

ECM-1: Lighting System Improvements

County of Henrico
Lighting and Lighting Control Summary (Draft 12/14/2004)

	Existing Qty	Proposed Qty	Total Existing kW	Total Proposed kW	Total kW Saved	Existing kWh	Proposed kWh	Total kWh Saved	Total Energy Savings	Total Maintenance Savings	Total Material	Total Labor	Disposal	Bond	Total Cost	Simple Payback
Administration Building	1,429	1,429	161	101	60	575,367	372,961	202,406	\$ 12,144	\$ 189	\$ 31,354	\$ 26,515	\$ 1,584	\$ 759	\$ 60,211	4.9
Adult Detention Center	251	251	20	15	4	96,272	75,130	21,142	\$ 1,269	\$ 14	\$ 2,307	\$ 2,824	\$ 114	\$ 79	\$ 5,324	4.2
Byrd M. S.	1,808	1,628	209	103	106	646,833	280,781	366,051	\$ 21,963	\$ 330	\$ 76,348	\$ 54,841	\$ 2,769	\$ 1,555	\$ 135,514	6.1
Carver E. S.	644	543	99	35	64	280,214	91,572	188,642	\$ 11,319	\$ 201	\$ 33,033	\$ 21,549	\$ 1,682	\$ 627	\$ 56,891	4.9
Fire Station # 12	75	75	13	6	6	92,388	45,213	47,175	\$ 2,830	\$ 20	\$ 4,693	\$ 2,613	\$ 169	\$ 75	\$ 7,551	2.6
Gayton Library	181	177	19	11	8	72,903	43,503	29,400	\$ 1,764	\$ 24	\$ 4,527	\$ 3,260	\$ 204	\$ 94	\$ 8,084	4.5
Hermitage H. S.	2,607	1,935	261	135	125	844,849	392,762	452,086	\$ 27,125	\$ 393	\$ 75,674	\$ 69,057	\$ 3,292	\$ 1,953	\$ 149,977	5.5
Grand Total	6,995	6,038	782	408	374	2,608,827	1,301,924	1,306,903	\$ 78,414	\$ 1,171	\$ 227,935	\$ 180,659	\$ 9,814	\$ 5,143	\$ 423,551	5.3

Henrico County, Lighting ECM-1 Summary

Line	Building	Floor	Location	Existing Fixture Description	Proposed Fixture Description	# of Control Required	Estimated % reduction in operating hours	Type of Control	Existing Qty	Proposed Qty	Total Existing Hours	Total Proposed Hours	Existing kW
1	Gayton Library	1	Meeting room	2x4 3F34T12/18cell/DS	3F32T8/LO/No DS	-			11	11	3,224	3,224	0.1171
2	Gayton Library	1	Meeting room, EM	2x4 3F34T12/18cell/DS	3F32T8/LO/EM/No DS	-			2	2	8,760	8,760	0.1171
3	Gayton Library	1	Meeting room	Inc. 150w Flood Recessed	CF 20W Flood Dimmable	-			10	10	3,224	3,224	0.1500
4	Gayton Library	1	Meeting room, storage	2x4 2F34T12/TG	2F32T8/LO	-			3	3	312	312	0.0743
5	Gayton Library	1	Staff Lounge	2x4 2F34T12/TG	4F32T8/LO/TW2	1	50%	Ceiling	4	2	3,224	1,612	0.0743
6	Gayton Library	1	Staff Lounge	2x4 2F34T12/TG	2F32T8/LO	1	50%	Ceiling	1	1	3,224	1,612	0.0743
7	Gayton Library	1	Work room	2x4 3F34T12/18cell/DS	3F32T8/LO/No DS	-			17	17	3,224	3,224	0.1171
8	Gayton Library	1	Work room, EM	2x4 3F34T12/18cell/DS	3F32T8/LO/EM/No DS	-			2	2	8,760	8,760	0.1171
9	Gayton Library	1	Work room	2x2 2F34UT12/TG	2F17T8/EB/RF	-			5	5	3,224	3,224	0.0743
10	Gayton Library	1	Staff restrooms	1x2 1F20T12/Wall	1F17T8/EB	-			2	2	312	312	0.0320
11	Gayton Library	1	Storage	1x4 2F34T12/S	New 1F32T8/EB	-			1	1	312	312	0.0743
12	Gayton Library	1	Branch Manager's Office	2x4 3F34T12/18cell	3F32T8/LO	-			2	2	2,340	2,340	0.1171
13	Gayton Library	1	Front Desk	1x4 2F34T12/Cove	2F32T8/LO	-			19	19	3,224	3,224	0.0743
14	Gayton Library	1	Front Desk, EM	1x4 2F34T12/Cove	2F32T8/LO/EM	-			4	4	8,760	8,760	0.0743
15	Gayton Library	1	Library	2x4 3F34T12/18cell/DS	3F32T8/LO/No DS	-			68	68	3,224	3,224	0.1171
16	Gayton Library	1	Library, EM	2x4 3F34T12/18cell/DS	3F32T8/LO/EM/No DS	-			10	10	8,760	8,760	0.1171
17	Gayton Library	1	Atrium, Track light	Inc. 75w Flood Track	CF 20W Flood	-			6	6	3,224	3,224	0.0750
18	Gayton Library	1	Men	1x4 2F34T12/Wall	4F32T8/LO/TW2	1	40%	Wall, PDT	2	1	3,224	1,934	0.0743
19	Gayton Library	1	Men, EM	2x4 2F34T12/TG	2F32T8/LO/EM	-			1	1	8,760	8,760	0.0743
20	Gayton Library	1	Women	1x4 2F34T12/Wall	4F32T8/LO/TW2	1	40%	Wall, PDT	2	1	3,224	1,934	0.0743
21	Gayton Library	1	Women, EM	2x4 2F34T12/TG	2F32T8/LO/EM	-			1	1	8,760	8,760	0.0743
22	Gayton Library	1	Janitor	1x4 2F34T12/S	New 1F17T8/EB/VP	-			1	1	2,340	2,340	0.0743
23	Gayton Library	1	Lobby	2x4 4F34T12/TG/DS	4F32T8/LO/No DS	-			3	3	3,224	3,224	0.1486
24	Gayton Library	1	Lobby, EM	2x4 4F34T12/TG/DS	4F32T8/LO/EM/No DS	-			1	1	8,760	8,760	0.1486
25	Gayton Library	1	Display	Inc. 65w Flood	CF 20W Flood	-			3	3	3,224	3,224	0.0650
26	Gayton Library	1	Exit signs	All LED	Not in scope	-			0	0	8,760	8,760	-
27	Fire Station # 12	1	Garage	1x8 2F96T12/VHO/Ind.	New 4F54T5/HO/8'/Ind/Guard	-			17	17	8,760	8,760	0.3900
28	Fire Station # 12	1	Day Room	2x4 4F34T12/TG	New 2F32T8/EB/TG	-			6	6	3,276	3,276	0.1486
29	Fire Station # 12	1	Kitchen	2x4 4F34T12/TG	New 3F32T8/EB/TG	-			1	1	8,760	8,760	0.1486
30	Fire Station # 12	1	Storage	1x4 2F34T12/Ind.	New 1F32T8/EB	-			3	3	8,760	8,760	0.0743
31	Fire Station # 12	1	Captain's office & Hallway	1x4 2F34T12/Wrap	2F32T8/LO	-			4	4	3,276	3,276	0.0743
32	Fire Station # 12	1	Toilet	Inc. 100w	CF 20W	-			6	6	8,760	8,760	0.1000
33	Fire Station # 12	1	Toilet	1x4 2F34T12/Wall	New 1F32T8/EB	1	70%	Wall, PDT	2	2	8,760	2,628	0.0743
34	Fire Station # 12	1	Dorm	1x4 4F34T12/Wrap	New 2F32T8/EB	-			3	3	3,276	3,276	0.1486
35	Fire Station # 12	1	Equipment room	1x8 2F96T12/Strip/Tube Guard	New 2F32T8/EB/8'	-			2	2	3,276	3,276	0.1230
36	Fire Station # 12	1	Mech room	Inc. 65w Flood/Keyless	New 1F32T8/EB	-			2	2	8,760	8,760	0.0650
37	Fire Station # 12	1	Mech room	1x4 2F34T12/Wrap	New 1F32T8/EB	-			2	2	8,760	8,760	0.0743
38	Fire Station # 12	1	Electric Shop	1x4 2F34T12/S	New 2F32T8/EB	-			1	1	3,276	3,276	0.0743
39	Fire Station # 12	1	Laundry	1x4 2F34T12/VP	New 1F32T8/EB/VP	1	70%	Wall	3	3	8,760	2,628	0.0743
40	Fire Station # 12	1	Dorm	1x4 4F34T12/Wrap	New 2F32T8/EB	-			3	3	3,276	3,276	0.1486
41	Fire Station # 12	1	Toilet	Inc. 100w	CF 20W	-			6	6	8,760	8,760	0.1000
42	Fire Station # 12	1	Toilet	1x4 2F34T12/Wall	New 1F32T8/EB	1	70%	Wall, PDT	2	2	8,760	2,628	0.0743
43	Fire Station # 12	1	Hallway	1x4 2F34T12/Wrap	2F32T8/LO	-			2	2	8,760	8,760	0.0743
44	Fire Station # 12	1	Captain's office & Bunk	All T8	Not in scope	-			0	0	8,760	8,760	-
45	Fire Station # 12	Ext	Wall	Inc. 100w Can	CF 20W	-			10	10	4,380	4,380	0.1000
46	Adult Detention Center	1	Administration Building	2x4 3F32T8/TG/DS	Relamp 3F25T8/4'	-			78	78	4,380	4,380	0.0900
47	Adult Detention Center	1	Administration Building	2x2 3F17T8/TG	Not in scope	-			0	0	4,380	4,380	-
48	Adult Detention Center	1	Administration Building	LED Exit signs	Not in scope	-			0	0	4,380	4,380	-

