Water-Energy Grant Application
Cross Valley Canal Extension Lining - Pool No. 8

Appendix 2.4 - Well Power Calculation Sheet

Exhibit C-1
Well Power Calculation Sheet

Power Charge = Power Rate ($/KWH) X Energy Use (Avg. KWH/AF) X Annual Pumping (AF)

Notes:

1) $/KWH is calculated by using the PG&E, AG 5b rate or future equivalent determined prior to May 1 of each year. Currently AG 5b includes demand charges, electric energy charges for on peak, off peak and partial peak and associated energy tarrifs.

2) The following table will be used to determine the KWH/AF. Pump TDH is a value calculated from the measurements from wells in the well field at one hour of pumping. If multiple wells are used, the average calculated TDH for the operational wells will be used for determination of energy use.

3) If the calculated total dynamic head (TDH) is greater than 400 feet, the KWH/AF will be recalculated.

Pump TDH After 1 Hour of Pumping		Average KWH/AF		KWH Per 21,000 AF	Cost Per 21,000 AF ($)
50.0		156.3		3,282,288.8	385,341
60.0		163.3		3,429,473.1	402,620
70.0		169.7		3,563,995.4	418,413
80.0		175.8		3,692,054.4	433,447
90.0		181.8		3,817,488.0	448,173
100.0		187.8		3,942,888.5	462,895
110.0		193.8		4,070,153.5	477,836
120.0		200.0		4,200,781.9	493,172
130.0		206.5		4,336,044.5	509,052
140.0		213.2		4,477,090.4	525,610
150.0		220.2		4,625,017.4	542,977
160.0		227.7		4,780,923.3	561,280
170.0		235.5		4,945,946.7	580,654
180.0		243.9		5,121,301.9	601,241
190.0		252.8		5,308,313.2	623,196
200.0		262.3		5,508,450.2	646,692
210.0		272.5		5,723,366.0	671,923
220.0		283.6		5,954,942.5	699,110
230.0		295.5		6,205,343.5	728,507
240.0		308.4		6,477,079.9	760,409
250.0		322.5		6,773,091.7	795,161
260.0		337.9		7,096,850.3	833,170
270.0		354.9		7,452,491.5	874,922
280.0		373.6		7,844,987.8	921,002
290.0		394.3		8,280,376.5	972,116
300.0		417.4		8,766,064.9	1,029,136
310.0		443.4		9,311,247.0	1,093,140
320.0		472.7		9,927,479.9	1,165,486
330.0		506.2		10,629,499.4	1,247,903
340.0		544.6		11,436,396.1	1,342,633
350.0		589.2		12,373,356.8	1,452,632
360.0		641.6		13,474,311.8	1,581,884
370.0		704.1		14,786,094.0	1,735,887
380.0		779.8		16,375,221.1	1,922,451
390.0		873.3		18,339,459.7	2,153,053
400.0		991.8		20,828,630.5	2,445,281

Example:

