State of Utah

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TECHNICAL MEMORANDUM

TO : Perry/Willard Spur Workgroup

FROM : Paul Krauth

DATE : September 6, 2010

SUBJECT: Estimated Nutrient Levels from new Perry/Willard POTW

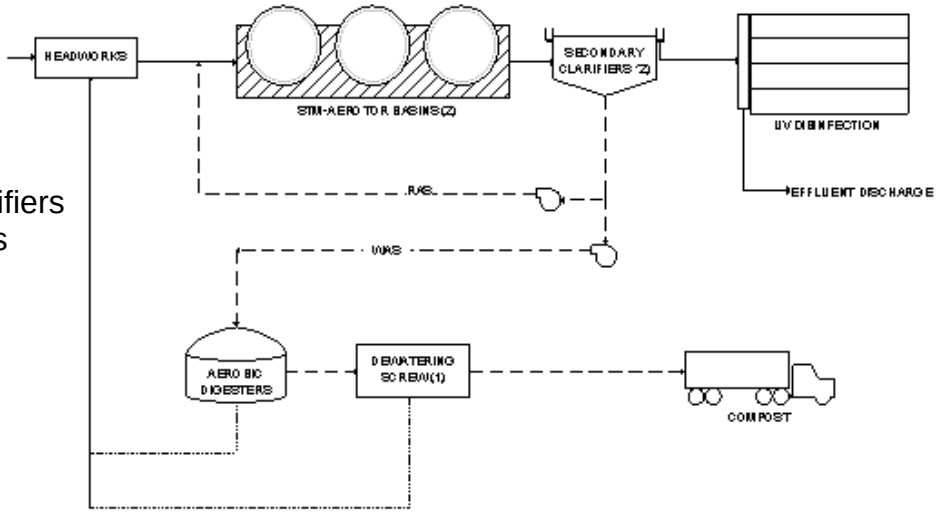
In reviewing some of the assumptions made for the nutrient model, I believe that the effluent numbers used for the treatment plant are too low for the existing plant design.

Utah's has four wastewater facilities currently using the STM-Aerotor^{TM} treatment technology; Payson, Spanish Fork, Springville and Tremonton. None of these are representative of the design used for Perry/Willard. All of these were upgrades of existing facilities, and ALL have additional treatment process, yet according to DWQ Storet data (a limited data set) NONE are able reach and effluent total nitrogen of 10 mg/L or total phosphorus of 2.5 mg/L. I compared each of the STM facilities process flow diagrams to the Perry/Willard and note differences and included the performance of each, along with the assumptions used by CH_2M Hill for the Statewide Nutrient Cost Study