Henrico County, Lighting ECM-1 Summary

Line	Proposed kW	Total Existing kW	Total Proposed kW	Total kW Saved	Existing Lighting only kWh	Proposed Lighting only kWh	Lighting only kWh Saved	Additional kWh Saved From Lighting Control	Total kWh Saved	kWh Dollars Saved	kWh Dollars Saved	Total Annual Savings	Unit Lighting Control Material	Unit Lighting Control Labor	Unit Lighting Material	Unit Lighting Labor	Total Material	Total Labor	Total Cost
1	0.0760	1.29	0.84	0.45	4,153	2,695	1,458	-	1,458	\$ 87	\$ -	\$ 87	\$ -	\$ -	\$ 16.70	\$ 16.65	\$ 184	\$ 183	\$ 367
2	0.0760	0.23	0.15	0.08	2,052	1,332	720	-	720	\$ 43	\$ -	\$ 43	\$ -	\$ -	\$ 81.70	\$ 26.65	\$ 163	\$ 53	\$ 217
3	0.0200	1.50	0.20	1.30	4,836	645	4,191	-	4,191	\$ 251	\$ -	\$ 251	\$ -	\$ -	\$ 19.41	\$ 10.00	\$ 194	\$ 100	\$ 294
4	0.0510	0.22	0.15	0.07	70	48	22	-	22	\$ 1	\$ -	\$ 1	\$ -	\$ -	\$ 13.65	\$ 16.65	\$ 41	\$ 50	\$ 91
5	0.1000	0.30	0.20	0.10	958	645	313	322	636	\$ 38	\$ -	\$ 38	\$ 131.97	\$ 76.30	\$ 19.70	\$ 29.13	\$ 171	\$ 135	\$ 306
6	0.0510	0.07	0.05	0.02	240	164	75	82	157	\$ 9	\$ -	\$ 9	\$ -	\$ -	\$ 13.65	\$ 16.65	\$ 14	\$ 17	\$ 30
7	0.0760	1.99	1.29	0.70	6,418	4,165	2,253	-	2,253	\$ 135	\$ -	\$ 135	\$ -	\$ -	\$ 16.70	\$ 16.65	\$ 284	\$ 283	\$ 567
8	0.0760	0.23	0.15	0.08	2,052	1,332	720	-	720	\$ 43	\$ -	\$ 43	\$ -	\$ -	\$ 81.70	\$ 26.65	\$ 163	\$ 53	\$ 217
9	0.0330	0.37	0.17	0.21	1,198	532	666	-	666	\$ 40	\$ -	\$ 40	\$ -	\$ -	\$ 24.53	\$ 24.97	\$ 123	\$ 125	\$ 248
10	0.0170	0.06	0.03	0.03	20	11	9	-	9	\$ 1	\$ -	\$ 1	\$ -	\$ -	\$ 13.00	\$ 16.65	\$ 26	\$ 33	\$ 59
11	0.0310	0.07	0.03	0.04	23	10	14	-	14	\$ 1	\$ -	\$ 1	\$ -	\$ -	\$ 46.75	\$ 32.98	\$ 47	\$ 33	\$ 80
12	0.0760	0.23	0.15	0.08	548	356	192	-	192	\$ 12	\$ -	\$ 12	\$ -	\$ -	\$ 16.70	\$ 16.65	\$ 33	\$ 33	\$ 67
13	0.0510	1.41	0.97	0.44	4,551	3,124	1,427	-	1,427	\$ 86	\$ -	\$ 86	\$ -	\$ -	\$ 13.65	\$ 16.65	\$ 259	\$ 316	\$ 576
14	0.0510	0.30	0.20	0.09	2,603	1,787	816	-	816	\$ 49	\$ -	\$ 49	\$ -	\$ -	\$ 73.65	\$ 26.65	\$ 295	\$ 107	\$ 401
15	0.0760	7.96	5.17	2.79	25,672	16,662	9,010	-	9,010	\$ 541	\$ -	\$ 541	\$ -	\$ -	\$ 16.70	\$ 16.65	\$ 1,136	\$ 1,132	\$ 2,268
16	0.0760	1.17	0.76	0.41	10,258	6,658	3,600	-	3,600	\$ 216	\$ -	\$ 216	\$ -	\$ -	\$ 81.70	\$ 26.65	\$ 817	\$ 267	\$ 1,084
17	0.0200	0.45	0.12	0.33	1,451	387	1,064	-	1,064	\$ 64	\$ -	\$ 64	\$ -	\$ -	\$ 10.86	\$ 7.63	\$ 65	\$ 46	\$ 111
18	0.1000	0.15	0.10	0.05	479	322	157	129	286	\$ 17	\$ -	\$ 17	\$ 40.56	\$ 24.97	\$ 19.70	\$ 29.13	\$ 60	\$ 54	\$ 114
19	0.0510	0.07	0.05	0.02	651	447	204	-	204	\$ 12	\$ -	\$ 12	\$ -	\$ -	\$ 73.65	\$ 26.65	\$ 74	\$ 27	\$ 100
20	0.1000	0.15	0.10	0.05	479	322	157	129	286	\$ 17	\$ -	\$ 17	\$ 40.56	\$ 24.97	\$ 19.70	\$ 29.13	\$ 60	\$ 54	\$ 114
21	0.0510	0.07	0.05	0.02	651	447	204	-	204	\$ 12	\$ -	\$ 12	\$ -	\$ -	\$ 73.65	\$ 26.65	\$ 74	\$ 27	\$ 100
