2015 -2016
<i>Pond water end 2017 (12/31/17)</i>	3337.00	541.0	0.0	468.3	210.8	46.8	3.8	1.0	3,382.0	4,945.0	Avg from 2017 data

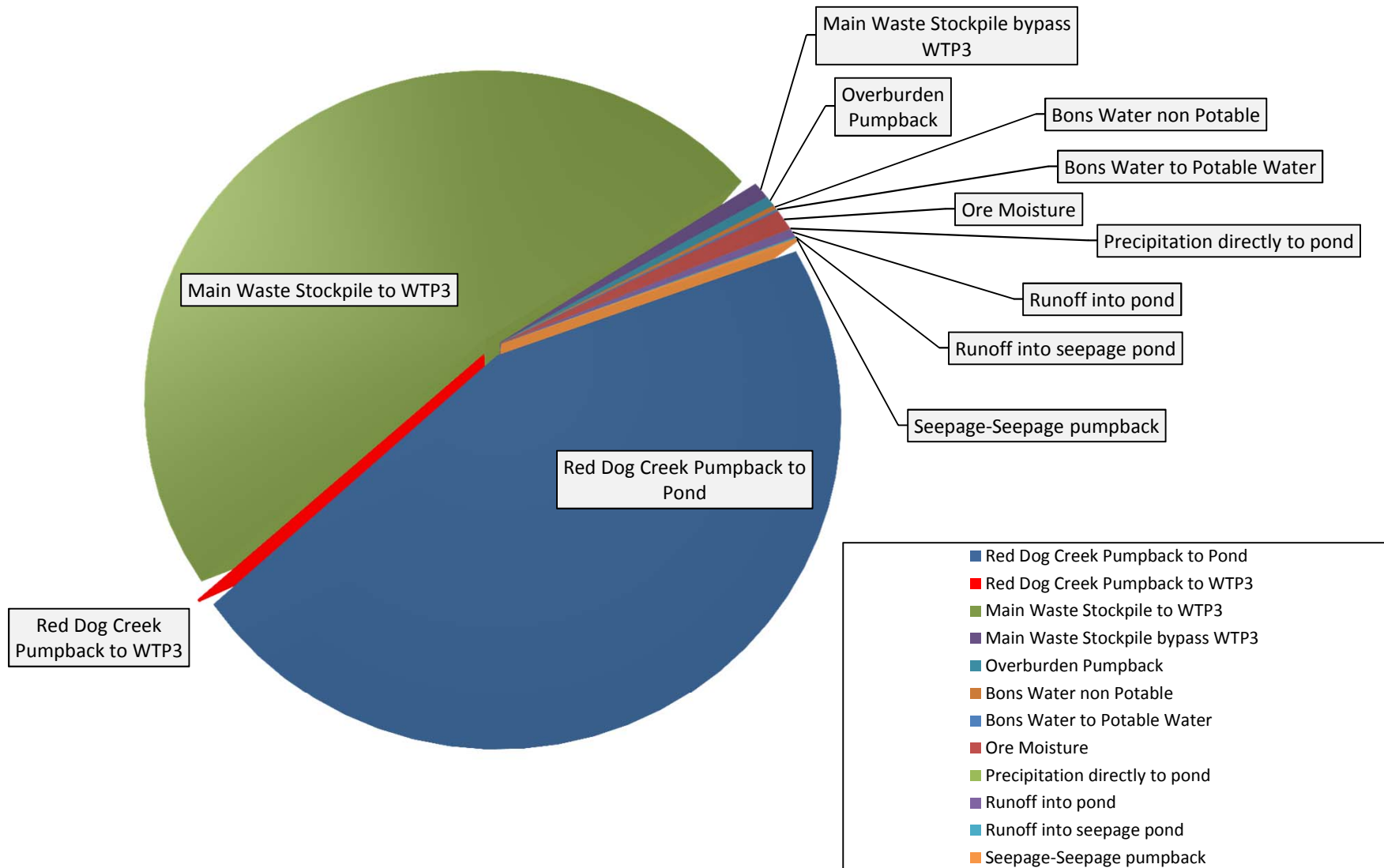
## Red Dog Tailings Basin Water Mass Balance 2017

	Load								
	Ca tonnes	Cu tonnes	Zn tonnes	Mg tonnes	Mn tonnes	Fe tonnes	Al tonnes	SO4 tonnes	TDS tonnes
WTP1 Net to Pond	-713	0	-617	-278	-62	-5	-1	-4,458	-6,517
WTP2 Net to Pond	-5,157	0	-4,542	-2,030	-455	-37	-9	-32,340	-47,292
WTP3 Net to Pond	35	-2	-2,701	-555	-138	-707	-249	-11,129	-16,461
Net Mill to pond	-590	0	2,092	-454	-81	-51	-12	-1,352	1,035
Red Dog Creek Pumpback to Pond	1,186	0	2,475	547	135	185	19	10,965	14,455
Main Waste Stockpile bypass WTP3	2	0	46	10	2	12	4	200	297
Overburden Pumpback	12	0	1	19	1	0	0	117	186
Runoff into pond	26	0	1	14	0	0	0	90	155
Seepage System Net to pond	-335	0	-273	-20	-2	85	-1	-1,327	-2,001
Reclaim Water to WTP2/Discharge	-3,873	0	-3,352	-1,509	-335	-27	-7	-24,210	-35,399
Retained pore water	-543	0	-470	-211	-47	-4	-1	-3,393	-4,961
<b>Net Change in Tailings Pond loads</b>	<b>-9,949</b>	<b>-1</b>	<b>-7,340</b>	<b>-4,467</b>	<b>-981</b>	<b>-550</b>	<b>-258</b>	<b>-66,837</b>	<b>-96,504</b>

## 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 2016 modeled	8,107	0	5,151	3,068	677	44	8	47,078	68,274
Pond water end 2017 modeled	6,834	0	5,915	2,663	591	49	12	42,721	62,465
<b>Annual Change Pond water loads</b>	<b>-1,273</b>	<b>0</b>	<b>764</b>	<b>-405</b>	<b>-86</b>	<b>5</b>	<b>4</b>	<b>-4,357</b>	<b>-5,809</b>

## 2017 Sources of TDS tonnes



# 2017 Major TDS Sources and sinks

Tonnes TDS