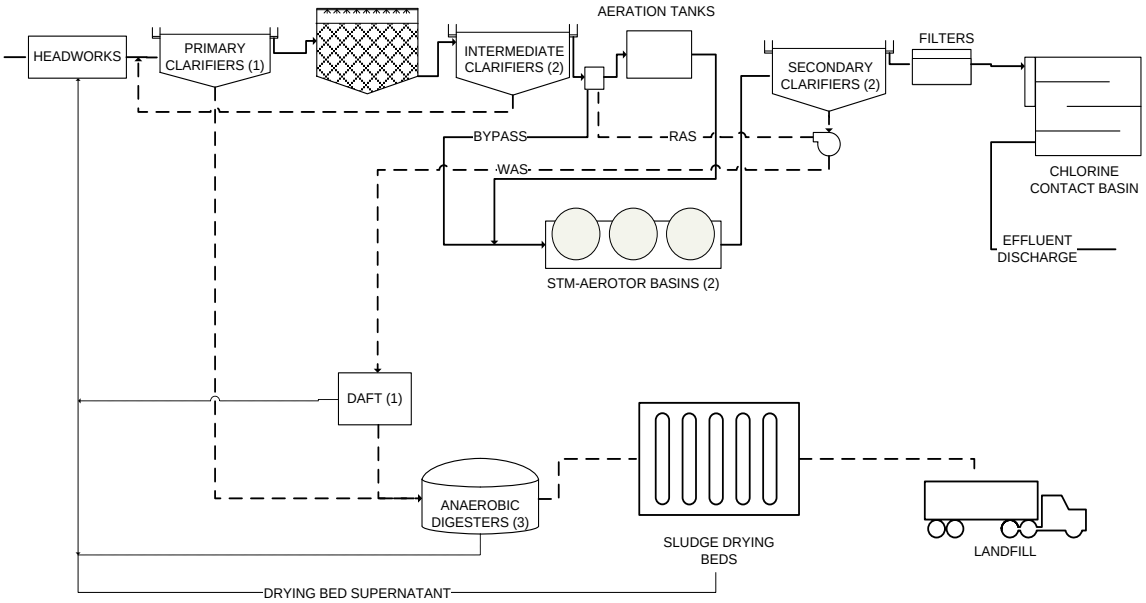
Perry/Willard Process Flow Diagram

Note: lacks

No primary clarifiers
No anoxic tanks



Payson Process Flow Diagram



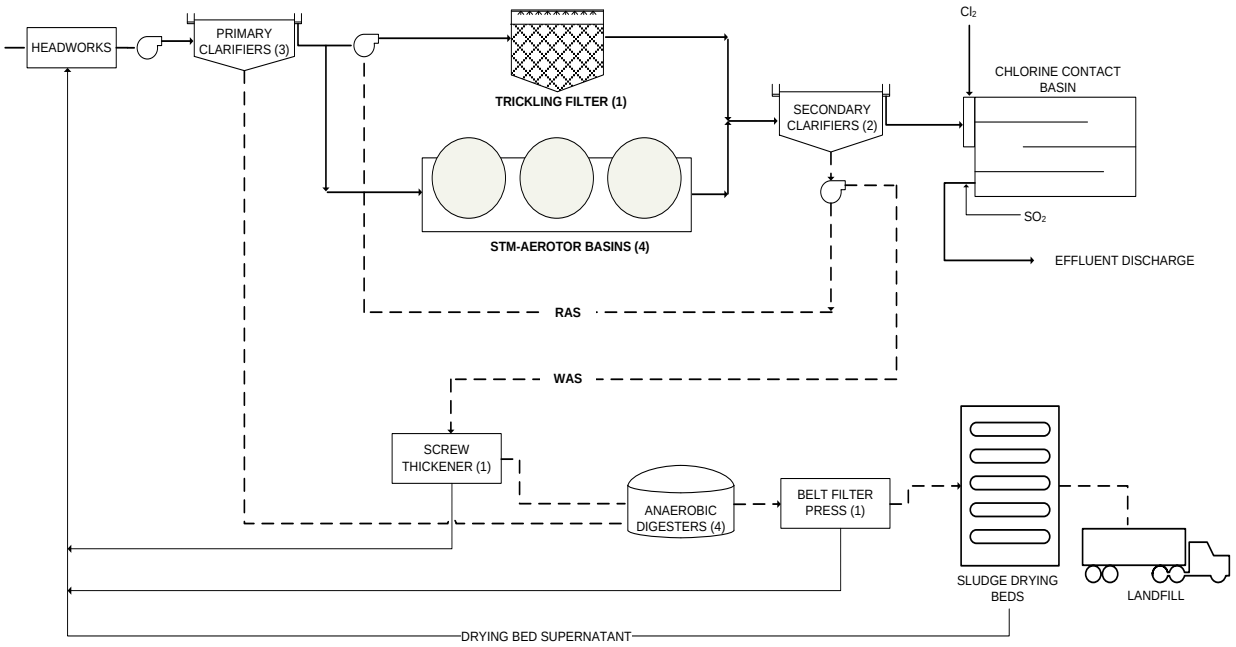
Note: has

Primary clarifiers
Roughing filter
Intermediate clarifiers
Aeration (anoxic) tanks
Dissolved air flotation thickener
Sand filters

Average Effluent Data

Parameter	mg/L	Percentage	CH_2M Assumptions
Nitrite + Nitrate as N	27.97	43.11%	*35*
Ammonia as N	3.11	4.79%	
Organic nitrogen	33.80	52.10%	
Total Inorganic Nitrogen	31.07		
Total Nitrogen	64.87		*34*
Dissolved Phosphorus	3.62	98.64%	
Total Phosphorus	3.67		*4.1*