22	0.0170	0.07	0.02	0.06	174	40	134	-	134	\$ 8	\$ -	\$ 8	\$ -	\$ -	\$ 72.60	\$ 32.98	\$ 73	\$ 33	\$ 106
23	0.1000	0.45	0.30	0.15	1,437	967	470	-	470	\$ 28	\$ -	\$ 28	\$ -	\$ -	\$ 19.70	\$ 16.65	\$ 59	\$ 50	\$ 109
24	0.1000	0.15	0.10	0.05	1,302	876	426	-	426	\$ 26	\$ -	\$ 26	\$ -	\$ -	\$ 79.70	\$ 26.65	\$ 80	\$ 27	\$ 106
25	0.0200	0.20	0.06	0.14	629	193	435	-	435	\$ 26	\$ -	\$ 26	\$ -	\$ -	\$ 10.86	\$ 7.63	\$ 33	\$ 23	\$ 55
26	-	-	-	-	-	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
27	0.2320	6.63	3.94	2.69	58,079	34,549	23,529	-	23,529	\$ 1,412	\$ -	\$ 1,412	\$ -	\$ -	\$ 167.00	\$ 76.30	\$ 2,839	\$ 1,297	\$ 4,136
28	0.0590	0.89	0.35	0.54	2,921	1,160	1,761	-	1,761	\$ 106	\$ -	\$ 106	\$ -	\$ -	\$ 49.40	\$ 27.74	\$ 296	\$ 166	\$ 463
29	0.0860	0.15	0.09	0.06	1,302	753	548	-	548	\$ 33	\$ -	\$ 33	\$ -	\$ -	\$ 52.35	\$ 27.74	\$ 52	\$ 28	\$ 80
30	0.0310	0.22	0.09	0.13	1,953	815	1,138	-	1,138	\$ 68	\$ -	\$ 68	\$ -	\$ -	\$ 46.75	\$ 32.98	\$ 140	\$ 99	\$ 239
31	0.0510	0.30	0.20	0.09	974	668	305	-	305	\$ 18	\$ -	\$ 18	\$ -	\$ -	\$ 13.65	\$ 16.65	\$ 55	\$ 67	\$ 121
32	0.0200	0.60	0.12	0.48	5,256	1,051	4,205	-	4,205	\$ 252	\$ -	\$ 252	\$ -	\$ -	\$ 7.07	\$ 7.63	\$ 42	\$ 46	\$ 88
33	0.0310	0.15	0.06	0.09	1,302	543	759	380	1,139	\$ 68	\$ -	\$ 68	\$ 40.56	\$ 24.97	\$ 46.75	\$ 32.98	\$ 134	\$ 91	\$ 225
34	0.0590	0.45	0.18	0.27	1,460	580	881	-	881	\$ 53	\$ -	\$ 53	\$ -	\$ -	\$ 42.50	\$ 32.98	\$ 128	\$ 99	\$ 226
35	0.0590	0.25	0.12	0.13	806	387	419	-	419	\$ 25	\$ -	\$ 25	\$ -	\$ -	\$ 63.80	\$ 47.16	\$ 128	\$ 94	\$ 222
36	0.0310	0.13	0.06	0.07	1,139	543	596	-	596	\$ 36	\$ -	\$ 36	\$ -	\$ -	\$ 46.75	\$ 29.13	\$ 94	\$ 58	\$ 152
37	0.0310	0.15	0.06	0.09	1,302	543	759	-	759	\$ 46	\$ -	\$ 46	\$ -	\$ -	\$ 46.75	\$ 32.98	\$ 94	\$ 66	\$ 159
38	0.0590	0.07	0.06	0.02	243	193	50	-	50	\$ 3	\$ -	\$ 3	\$ -	\$ -	\$ 42.50	\$ 32.98	\$ 43	\$ 33	\$ 75
39	0.0310	0.22	0.09	0.13	1,953	815	1,138	570	1,708	\$ 102	\$ -	\$ 102	\$ 32.38	\$ 24.97	\$ 71.80	\$ 32.98	\$ 248	\$ 124	\$ 372
40	0.0590	0.45	0.18	0.27	1,460	580	881	-	881	\$ 53	\$ -	\$ 53	\$ -	\$ -	\$ 42.50	\$ 32.98	\$ 128	\$ 99	\$ 226
41	0.0200	0.60	0.12	0.48	5,256	1,051	4,205	-	4,205	\$ 252	\$ -	\$ 252	\$ -	\$ -	\$ 7.07	\$ 7.63	\$ 42	\$ 46	\$ 88
42	0.0310	0.15	0.06	0.09	1,302	543	759	380	1,139	\$ 68	\$ -	\$ 68	\$ 40.56	\$ 24.97	\$ 46.75	\$ 32.98	\$ 134	\$ 91	\$ 225
43	0.0510	0.15	0.10	0.05	1,302	894	408	-	408	\$ 24	\$ -	\$ 24	\$ -	\$ -	\$ 13.65	\$ 16.65	\$ 27	\$ 33	\$ 61
44	-	-	-	-	-	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
45	0.0200	1.00	0.20	0.80	4,380	876	3,504	-	3,504	\$ 210	\$ -	\$ 210	\$ -	\$ -	\$ 7.07	\$ 7.63	\$ 71	\$ 76	\$ 147
46	0.0720	7.02	5.62	1.40	30,748	24,598	6,150	-	6,150	\$ 369	\$ -	\$ 369	\$ -	\$ -	\$ 10.50	\$ 12.00	\$ 819	\$ 936	\$ 1,755
47	-	-	-	-	-	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
48	-	-	-	-	-	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

