

WATER BALANCE-EAST VALLEY CATTLE DAIRY

Brockway Engineering PLLC
11/28/2018 GWS

Water Balance		Ref.	Description	January	February	March	April	May	June	July	August	September	October	November	December	Yearly Total	Units
WATER IN	1		Area Dairy	640.9	640.9	640.9	640.9	640.9	640.9	640.9	640.9	640.9	640.9	640.9	640.9		acres
			Area Pond	51.0	51.0	51.0	51.0	51.0	51.0	51.0	51.0	51.0	51.0	51.0	51.0		acres
			Pumped Volume	1,396,923	1,396,923	1,396,923	1,629,744	1,707,350	1,707,350	1,930,175	1,707,350	1,707,350	1,707,350	1,396,923	1,396,923		gpd
			Stockwater and Commercial Diversion	3.2	3.2	3.2	3.8	4.0	4.0	4.5	4.0	4.0	4.0	3.2	3.2		cfs
			Days Per Month	31.0	28.0	31.0	30.0	31.0	30.0	31.0	31.0	30.0	31.0	30.0	31.0	365.0	days
	Pump	2	Pumped Volume	132.9	120.0	132.9	150.1	162.4	157.2	183.6	162.4	157.2	162.4	128.6	132.9	1,787.4	afa
	Pd	3	Precipitation	0.74	0.63	1.07	1.12	1.53	1.15	1.04	0.90	0.93	0.77	0.87	0.66	11.4	in
				0.06	0.05	0.09	0.09	0.13	0.10	0.09	0.08	0.08	0.06	0.07	0.06	0.95	ft
			Precipitation Volume Dairy	39.8	33.6	57.4	59.9	81.5	61.2	55.4	48.2	49.8	41.1	46.7	35.3	608.8	afa
	Pp	Precipitation Volume Pond	3.2	2.7	4.6	4.8	6.5	4.9	4.4	3.8	4.0	3.3	3.7	2.8	48.5	afa	
F	4	Water Content Volume Feed	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	89.7	afa
Water In=Pd+Pp+F+Pump				183.3	163.8	202.3	222.2	257.9	230.7	250.9	222.0	218.5	214.3	186.5	178.5	2,530.9	afa
WATER OUT	Etp	5	ET-Pond-pact	0.90	1.15	2.44	3.32	4.22	5.17	6.36	5.80	4.28	2.76	1.37	0.84	38.6	in
				0.08	0.10	0.20	0.28	0.35	0.43	0.53	0.48	0.36	0.23	0.11	0.07	3.2	ft
			Pond Evap Volume	3.8	4.9	10.4	14.1	17.9	22.0	27.0	24.6	18.2	11.7	5.8	3.6	164.1	afa
	In	6	Precipitation Available to Store (Fact-Sagebrush)	0.5	0.5	0.8	1.3	1.8	1.5	1.1	1.0	0.7	0.7	0.5	0.4	10.5	in
			Est. Storable Private Water	24.1	24.7	42.4	68.1	95.2	78.9	56.7	50.8	37.2	35.2	27.1	20.2	560.6	afa
			Natural Infiltration=P-Pact_sage	15.6	8.8	15.0	-8.2	-13.7	-17.7	-1.3	-2.6	12.6	5.9	19.6	15.1	49.2	afa
	Consumptive Use of Dairy—Estimated 2017 Using LCO 2017																
	Cud	4	Commercial Use	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	76.04	afa
			Manure Evaporated	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	153.6	afa
			Milk Export of Water	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3	87.2	afa
			Metabolism Milking	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	13.7	164.5	afa
			Metabolism Replacement herd etc	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	94.7	afa
			Dairy Processes Consumptive Use	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	48.0	575.9	afa
	Id+Etd	See Below	Additional Infiltration and Evaporation from Dairy Surfaces	27.8	26.8	-30.0	-21.2	16.1	24.5	27.7	24.1	24.9	20.5	9.3	28.3	179.0	afa
Water Out=In+(Id+Etd)+Cud+Etp				95.3	88.5	43.4	32.7	68.4	76.8	101.4	94.1	103.7	86.1	82.7	95.0	968.2	afa
Stored Water	Stored Water=Water In- Water Out			88.0	75.2	158.9	189.5	189.5	153.9	149.5	127.9	114.8	128.1	103.8	83.5	1562.7	AFA
	Cut	10	Irrigated WWheat pdef (Proxy for Triticale)	1.96													afa/acre
	e	11	Irrigation Efficiency of LEPA	88.0%													
	Vgross		Acre of Stored Water Applied/ Acre of Irrigation	2.23													afa/acre
	Acres of Irrigation By Volume = Stored Water/ Vgross				702.1 Acres of Triticale												
Water Quality	4		Manure Volume Flushed To Lagoon Excluded From Balance	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	74.9	afa
			Estimated % Manure In Stored Water	7%	8%	4%	3%	3%	4%	4%	5%	5%	5%	6%	7%	% Manure	