Spanish Fork Process Flow Diagram



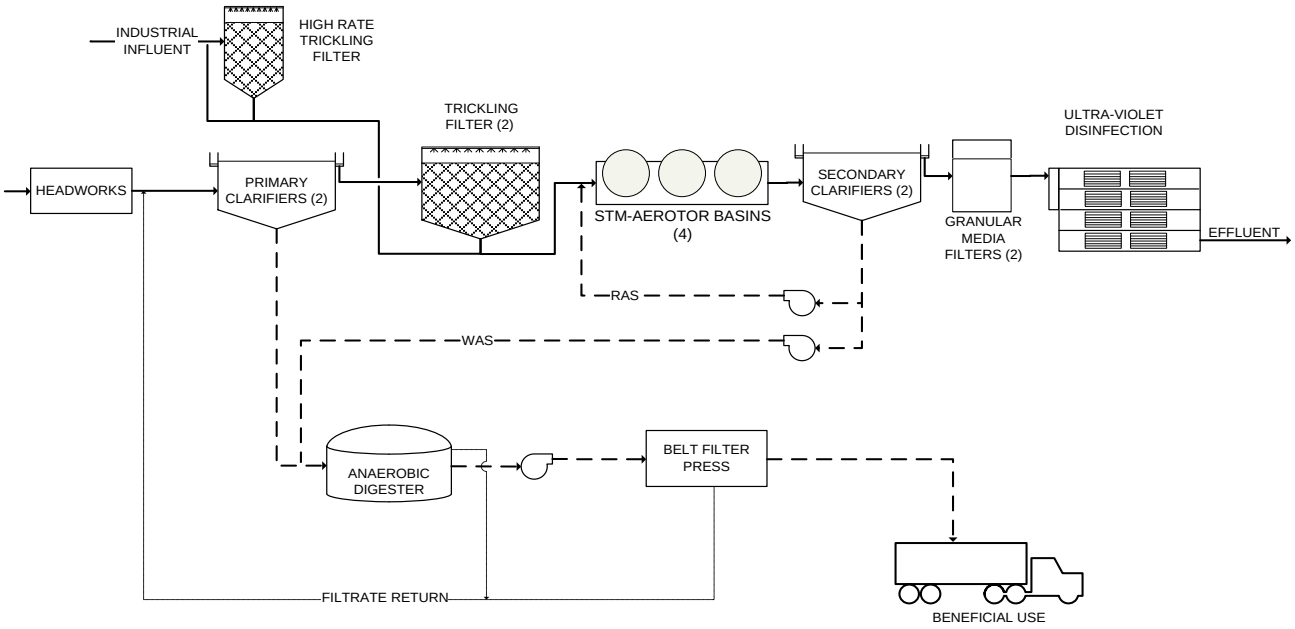
Note: has

Primary clarifiers
Trickling filter
Screw thickener

Average Effluent Data

Parameter	mg/L	Percentage	CH_2M Assumptions
Nitrite + Nitrate as N	9.28	25.87%	*18.55*
Ammonia as N	5.54	15.43%	*3.45*
Organic nitrogen	21.07	58.70%	
Total Inorganic Nitrogen	14.82		
Total Nitrogen	35.89		*24.39*
Dissolved Phosphorus	2.49	96.76%	
Total Phosphorus	2.57		*4.47*

