Kyler Loading Evaluation – 10/1/03

Raw Water:	acid -	216 mg/l	
	flow-	overflow -	745 gpm
		Saps 1	150 gpm
		Saps 2	300 mg/l
		ALD 1	140 mg/l
		ALD 2	140 mg/l
	total flow		**1475 gpm**

Acid loading:

1475g/m x 60m/hr x 24hr/d x 216mg/l x 3.785 l/g x 1 gr/1000mg x 1#/453.6gr = **3828.3 #/d**

Alkalinity generation:	Flow (gpm)	Outflow alkalinity (mg/l)	Total alkalinity generated(mg/l)
Saps 1 -	150	79	79 + 215 = 295
Saps 2 -	300	59	59 + 216 = 275
ALD 1 -	140	164	164 + 216 = 380
ALD -	140	173	173 + 216 = 389

Alkalinity generation in #/d:

Saps 1 – 150g/m x 60m/hr x 24hr/d x 295mg/l x 3.785l/g x 1gr/1000mg x 1#/453.6gr =	531.7 #/d
Saps 2 -	991.3 #/d
ALD 1 -	639.3 #/d
ALD 2 -	654.4 #/d
Total	**2817 #/d**

Efficiency: 2817 3/d generated / 3828 # /d in raw water = 74% Keep in mind, this is at a flow 275 gpm above the design flow and at an acidity of almost twice the design acidity (216 vs. 110). Using the design flow of 1200 gpm efficiency would be around 90% in terms of alkalinity generation.

Notes:

- **Assumption is made that a cell producing 79 mg/l of alkalinity with no acidity has already satisfied the 216 mg/l of acidity in the raw water…… therefore total alkalinity generation is cell production plus the original acidity in the raw water.**

- **There is a minor of amount of acidity that I am not sure is not considered in these calculations. Water coming out of cell contains approximately 7.5 mg/l of manganese, 1.8mg/l of ferrous iron 1.5 mg/l of aluminum at a pH of 6. These metals represent acidity that will be expressed when they are precipitated. I am not sure how this acidity is considered in the sample results. Even if is not it**

represents only about 28 #/d of acidity for the 730 gpm of treated water which is insignificant for our purposes.

- **Original cubitainer results showed alkalinity generation of 132 at 4 hours, 159 at 6 hours, 162 at 6 hours, and 230 at 24 hours. Acidity of the raw water at that time was 110 mg/l. We are now at 216. This is odd because with all of the high flows you would think it might be diluted. I think we used a detention time of 6 hours based on these results and an ave. flow of 1200 gpm / 300 gpm per cell. Since flows through the ALD's are only 1/2 of the design flow, the detention would be roughly twice the design detention, approx. 12 hours. That may be one reason why the ALD's are generating so much more alkalinity that the SAPs. However, why is Saps 1 putting out the same alkalinity as Saps 2 when it has basically twice the detention time (79 mg/l at 150 gpm vs. 59 mg/l at 300 gpm)?**

- **We need to see what happens over the next year or so and find out why there is such a difference between the Saps and the ALD's and between Saps 1 and Saps 2. Actually the SAPs probably have way more detention time than the ALD's because they have water on top of the stone instead of soil.**

- **Can we consider: - a low cost upgrade for the site - convert the SAPs to ALDs**
  - pipe over flow into settling pond
  - if possible, raise head in manhole to increase flow to the Saps 1, and ALDs 1 and 2.