Additional Infiltration and Runoff for Dairy Surfaces																	
It+Etd+Pd-Rd	C	7	Runoff Coef.	0.70	0.80	0.80	0.80	0.70	0.60	0.50	0.50	0.50	0.50	0.80	0.80	LIGHT INDUSTRY	
	Ra	8	Stored Precip	0.52	0.50	Yellow Is Frozen Precipitation Based on Average Monthly Temperatures										0.53	1.6 in
	Rg	9	Direct Runoff	0.22	0.13	0.86	0.90	1.07	0.69	0.52	0.45	0.47	0.38	0.70	0.13	6.5	in
	Pi	7	Melting Stored Precip Fraction			0.5	0.4	0.1								1.0	
			Stored Precip Melting			0.78	0.62	0.16								1.6	in
			Runoff + Stored Precip Melting	0.22	0.13	1.64	1.52	1.22	0.69	0.52	0.45	0.47	0.38	0.70	0.13	8.1	in
	Rg+Pi			0.0186	0.0105	0.1363	0.1266	0.1019	0.0573	0.0432	0.0376	0.0389	0.0320	0.0583	0.0110	0.7	ft
	Rd		Estimated Runoff Volumes	11.9	6.7	87.4	81.1	65.3	36.7	27.7	24.1	24.9	20.5	37.3	7.1	430.8	afa
	(Id+Etd)		Additional Evaporation and Infiltration Dairy Surfaces	27.8	26.8	-30.0	-21.2	16.1	24.5	27.7	24.1	24.9	20.5	9.3	28.3	179.0	afa

TRANSFER 81940
APPLICANTS
EXHIBIT 6

References	
1	Bill Millenkamp, Owner of East Valley Cattle
2	Water Right Combined Limit for Stockwater and Commercial Use 43-13491
3	Mali- Gross Precipitation: Allen, Richard G. and Clarence W. Robison, 2012. Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho: Supplement updating the Time Series through December 2008, Research Technical Completion Report, Kimberly Research and Extension Center, University of Idaho, Moscow, ID.
4	Brockway LCO 2017 Analysis-Attachment B
5	Mali- ETact Shallow Pond: Allen, Richard G. and Clarence W. Robison, 2012. Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho: Supplement updating the Time Series through December 2008, Research Technical Completion Report, Kimberly Research and Extension Center, University of Idaho, Moscow, ID.
6	Mali-ETact Sagebrush: Allen, Richard G. and Clarence W. Robison, 2012. Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho: Supplement updating the Time Series through December 2008, Research Technical Completion Report, Kimberly Research and Extension Center, University of Idaho, Moscow, ID.
7	Vlissman, W., Harbaugh, T. E., & Knapp, J. (1972). Introduction to hydrology, Intex Educational. Rational Method, Pg 308
8	Mali-Monthly Temperature: Allen, Richard G. and Clarence W. Robison, 2012. Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho: Supplement updating the Time Series through December 2008, Research Technical Completion Report, Kimberly Research and Extension Center, University of Idaho, Moscow, ID.
9	Rg=CPgA
10	Mali-Irrigated Winter Wheat: Allen, Richard G. and Clarence W. Robison, 2012. Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho: Supplement updating the Time Series through December 2008, Research Technical Completion Report, Kimberly Research and Extension Center, University of Idaho, Moscow, ID.
11	Lyle, W. M., & Bordovsky, J. P. (1981). Low energy precision application (LEPA) irrigation system. Trans. ASAE, 24(5), 1241-1245.
12	Mali- Irrigated Winter Wheat: Allen, Richard G. and Clarence W. Robison, 2012. Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho: Supplement updating the Time Series through December 2008, Research Technical Completion Report, Kimberly Research and Extension Center, University of Idaho, Moscow, ID.

Variable	Description	Units
Rg	Direct Runoff	in
C	Coefficient of Runoff	-
Pg	Gross Precipitation	in
A	Area	acre
I	Infiltration Volume	afa
ET	Evapotranspiration Volume	afa
P	Precipitation Volume	afa
R	Runoff Volume	afa
Pd	Precipitation Volume of Dairy Surfaces	afa
F	Volume of Moisture from Feed	afa
Pp	Precipitation Volume on Pond Surfaces	afa
Pump	Pumped Volume	afa
CUt	Consumptive Use for Irrigated Winter Wheat	afa