Springville Process Flow Diagram



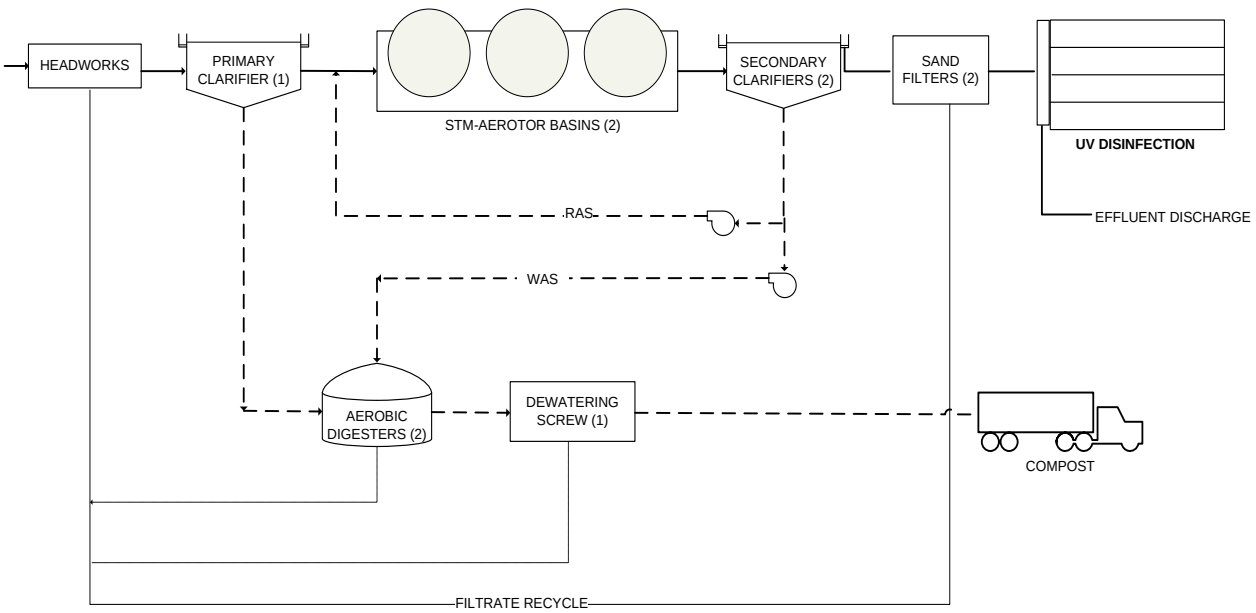
Note: has

Primary clarifiers
Roughing filter
Trickling filters
Granular media filters

Average Effluent Data

Parameter	mg/L	Percentage	CH_2M Assumptions
Nitrite + Nitrate as N	11.28	37.69%	*22.8*
Ammonia as N	2.05	6.85%	
Organic nitrogen	16.60	55.46%	
Total Inorganic Nitrogen	13.33		
Total Nitrogen	29.93		*24.2*
Dissolved Phosphorus	1.83	83.21%	
Total Phosphorus	2.20		*5.13*