Henrico County, Lighting ECM-1 Summary

Line	Building	Floor	Location	Existing Fixture Description	Proposed Fixture Description	# of Control Required	Estimated % reduction in operating hours	Type of Control	Existing Qty	Proposed Qty	Total Existing Hours	Total Proposed Hours	Existing kW
49	Adult Detention Center	1	Administration Building	Compact Fluorescent	Not in scope	-			0	0	4,380	4,380	-
50	Adult Detention Center	1	Building 4, Inmate cell	1x4 3F32T8/Wall	Relamp 3F25T8/4'	-			34	34	4,380	4,380	0.0900
51	Adult Detention Center	1	Building 4, Inmate cell	1x2 1F17T8/Wall	Not in scope	-			0	0	4,380	4,380	-
52	Adult Detention Center	1	Building 4, Hallway	1x4 2F32T8	Relamp 2F25T8/4'	-			29	29	4,380	4,380	0.0590
53	Adult Detention Center	1	Building 4, Hallway EM	1x4 2F32T8	Relamp 2F25T8/4'	-			17	17	8,760	8,760	0.0590
54	Adult Detention Center	1	Building 4, Lobby & Control rm	2x4 3F32T8	Relamp 3F25T8/4'	-			9	9	4,380	4,380	0.0900
55	Adult Detention Center	1	Building 4, Lobby & Control rm EM	2x4 3F32T8	Relamp 3F25T8/4'	-			2	2	8,760	8,760	0.0900
56	Adult Detention Center	2	Building 4, Inmate cell	1x4 3F32T8/Wall	Relamp 3F25T8/4'	-			34	34	4,380	4,380	0.0900
57	Adult Detention Center	2	Building 4, Inmate cell	1x2 1F17T8/Wall	Not in scope	-			0	0	4,380	4,380	-
58	Adult Detention Center	2	Building 4, Hallway	1x4 2F32T8	Relamp 2F25T8/4'	-			29	29	4,380	4,380	0.0590
59	Adult Detention Center	2	Building 4, Hallway EM	1x4 2F32T8	Relamp 2F25T8/4'	-			19	19	8,760	8,760	0.0590
60	Adult Detention Center	2	Building 4, Open Areas	Metal Halide	Not in scope	-			0	0	4,380	4,380	-
61	Carver E. S.	1	30 Classrooms	1x8 2F96HOT12/Egg	New 4F32T8/EB/16'	30	30%	Ceiling	180	90	2,565	1,796	0.2070
62	Carver E. S.	1	30 Classrooms	1x8 2F96HOT12/Egg	New 2F32T8/EB/8'	30	30%	Ceiling	30	30	2,565	1,796	0.2070
63	Carver E. S.	1	30 Classrooms	1x4 2F48HOT12/Egg	New 1F32T8/EB	30	30%	Ceiling	90	90	2,565	1,796	0.1350
64	Carver E. S.	1	Restrooms between classrooms	Inc. 60w	CF 9W	-			39	39	2,565	2,565	0.0600
65	Carver E. S.	1	Art Room	2x4 3F34T12/18cell	3F32T8/LO	-			24	24	2,945	2,945	0.1171
66	Carver E. S.	1	Multipurpose rm	2x4 4F34T12/TG	4F32T8/LO	-			30	30	2,945	2,945	0.1486
67	Carver E. S.	1	Library	1x8 2F96HOT12/Egg	New 4F32T8/EB/16'	-			22	11	2,945	2,945	0.2070
68	Carver E. S.	1	Library	1x8 2F96HOT12/Egg	New 2F32T8/EB/8'	-			2	2	2,945	2,945	0.2070
69	Carver E. S.	1	Library	1x4 2F48HOT12/Egg	New 1F32T8/EB	-			4	4	2,945	2,945	0.1350
70	Carver E. S.	1	Offices	2x4 3F34T12/18cell	3F32T8/LO	-			59	59	3,485	3,485	0.1171
71	Carver E. S.	1	Hallway	2x4 4F34T12/TG/PBG	New 2F32T8/EB/12cell	-			79	79	3,485	3,485	0.1486
72	Carver E. S.	1	Hallway, exit sign	Inc. 2X15W Exit Sign	New LED Exit Sign (thermoplastic)	-			15	15	8,760	8,760	0.0300
73	Carver E. S.	1	Cafeteria	2x4 4F34T12/TG	4F32T8/LO	-			30	30	2,945	2,945	0.1486
74	Carver E. S.	1	Kitchen	1x4 4F34T12/Wrap	New 2F32T8/EB/VP	-			25	25	2,565	2,565	0.1486
75	Carver E. S.	1	Kitchen	1x4 2F34T12/Wrap	New 2F32T8/EB/VP	-			2	2	2,565	2,565	0.0743
76	Carver E. S.	Ext	Covered Walkway	Inc. 100w Can	CF 20W	-			13	13	1,500	1,500	0.1000
77	Byrd M. S.	1	29 Classrooms with T8's	1x4 2F32T8/Wrap	Relamp 2F25T8/4'	29	30%	Ceiling	435	435	2,708	1,896	0.0590
78	Byrd M. S.	1	4 Classrooms with T8's	1x4 2F32T8/Wrap	Relamp 2F25T8/4'	4	30%	Ceiling	108	108	2,708	1,896	0.0590
79	Byrd M. S.	1	2 Classrooms with T8's	1x4 2F32T8/Wrap	Relamp 2F25T8/4'	2	30%	Ceiling	66	66	2,708	1,896	0.0590
80	Byrd M. S.	1	4 Classrooms (6 fixtures)	1x8 2F96HOT12/Egg	New 4F32T8/EB/16'	4	30%	Ceiling	16	8	2,708	1,896	0.2070
81	Byrd M. S.	1	4 Classrooms (6 fixtures)	1x8 2F96HOT12/Egg	New 2F32T8/EB/8'	4	30%	Ceiling	8	8	2,708	1,896	0.2070
82	Byrd M. S.	1	14 Classrooms (9 fixtures)	1x8 2F96HOT12/Egg	New 4F32T8/EB/16'	14	30%	Ceiling	84	42	2,708	1,896	0.2070
83	Byrd M. S.	1	14 Classrooms (9 fixtures)	1x4 2F48HOT12/Egg	New 1F32T8/EB	14	30%	Ceiling	42	42	2,708	1,896	0.1350
84	Byrd M. S.	1	4 Classrooms (10 fixtures)	1x8 2F96HOT12/Egg	New 2F32T8/EB/8'	4	30%	Ceiling	40	40	2,708	1,896	0.2070
85	Byrd M. S.	1	Offices	1x8 2F96HOT12/Egg	New 4F32T8/EB/16'	-			28	14	2,945	2,945	0.2070
86	Byrd M. S.	1	12 Restrooms	1x4 2F34T12/TG	New 4F32T8/EB/TG/TW4	12	50%	Ceiling	48	12	3,515	1,758	0.0743
87	Byrd M. S.	1	12 Restrooms	1x4 2F34T12/TG	New 1F32T8/EB/TG	12	50%	Ceiling	12	12	3,515	1,758	0.0743
88	Byrd M. S.	1	Library	2x4 4F34T12/TG	New 3F32T8/LO/PBG	-			108	108	2,945	2,945	0.1486
89	Byrd M. S.	1	Library	1x4 2F34T12/Wrap	New 2F32T8/EB/8'	-			16	8	2,945	2,945	0.0743
90	Byrd M. S.	1	Offices	2x4 4F34T12/TG	New 4F32T8/EB/12cell/TW2	-			40	20	2,945	2,945	0.1486
91	Byrd M. S.	1	Offices	1x4 2F34T12/TG	New 4F32T8/EB/TG/TW4	-			12	3	2,945	2,945	0.0743
92	Byrd M. S.	1	Main office	2x4 4F34T12/TG	New 4F32T8/EB/12cell/TW2	-			54	27	3,515	3,515	0.1486
93	Byrd M. S.	1	Main office	1x4 2F34T12/TG	New 1F32T8/EB/8cell	-			12	12	3,515	3,515	0.0743
94	Byrd M. S.	1	Main office	1x4 2F34T12/Wrap	New 3F32T8/EB/12'	-			3	1	3,515	3,515	0.0743
95	Byrd M. S.	1	Cafeteria	2x4 4F34T12/TG	New 3F32T8/LO/PBG	-			110	110	3,515	3,515	0.1486
96	Byrd M. S.	1	Kitchen	1x4 2F34T12/VP	2F32T8/LO	-			37	37	2,708	2,708	0.0743