$646,692 = 0.1174/KWH X 262.3KWH/AF X 21,000 AF

Exhibit C-2
250 HP Power Cost Calculation Sheet

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16.0	17	18	19	20
Pumping Level	Pump Column Losses	Discharge Head	Total Dynamic Head (TDH)	Pump Flow	Pump Bowl Efficiency	Pump Bowl Power	Pump Shaft Losses	Pump Thrust Losses	Motor Efficiency	Overall Efficiency	Input Power	Electric Power	Energy Use	Water Production	Energy Use	Unit Cost-PG&E 5b	Cost Per Acre-Foot	Cost Per Hour of Operation	Cost Per Day of Operation
(ft)	(ft)	(ft)	(ft)	(GPM)	(%)	(HP)	(HP)	(HP)	(%)	(%)	(HP)	(KW)	KWH/Day	(AF/Day)	KWH/AF	($/KWH)	($/AF)	($/HR)	($/Day)
-20.3	22.7	27.6	30	4,422	24.2%	138.6	2.0	0.826	94.0%	22.7%	150.4	112.2	2,693.5	19.5	137.8	0.1174	16.2	13.176	316.2
-6.8	21.2	25.6	40	4,329	29.9%	146.4	2.0	0.826	94.3%	28.2%	158.3	118.1	2,834.7	19.1	148.2	0.1174	17.4	13.866	332.8
6.5	19.7	23.8	50	4,236	35.3%	151.6	2.0	0.826	94.5%	33.3%	163.4	121.9	2,926.2	18.7	156.3	0.1174	18.3	14.314	343.5
19.5	18.4	22.1	60	4,143	40.4%	155.4	2.0	0.826	94.7%	38.3%	167.0	124.6	2,990.4	18.3	163.3	0.1174	19.2	14.628	351.1
32.3	17.2	20.5	70	4,050	45.2%	158.3	2.0	0.826	95.0%	42.9%	169.7	126.6	3,037.9	17.9	169.7	0.1174	19.9	14.861	356.7
45.0	16.0	19.0	80	3,957	49.8%	160.6	2.0	0.826	95.2%	47.4%	171.7	128.1	3,074.8	17.5	175.8	0.1174	20.6	15.041	361.0
57.4	14.9	17.6	90	3,864	54.0%	162.5	2.0	0.826	95.3%	51.5%	173.4	129.4	3,104.4	17.1	181.8	0.1174	21.3	15.186	364.5
69.7	13.9	16.4	100	3,771	58.0%	164.1	2.0	0.826	95.5%	55.4%	174.8	130.4	3,129.1	16.7	187.8	0.1174	22.0	15.307	367.4
81.8	13.0	15.2	110	3,678	61.7%	165.6	2.0	0.826	95.7%	59.1%	176.0	131.3	3,150.2	16.3	193.8	0.1174	22.8	15.410	369.8
93.8	12.1	14.1	120	3,584	65.1%	166.8	2.0	0.826	95.9%	62.4%	177.0	132.0	3,168.9	15.8	200.0	0.1174	23.5	15.501	372.0
105.6	11.3	13.1	130	3,491	68.2%	168.0	2.0	0.826	96.0%	65.5%	177.9	132.7	3,185.7	15.4	206.5	0.1174	24.2	15.583	374.0
117.3	10.5	12.2	140	3,398	71.0%	169.1	2.0	0.826	96.1%	68.3%	178.8	133.4	3,201.3	15.0	213.2	0.1174	25.0	15.660	375.8
128.9	9.8	11.3	150	3,304	73.6%	170.1	2.0	0.826	96.3%	70.8%	179.6	134.0	3,216.1	14.6	220.2	0.1174	25.9	15.732	377.6
140.4	9.1	10.5	160	3,211	75.8%	171.0	2.0	0.826	96.4%	73.1%	180.4	134.6	3,230.4	14.2	227.7	0.1174	26.7	15.802	379.3
151.8	8.5	9.7	170	3,117	77.8%	172.0	2.0	0.826	96.5%	75.1%	181.2	135.2	3,244.5	13.8	235.5	0.1174	27.7	15.871	380.9
163.0	7.9	9.0	180	3,023	79.5%	172.9	2.0	0.826	96.5%	76.7%	182.0	135.8	3,258.6	13.4	243.9	0.1174	28.6	15.940	382.6
174.2	7.4	8.4	190	2,930	80.9%	173.8	2.0	0.826	96.6%	78.1%	182.8	136.4	3,272.9	12.9	252.8	0.1174	29.7	16.010	384.2
185.3	6.9	7.8	200	2,836	82.0%	174.7	2.0	0.826	96.7%	79.3%	183.6	137.0	3,287.6	12.5	262.3	0.1174	30.8	16.082	386.0