Tremonton Process Flow Diagram



Note: has

Primary clarifiers
Sand filters

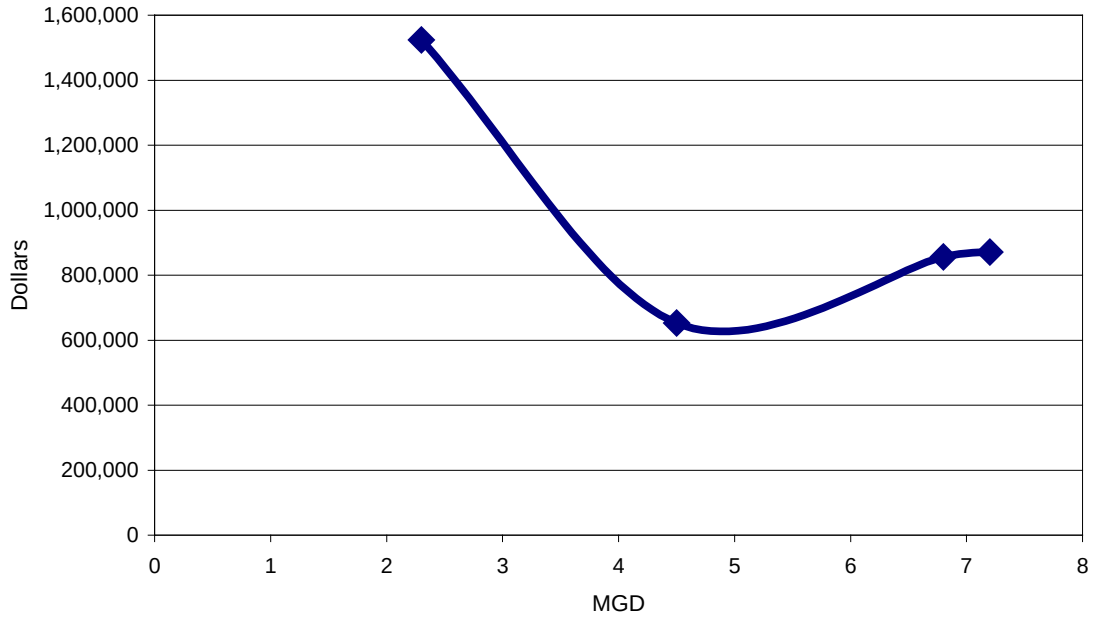
Average Effluent Data

Parameter	mg/L	Percentage	CH_2M Assumptions
Nitrite + Nitrate as N	3.44	17.80%	*15.28*
Ammonia as N	6.09	31.54%	*0.10*
Organic nitrogen	9.78	50.66%	
Total Inorganic Nitrogen	9.52		
Total Nitrogen	19.30		*20.00*
Dissolved Phosphorus	4.65	*103.86% ?*	
Total Phosphorus	4.48		*3.2*

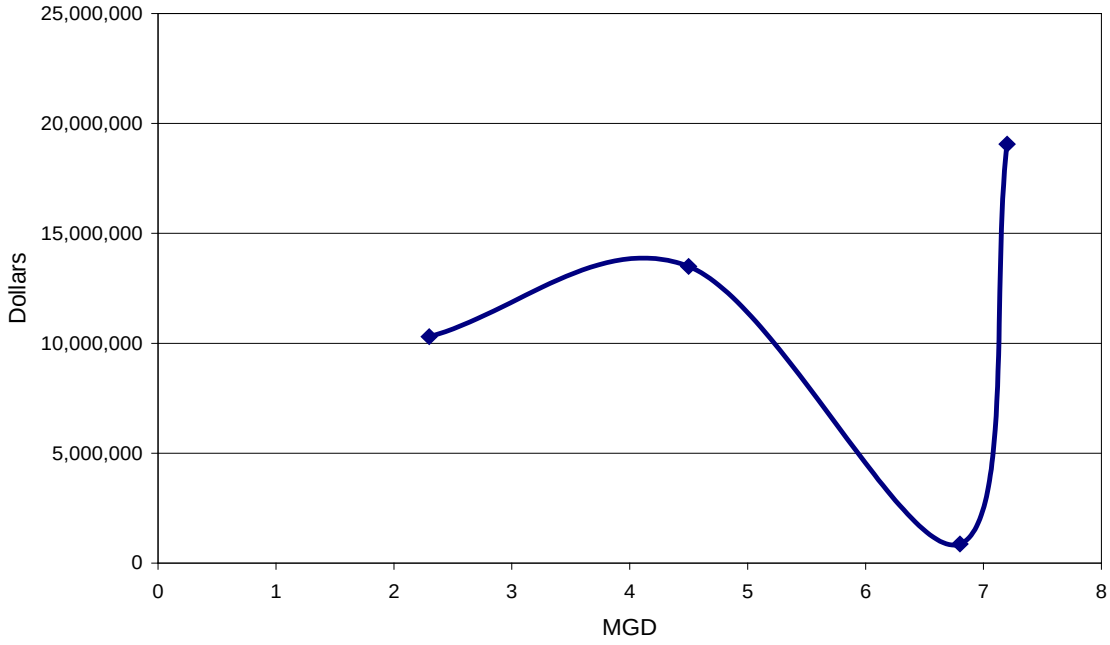
The average total nitrogen for the four facilities is 37.5 mg/L, total inorganic nitrogen is 17.2 mg/L and total phosphorus is 3.2 mg/L. But this is an erroneous comparison. Three of the facilities have filtration, skewing the total phosphorus numbers. Additionally three of the facilities have large food processors on their systems, skewing the total nitrogen numbers.

Given the various designs, trying to do any cost estimates for potential upgrades for Perry/Willard based upon the completed technical memorandum from CH_2M Hill's Nutrient Study is pointless. This is shown by a generated cost curves for phosphorus.