Henrico County, Lighting ECM-1 Summary

Line	Proposed kW	Total Existing kW	Total Proposed kW	Total kW Saved	Existing Lighting only kWh	Proposed Lighting only kWh	Lighting only kWh Saved	Additional kWh Saved From Lighting Control	Total kWh Saved	kWh Dollars Saved	kWh Dollars Saved	Total Annual Savings	Unit Lighting Control Material	Unit Lighting Control Labor	Unit Lighting Material	Unit Lighting Labor	Total Material	Total Labor	Total Cost	
49	-	-	-	-	-	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
50	0.0670	3.06	2.28	0.78	13,403	9,978	3,425	-	3,425	\$ 206	\$ -	\$ 206	\$ -	\$ -	\$ 10.50	\$ 12.00	\$ 357	\$ 408	\$ 765	
51	-	-	-	-	-	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
52	0.0470	1.71	1.36	0.35	7,494	5,970	1,524	-	1,524	\$ 91	\$ -	\$ 91	\$ -	\$ -	\$ 7.00	\$ 10.00	\$ 203	\$ 290	\$ 493	
53	0.0470	1.00	0.80	0.20	8,786	6,999	1,787	-	1,787	\$ 107	\$ -	\$ 107	\$ -	\$ -	\$ 7.00	\$ 10.00	\$ 119	\$ 170	\$ 289	
54	0.0670	0.81	0.60	0.21	3,548	2,641	907	-	907	\$ 54	\$ -	\$ 54	\$ -	\$ -	\$ 10.50	\$ 12.00	\$ 95	\$ 108	\$ 203	
55	0.0670	0.18	0.13	0.05	1,577	1,174	403	-	403	\$ 24	\$ -	\$ 24	\$ -	\$ -	\$ 10.50	\$ 12.00	\$ 21	\$ 24	\$ 45	
56	0.0670	3.06	2.28	0.78	13,403	9,978	3,425	-	3,425	\$ 206	\$ -	\$ 206	\$ -	\$ -	\$ 10.50	\$ 12.00	\$ 357	\$ 408	\$ 765	
57	-	-	-	-	-	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
58	0.0470	1.71	1.36	0.35	7,494	5,970	1,524	-	1,524	\$ 91	\$ -	\$ 91	\$ -	\$ -	\$ 7.00	\$ 10.00	\$ 203	\$ 290	\$ 493	
59	0.0470	1.12	0.89	0.23	9,820	7,823	1,997	-	1,997	\$ 120	\$ -	\$ 120	\$ -	\$ -	\$ 7.00	\$ 10.00	\$ 133	\$ 190	\$ 323	
60	-	-	-	-	-	-	-	-	-	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
61	0.1120	37.26	10.08	27.18	95,572	25,855	69,717	7,757	77,473	\$ 4,648	\$ -	\$ 4,648	\$ 131.97	\$ 76.30	\$ 117.60	\$ 81.84	\$ 14,543	\$ 9,655	\$ 24,198	
62	0.0590	6.21	1.77	4.44	15,929	4,540	11,389	1,362	12,751	\$ 765	\$ -	\$ 765	\$ -	\$ -	\$ 63.80	\$ 47.16	\$ 1,914	\$ 1,415	\$ 3,329	
63	0.0310	12.15	2.79	9.36	31,165	7,156	24,008	2,147	26,155	\$ 1,569	\$ -	\$ 1,569	\$ -	\$ -	\$ 46.75	\$ 32.98	\$ 4,208	\$ 2,968	\$ 7,176	
64	0.0090	2.34	0.35	1.99	6,002	900	5,102	-	5,102	\$ 306	\$ -	\$ 306	\$ -	\$ -	\$ 7.07	\$ 7.63	\$ 276	\$ 298	\$ 573	
65	0.0760	2.81	1.82	0.99	8,277	5,372	2,905	-	2,905	\$ 174	\$ -	\$ 174	\$ -	\$ -	\$ 16.70	\$ 16.65	\$ 401	\$ 400	\$ 800	
66	0.1000	4.46	3.00	1.46	13,129	8,835	4,294	-	4,294	\$ 258	\$ -	\$ 258	\$ -	\$ -	\$ 19.70	\$ 16.65	\$ 591	\$ 500	\$ 1,091	
67	0.1120	4.55	1.23	3.32	13,412	3,628	9,783	-	9,783	\$ 587	\$ -	\$ 587	\$ -	\$ -	\$ 117.60	\$ 81.84	\$ 1,294	\$ 900	\$ 2,194	
68	0.0590	0.41	0.12	0.30	1,219	348	872	-	872	\$ 52	\$ -	\$ 52	\$ -	\$ -	\$ 63.80	\$ 47.16	\$ 128	\$ 94	\$ 222	
69	0.0310	0.54	0.12	0.42	1,590	365	1,225	-	1,225	\$ 74	\$ -	\$ 74	\$ -	\$ -	\$ 46.75	\$ 32.98	\$ 187	\$ 132	\$ 319	
70	0.0760	6.91	4.48	2.42	24,078	15,627	8,451	-	8,451	\$ 507	\$ -	\$ 507	\$ -	\$ -	\$ 16.70	\$ 16.65	\$ 985	\$ 982	\$ 1,968	
71	0.0590	11.74	4.66	7.08	40,912	16,244	24,668	-	24,668	\$ 1,480	\$ -	\$ 1,480	\$ -	\$ -	\$ 65.90	\$ 27.74	\$ 5,206	\$ 2,191	\$ 7,398	
72	0.0050	0.45	0.08	0.38	3,942	657	3,285	-	3,285	\$ 197	\$ -	\$ 197	\$ -	\$ -	\$ 40.00	\$ 35.00	\$ 600	\$ 525	\$ 1,125	