196.4	6.4	7.2	210	2,742	82.8%	175.6	2.0	0.826	96.7%	80.1%	184.5	137.6	3,302.8	12.1	272.5	0.1174	32.0	16.156	387.8
207.3	6.0	6.7	220	2,648	83.3%	176.5	2.0	0.826	96.8%	80.6%	185.4	138.3	3,318.8	11.7	283.6	0.1174	33.3	16.235	389.6
218.2	5.6	6.2	230	2,554	83.6%	177.5	2.0	0.826	96.8%	80.9%	186.3	139.0	3,335.7	11.3	295.5	0.1174	34.7	16.317	391.6
229.0	5.2	5.7	240	2,460	83.5%	178.5	2.0	0.826	96.8%	80.9%	187.3	139.7	3,353.6	10.9	308.4	0.1174	36.2	16.405	393.7
239.8	4.9	5.3	250	2,366	83.2%	179.5	2.0	0.826	96.8%	80.5%	188.4	140.5	3,372.8	10.5	322.5	0.1174	37.9	16.498	396.0
250.5	4.5	4.9	260	2,272	82.6%	180.6	2.0	0.826	96.8%	79.9%	189.5	141.4	3,393.4	10.0	337.9	0.1174	39.7	16.599	398.4
261.2	4.2	4.6	270	2,178	81.7%	181.7	2.0	0.826	96.7%	79.0%	190.8	142.3	3,415.7	9.6	354.9	0.1174	41.7	16.708	401.0
271.8	3.9	4.2	280	2,084	80.5%	183.0	2.0	0.826	96.7%	77.9%	192.1	143.3	3,440.0	9.2	373.6	0.1174	43.9	16.827	403.9
282.4	3.7	3.9	290	1,989	79.0%	184.3	2.0	0.826	96.7%	76.4%	193.6	144.4	3,466.5	8.8	394.3	0.1174	46.3	16.957	407.0
292.9	3.4	3.7	300	1,895	77.3%	185.8	2.0	0.826	96.6%	74.6%	195.3	145.7	3,495.8	8.4	417.4	0.1174	49.0	17.100	410.4
303.4	3.2	3.4	310	1,800	75.2%	187.4	2.0	0.826	96.5%	72.6%	197.1	147.0	3,528.1	8.0	443.4	0.1174	52.1	17.258	414.2
313.9	3.0	3.1	320	1,706	72.9%	189.1	2.0	0.826	96.4%	70.3%	199.1	148.5	3,564.2	7.5	472.7	0.1174	55.5	17.435	418.4
324.3	2.8	2.9	330	1,611	70.3%	191.1	2.0	0.826	96.3%	67.7%	201.3	150.2	3,604.7	7.1	506.2	0.1174	59.4	17.633	423.2
334.7	2.6	2.7	340	1,517	67.4%	193.3	2.0	0.826	96.2%	64.8%	203.9	152.1	3,650.7	6.7	544.6	0.1174	63.9	17.858	428.6
345.1	2.4	2.5	350	1,422	64.2%	195.9	2.0	0.826	96.1%	61.6%	206.8	154.3	3,703.2	6.3	589.2	0.1174	69.2	18.115	434.8
355.5	2.2	2.3	360	1,327	60.7%	198.9	2.0	0.826	95.9%	58.2%	210.2	156.8	3,764.1	5.9	641.6	0.1174	75.3	18.413	441.9
365.8	2.1	2.1	370	1,233	56.9%	202.4	2.0	0.826	95.8%	54.5%	214.2	159.8	3,835.6	5.4	704.1	0.1174	82.7	18.762	450.3
376.1	1.9	2.0	380	1,138	52.8%	206.6	2.0	0.826	95.6%	50.5%	219.0	163.4	3,920.9	5.0	779.8	0.1174	91.5	19.180	460.3
386.4	1.8	1.8	390	1,043	48.5%	211.7	2.0	0.826	95.4%	46.3%	224.8	167.7	4,024.9	4.6	873.3	0.1174	102.5	19.688	472.5
396.6	1.7	1.7	400	948	43.9%	218.2	2.0	0.826	95.3%	41.8%	232.1	173.1	4,154.9	4.2	991.8	0.1174	116.4	20.324	487.8
406.9	1.6	1.6	410	853	39.0%	226.7	2.0	0.826	95.1%	37.0%	241.4	180.1	4,322.7	3.8	1,146.9	0.1174	134.6	21.145	507.5
417.1	1.5	1.5	420	758	33.7%	238.1	2.0	0.826	94.8%	32.0%	254.1	189.5	4,548.8	3.3	1,358.3	0.1174	159.5	22.251	534.0
427.3	1.4	1.4	430	663	28.3%	254.6	2.0	0.826	94.6%	26.7%	272.1	203.0	4,871.7	2.9	1,663.7	0.1174	195.3	23.831	571.9