Costs of 1.0 mg TP



Costs of 0.1 mg TP



Finally if the current design is able to produce a 10 mg/L total nitrogen, why is there future plans for adding anoxic tanks and operating as a modified Ludzack-Ettinger process (MLE)?

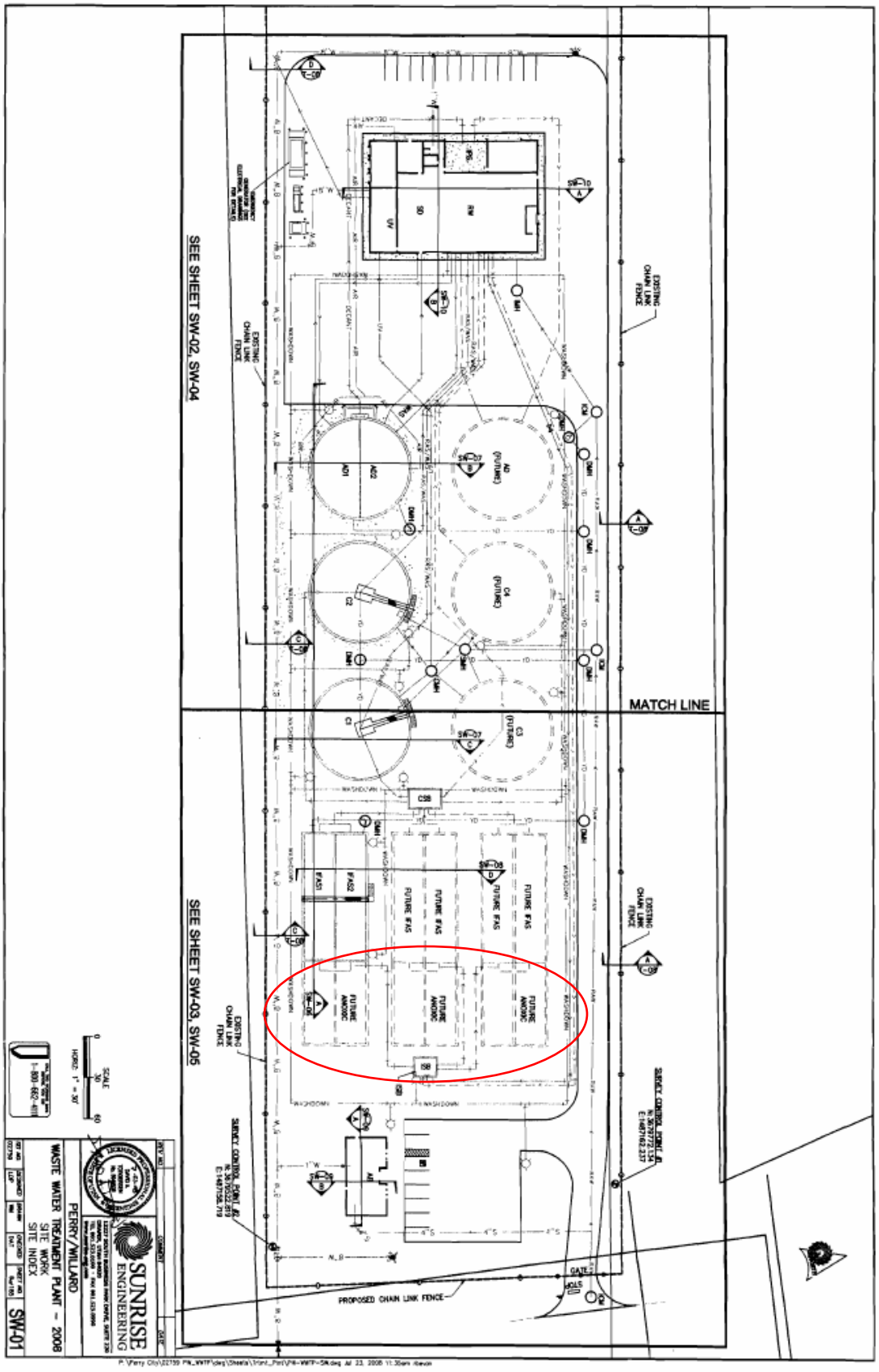


Figure 6-AW-01