73	0.1000	4.46	3.00	1.46	13,129	8,835	4,294	-	4,294	\$ 258	\$ -	\$ 258	\$ -	\$ -	\$ 19.70	\$ 16.65	\$ 591	\$ 500	\$ 1,091	
74	0.0590	3.72	1.48	2.24	9,529	3,783	5,746	-	5,746	\$ 345	\$ -	\$ 345	\$ -	\$ -	\$ 74.75	\$ 32.98	\$ 1,869	\$ 825	\$ 2,693	
75	0.0590	0.15	0.12	0.03	381	303	78	-	78	\$ 5	\$ -	\$ 5	\$ -	\$ -	\$ 74.75	\$ 32.98	\$ 150	\$ 66	\$ 215	
76	0.0200	1.30	0.26	1.04	1,950	390	1,560	-	1,560	\$ 94	\$ -	\$ 94	\$ -	\$ -	\$ 7.07	\$ 7.63	\$ 92	\$ 99	\$ 191	
77	0.0470	25.67	20.45	5.22	69,501	55,365	14,136	16,610	30,745	\$ 1,845	\$ -	\$ 1,845	\$ 131.97	\$ 76.30	\$ 7.00	\$ 8.00	\$ 6,872	\$ 5,693	\$ 12,565	
78	0.0470	6.37	5.08	1.30	17,255	13,746	3,510	4,124	7,633	\$ 458	\$ -	\$ 458	\$ 131.97	\$ 76.30	\$ 7.00	\$ 8.00	\$ 1,284	\$ 1,169	\$ 2,453	
79	0.0470	3.89	3.10	0.79	10,545	8,400	2,145	2,520	4,665	\$ 280	\$ -	\$ 280	\$ 263.94	\$ 152.60	\$ 7.00	\$ 8.00	\$ 990	\$ 833	\$ 1,823	
80	0.1120	3.31	0.90	2.42	8,969	2,426	6,543	728	7,270	\$ 436	\$ -	\$ 436	\$ 131.97	\$ 76.30	\$ 117.60	\$ 81.84	\$ 1,469	\$ 960	\$ 2,429	
81	0.0590	1.66	0.47	1.18	4,484	1,278	3,206	383	3,590	\$ 215	\$ -	\$ 215	\$ -	\$ -	\$ 63.80	\$ 47.16	\$ 510	\$ 377	\$ 888	
82	0.1120	17.39	4.70	12.68	47,087	12,738	34,348	3,822	38,170	\$ 2,290	\$ -	\$ 2,290	\$ 131.97	\$ 76.30	\$ 117.60	\$ 81.84	\$ 6,787	\$ 4,505	\$ 11,292	
83	0.0310	5.67	1.30	4.37	15,354	3,526	11,829	1,058	12,886	\$ 773	\$ -	\$ 773	\$ -	\$ -	\$ 46.75	\$ 32.98	\$ 1,964	\$ 1,385	\$ 3,349	
84	0.0590	8.28	2.36	5.92	22,422	6,391	16,031	1,917	17,949	\$ 1,077	\$ -	\$ 1,077	\$ 131.97	\$ 76.30	\$ 63.80	\$ 47.16	\$ 3,080	\$ 2,192	\$ 5,271	
85	0.1120	5.80	1.57	4.23	17,069	4,618	12,451	-	12,451	\$ 747	\$ -	\$ 747	\$ -	\$ -	\$ 117.60	\$ 81.84	\$ 1,646	\$ 1,146	\$ 2,792	
86	0.1120	3.57	1.34	2.22	12,536	4,724	7,812	2,362	10,174	\$ 610	\$ -	\$ 610	\$ 131.97	\$ 76.30	\$ 121.60	\$ 90.17	\$ 3,043	\$ 1,998	\$ 5,040	
87	0.0310	0.89	0.37	0.52	3,134	1,308	1,826	654	2,480	\$ 149	\$ -	\$ 149	\$ -	\$ -	\$ 47.20	\$ 27.74	\$ 566	\$ 333	\$ 899	
88	0.0760	16.05	8.21	7.84	47,264	24,173	23,091	-	23,091	\$ 1,385	\$ -	\$ 1,385	\$ -	\$ -	\$ 51.60	\$ 32.98	\$ 5,573	\$ 3,562	\$ 9,135	
89	0.0590	1.19	0.47	0.72	3,501	1,390	2,111	-	2,111	\$ 127	\$ -	\$ 127	\$ -	\$ -	\$ 66.10	\$ 47.16	\$ 529	\$ 377	\$ 906	
90	0.1120	5.94	2.24	3.70	17,505	6,597	10,908	-	10,908	\$ 654	\$ -	\$ 654	\$ -	\$ -	\$ 126.80	\$ 70.20	\$ 2,536	\$ 1,404	\$ 3,940	
91	0.1120	0.89	0.34	0.56	2,626	990	1,636	-	1,636	\$ 98	\$ -	\$ 98	\$ -	\$ -	\$ 121.60	\$ 90.17	\$ 365	\$ 271	\$ 635	
92	0.1120	8.02	3.02	5.00	28,206	10,629	17,576	-	17,576	\$ 1,055	\$ -	\$ 1,055	\$ -	\$ -	\$ 126.80	\$ 70.20	\$ 3,424	\$ 1,895	\$ 5,319	
93	0.0310	0.89	0.37	0.52	3,134	1,308	1,826	-	1,826	\$ 110	\$ -	\$ 110	\$ -	\$ -	\$ 47.20	\$ 27.74	\$ 566	\$ 333	\$ 899	
94	0.0860	0.22	0.09	0.14	783	302	481	-	481	\$ 29	\$ -	\$ 29	\$ -	\$ -	\$ 94.15	\$ 61.04	\$ 94	\$ 61	\$ 155	
95	0.0760	16.35	8.36	7.99	57,456	29,385	28,071	-	28,071	\$ 1,684	\$ -	\$ 1,684	\$ -	\$ -	\$ 51.60	\$ 32.98	\$ 5,676	\$ 3,628	\$ 9,304	
96	0.0510	2.75	1.89	0.86	7,445	5,110	2,335	-	2,335	\$ 140	\$ -	\$ 140	\$ -	\$ -	\$ 13.65	\$ 16.65	\$ 505	\$ 616	\$ 1,121	