Footnotes:

1) Pump characteristics derived from a four stage Flowserve 14ENL Pump with a 10.6-inch trim and a design point of 2500 GPM @ 226 Ft.

2) Power usage derived from a 250 HP US premium efficient hollowshaft electric motor.

3) Power costs based on a PG&E AG 5b melded unit rate of $0.1174/KWH

RRBWSD JURP05-1228

Water-Energy Grant Application

Cross Valley Canal Extension Lining - Pool No. 8

Appendix 2.5 - Air Pollution District Greenhouse Gas Emissions Memo

SAN JOAQUIN VALLEY UNIFIED
AIR POLLUTION CONTROL DISTRICT

DATE: 1/14/13

TO: Permit Services Staff

FROM: Leonard Scandura – Permit Services Manager

SUBJECT: Quantifying Greenhouse Gas Emissions Due To Electricity Use

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Purpose:

This document is intended to provide a generally accepted greenhouse gas (GHG) emission factor (as CO2 equivalents or CO2e) for electricity utilization.

Background:

While the District does not directly regulate direct or indirect emissions of GHGs from stationary sources, there are instances when a quantification of a project's GHG emissions is required. Direct GHG emissions are those that occur on site as a result of a project. Indirect GHG emissions are those that occur off site but are due to the activity at the stationary source. Electrical consumption can result in direct GHG emissions if the electricity is generated and consumed onsite or indirect GHG emissions if the electricity is generated offsite and consumed onsite.

District Policy "Addressing GHG Emission Impacts for Stationary Source Projects Under CEQA When Serving as the Lead Agency" provides a various methods for the District to determine significance of a project's GHG emissions. This can include quantification of a project's direct and indirect GHG emissions. Additionally, in establishing the Best Performance Standard for a given class and category of source, the direct and indirect GHG emissions from the baseline case and the similar equipment equipped with BPS must be quantified.

Additionally, Rule 2301 – Emission Reduction Credit Banking includes provisions to bank reductions in GHG emissions. GHG emission reductions are quantified as the difference between the historic actual GHG emissions and the post project potential GHG emissions from the project. Post project potential indirect GHG emissions due to an emission reduction project (due to electricity consumption) may need quantified and considered in determining the amount of GHG ERCs available.

Post project potential indirect GHG emissions due to electricity consumption are calculated using the post project potential electrical consumption (kW-hr) per year and a representative GHG emission factor (kg CO2e/kw-hr) .

Guidance:

There are a several different electricity suppliers in the District including Pacific Gas and Electric, Southern California Edison, and various municipally owned utility districts and irrigation districts. Electricity from out of state sources is consumed as well.

Further, each electricity supplier may purchase and provide electricity from a variety of power plants that can vary from day to day and year to year. Because of this variability, it would be impossible to establish a GHG emission factor for each electricity supplier in the District that would be representative of the current and future potential GHG emissions due to electricity use for a given project.

The California Energy Commission document "Updated Macroeconomic Analysis of Climate Strategies Presented in the March 2006 Climate Action Team Report" dated October 15, 2007 (available at http://www.climatechange.ca.gov/climate_action_team/reports/2007-10-15_MACROECONOMIC_ANALYSIS.PDF) provides an estimate of GHG emissions due to electricity consumption in California as a result of implementing various strategies to reduce GHG emissions in the State by 2020.

This document presents two different emission factors that present GHG emissions due to electricity consumption as a result of implementing these strategies. These emission factors take into account electricity produced out of state (and therefore not subject to AB32 requirements), electricity generated with renewable resources (wind, solar, hydroelectric, biomass, etc.), and transmission losses as projected in 2020.

An emission factor of 313 kg CO2e/MW-hr is identified to estimate GHG emission reductions due to improved electrical efficiency. This emission factor represents GHG emissions due to marginal decreases in electrical use due to energy efficiency projects. It can also be used to estimate GHG emissions due to marginal increases in electrical use due to new projects that consume electricity.

A separate emission factor of 390 kg CO2e/MW-hr is identified to estimate GHG emission reductions due to increased renewable electricity production. This emission factor is based on the assumption that electricity generated from renewable resources will displace electricity generated from fossil fuel combustion (which has higher GHG emissions than the total portfolio of electricity consumed in California). This emission factor is not appropriate to estimate GHG emissions due to increased electricity use.

The emission factor of 313 kg CO2e/MW-hr represents GHG emissions due to marginal electricity use. Even though this emission factor is a projection what GHG emissions from electricity consumption will be in 2020, it is accepted as a reasonable estimate to use when quantifying GHG emissions due to electricity use.

This emission factor shall be used when determining the decrease in GHG emissions due to using less electricity (as due to an energy efficiency project) or due to increased electricity use (due to installation of new equipment). In summary, when estimating GHG emissions due to electricity use for a given project, an emission factor 313 kg CO2e/Mw-hr (0.313 kg/kW-hr) shall be used.