Henrico County, Lighting ECM-1 Summary

Line	Building	Floor	Location	Existing Fixture Description	Proposed Fixture Description	# of Control Required	Estimated % reduction in operating hours	Type of Control	Existing Qty	Proposed Qty	Total Existing Hours	Total Proposed Hours	Existing kW
97	Byrd M. S.	1	Kitchen	1x4 2F34T12/Wrap	New 2F32T8/EB/8'	-			6	3	2,708	2,708	0.0743
98	Byrd M. S.	1	Shops	1x8 2F96HOT12/Ind.	New 4F32T8/EB/RF/8'	-			54	54	2,708	2,708	0.2070
99	Byrd M. S.	1	Shops	1x4 2F48HOT12/Ind.	New 2F32T8/EB/RF	-			14	14	2,708	2,708	0.1350
100	Byrd M. S.	1	Shops	2x4 4F34T12/TG	New 4F32T8/EB/TW2	-			6	3	2,708	2,708	0.1486
101	Byrd M. S.	1	Shops	1x4 2F34T12/Wrap	New 2F32T8/EB/8'	1	30%	Ceiling	16	8	2,945	2,062	0.0743
102	Byrd M. S.	1	Chiller room	Inc. 150w	New 1F32T8/EB/VP	-			11	11	8,760	8,760	0.1500
103	Byrd M. S.	1	Band room	1x8 4F96HOT12/Egg	New 4F32T8/EB/8'	-			20	20	2,708	2,708	0.2070
104	Byrd M. S.	1	Choir(estimated)	1x8 4F96HOT12/Egg	New 4F32T8/EB/8'	-			20	20	2,708	2,708	0.2070
105	Byrd M. S.	1	Locker rooms	1x4 2F34T12/VP	2F32T8/LO	-			76	76	3,515	3,515	0.0743
106	Byrd M. S.	1	Gym	MH 400W	New 4F54T5/HO/Ind/Guard	-			32	32	3,515	3,515	0.4550
107	Byrd M. S.	1	Gym	Inc. 500W	New 4F54T5/HO/Ind/Guard	-			16	16	3,515	3,515	0.5000
108	Byrd M. S.	1	Gym	1x8 4F96HOT12/Egg	New 4F32T8/EB/8'	-			8	8	3,515	3,515	0.2070
109	Byrd M. S.	1	Hallway	1x4 2F34T12/Wrap	New 1F32T8/EB	-			242	242	3,515	3,515	0.0743
110	Byrd M. S.	1	Hallway (display)	1x4 1F34T12/Strip	1F32T8/EB	-			8	8	8,760	8,760	0.0428
111	Hermitage H. S.	1	74 Classrooms	1x4 2F34T12/Troff	4F25T8/4/EB/TW2	74	30%	Ceiling	882	441	2,803	1,962	0.0743
112	Hermitage H. S.	1	74 Classrooms	1x4 2F34T12/Troff	2F25T8/4/EB	74	30%	Ceiling	219	219	2,803	1,962	0.0743
113	Hermitage H. S.	1	Hallway	1x4 2F34T12/Troff	2F25T8/4/EB	-			319	319	3,705	3,705	0.0743
114	Hermitage H. S.	1	Hallway	1x4 2F34T12/Troff	4F25T8/4/EB/TW2	-			70	35	3,705	3,705	0.0743
115	Hermitage H. S.	1	Hallway	4x4 4F34T12/TG	4F25T8/4/EB	-			12	12	3,705	3,705	0.1486
116	Hermitage H. S.	1	Library	1x4 2F34T12/Troff	2F25T8/4/EB	-			7	7	3,135	3,135	0.0743
117	Hermitage H. S.	1	Library	1x4 2F34T12/Troff	4F25T8/4/EB/TW2	-			152	76	3,135	3,135	0.0743
118	Hermitage H. S.	1	Library	Inc. 100w Flood	CF 20W Flood	-			14	14	3,135	3,135	0.1000
119	Hermitage H. S.	1	Offices	1x4 2F34T12/Troff	2F25T8/4/EB	-			87	87	3,705	3,705	0.0743
120	Hermitage H. S.	1	Offices	1x4 2F34T12/Troff	4F25T8/4/EB/TW2	-			66	33	3,705	3,705	0.0743
121	Hermitage H. S.	1	Offices	2x4 3F34T12/PBG	3F25T8/4/EB	-			20	20	3,705	3,705	0.1171
122	Hermitage H. S.	1	Commons	Inc. 300W	New 3F17T8/EB/Box	-			72	72	3,705	3,705	0.3000
123	Hermitage H. S.	1	Commons	Inc. 100w Flood	CF 20W Flood	-			34	34	3,705	3,705	0.1000
124	Hermitage H. S.	1	Kitchen	1x4 4F34T12/Wrap	New 2F25T8/4/EB/VP	-			51	51	2,803	2,803	0.1486
125	Hermitage H. S.	1	Auditorium	Inc. 300W	New 2F42Quad CF/Dim	-			25	25	2,803	2,803	0.3000
126	Hermitage H. S.	1	Stage (High)	1x4 2F34T12/Strip	2F25T8/4/EB	-			30	30	2,803	2,803	0.0743
127	Hermitage H. S.	1	Music Annex (High)	1x4 2F34T12/Wrap	4F25T8/4/EB/TW2	-			96	48	2,803	2,803	0.0743
128	Hermitage H. S.	1	Music Annex (High)	1x4 2F34T12/Wrap	2F25T8/4/EB	-			16	16	2,803	2,803	0.0743
129	Hermitage H. S.	1	Chorus	2x4 2F34T12/TG	4F25T8/4/EB	-			22	22	2,803	2,803	0.1486
130	Hermitage H. S.	1	Band	1x4 1F34T12/Wrap	2F25T8/4/EB/TW2	-			30	15	2,803	2,803	0.0428
131	Hermitage H. S.	1	Gym	MH 400W	New 4F54T5/HO/Ind/Guard	-			36	36	3,705	3,705	0.4550
132	Hermitage H. S.	1	Gym	Inc. 500W	New 4F54T5/HO/Ind/Guard	-			36	32	3,705	3,705	0.5000
133	Hermitage H. S.	1	Gym Aux	MH 400W	New 4F54T5/HO/Ind/Guard	-			20	20	3,705	3,705	0.4550
134	Hermitage H. S.	1	Locker rooms	1x4 2F34T12/VP	2F25T8/4/EB	-			100	100	3,705	3,705	0.0743
135	Hermitage H. S.	1	Restrooms	2x4 2F34T12/Box	2F25T8/4/EB	-			48	48	3,705	3,705	0.0743
136	Hermitage H. S.	1	Exit signs	I27LED	New LED Exit Sign (Steel)	-			30	30	8,760	8,760	0.0140
137	Hermitage H. S.	1	Addition	2x4 2F34T12	2F25T8/4/EB	-			23	23	2,803	2,803	0.0743
138	Hermitage H. S.	1	Addition	1x4 2F34T12	4F25T8/4/EB/TW2	-			40	20	2,803	2,803	0.0743
139	Hermitage H. S.	1	Addition	2x4 4F34T12/TG	4F25T8/4/EB/DS	-			18	18	2,803	2,803	0.1486
140	Hermitage H. S.	1	Addition	2x4 3F34T12/TG	3F25T8/4/EB	-			2	2	2,803	2,803	0.1171
141	Hermitage H. S.	Ext	Canopy	MH 100W/1x1	New 2PL13/1X1/OC	1	30%	Photo cell	30	30	1,500	1,050	0.1250
142	Administration Building	1	Open Offices with Task lights	2x4 4F34T12/TG (Long)	4F25T8/4/EB	-			82.5	82.5	4,335	4,335	0.1486
143	Administration Building	1	Open Offices (EM)	2x4 4F34T12/TG (Long)	4F25T8/4/EB/EM	-			28	28	8,760	8,760	0.1486
144	Administration Building	1	Private Offices	2x4 4F34T12/TG (Long)	4F25T8/4/EB	-			126	126	1,960	1,960	0.1486

Henrico County, Lighting ECM-1 Summary

Line	Proposed kW	Total Existing kW	Total Proposed kW	Total kW Saved	Existing Lighting only kWh	Proposed Lighting only kWh	Lighting only kWh Saved	Additional kWh Saved From Lighting Control	Total kWh Saved	kWh Dollars Saved	kWh Dollars Saved	Total Annual Savings	Unit Lighting Control Material	Unit Lighting Control Labor	Unit Lighting Material	Unit Lighting Labor	Total Material	Total Labor	Total Cost
97	0.0590	0.45	0.18	0.27	1,207	479	728	-	728	\$ 44	\$ -	\$ 44	\$ -	\$ -	\$ 66.10	\$ 47.16	\$ 198	\$ 141	\$ 340
98	0.1120	11.18	6.05	5.13	30,270	16,378	13,892	-	13,892	\$ 834	\$ -	\$ 834	\$ -	\$ -	\$ 75.80	\$ 47.16	\$ 4,093	\$ 2,547	\$ 6,640
99	0.0590	1.89	0.83	1.06	5,118	2,237	2,881	-	2,881	\$ 173	\$ -	\$ 173	\$ -	\$ -	\$ 56.25	\$ 32.98	\$ 788	\$ 462	\$ 1,249
100	0.1120	0.89	0.34	0.56	2,414	910	1,505	-	1,505	\$ 90	\$ -	\$ 90	\$ -	\$ -	\$ 126.80	\$ 70.20	\$ 380	\$ 211	\$ 591
101	0.0590	1.19	0.47	0.72	3,501	1,390	2,111	417	2,528	\$ 152	\$ -	\$ 152	\$ 131.97	\$ 76.30	\$ 66.10	\$ 47.16	\$ 661	\$ 454	\$ 1,114
102	0.0310	1.65	0.34	1.31	14,454	2,987	11,467	-	11,467	\$ 688	\$ -	\$ 688	\$ -	\$ -	\$ 71.80	\$ 29.13	\$ 790	\$ 320	\$ 1,110
103	0.1120	4.14	2.24	1.90	11,211	6,066	5,145	-	5,145	\$ 309	\$ -	\$ 309	\$ -	\$ -	\$ 75.00	\$ 47.16	\$ 1,500	\$ 943	\$ 2,443
104	0.1120	4.14	2.24	1.90	11,211	6,066	5,145	-	5,145	\$ 309	\$ -	\$ 309	\$ -	\$ -	\$ 75.00	\$ 47.16	\$ 1,500	\$ 943	\$ 2,443
105	0.0510	5.65	3.88	1.77	19,849	13,624	6,224	-	6,224	\$ 373	\$ -	\$ 373	\$ -	\$ -	\$ 13.65	\$ 16.65	\$ 1,037	\$ 1,265	\$ 2,303
106	0.2320	14.56	7.42	7.14	51,178	26,095	25,083	-	25,083	\$ 1,505	\$ -	\$ 1,505	\$ -	\$ -	\$ 167.00	\$ 131.78	\$ 5,344	\$ 4,217	\$ 9,561
107	0.2320	8.00	3.71	4.29	28,120	13,048	15,072	-	15,072	\$ 904	\$ -	\$ 904	\$ -	\$ -	\$ 167.00	\$ 131.78	\$ 2,672	\$ 2,108	\$ 4,780
108	0.1120	1.66	0.90	0.76	5,821	3,149	2,671	-	2,671	\$ 160	\$ -	\$ 160	\$ -	\$ -	\$ 75.00	\$ 47.16	\$ 600	\$ 377	\$ 977
109	0.0310	17.98	7.50	10.48	63,202	26,370	36,832	-	36,832	\$ 2,210	\$ -	\$ 2,210	\$ -	\$ -	\$ 38.05	\$ 32.98	\$ 9,208	\$ 7,981	\$ 17,189
110	0.0310	0.34	0.25	0.09	2,999	2,172	827	-	827	\$ 50	\$ -	\$ 50	\$ -	\$ -	\$ 12.22	\$ 16.65	\$ 98	\$ 133	\$ 231
111	0.0890	65.53	39.25	26.28	183,688	110,015	73,673	33,004	106,677	\$ 6,401	\$ -	\$ 6,401	\$ 131.97	\$ 76.30	\$ 27.90	\$ 35.13	\$ 22,070	\$ 21,139	\$ 43,208
112	0.0470	16.27	10.29	5.98	45,610	28,851	16,758	8,655	25,414	\$ 1,525	\$ -	\$ 1,525	\$ -	\$ -	\$ 17.75	\$ 16.65	\$ 3,887	\$ 3,646	\$ 7,534
113	0.0470	23.70	14.99	8.71	87,815	55,549	32,266	-	32,266	\$ 1,936	\$ -	\$ 1,936	\$ -	\$ -	\$ 17.75	\$ 16.65	\$ 5,662	\$ 5,311	\$ 10,974
114	0.0890	5.20	3.12	2.09	19,270	11,541	7,729	-	7,729	\$ 464	\$ -	\$ 464	\$ -	\$ -	\$ 27.90	\$ 35.13	\$ 977	\$ 1,230	\$ 2,206
115	0.0890	1.78	1.07	0.72	6,607	3,957	2,650	-	2,650	\$ 159	\$ -	\$ 159	\$ -	\$ -	\$ 27.90	\$ 29.13	\$ 335	\$ 350	\$ 684
116	0.0470	0.52	0.33	0.19	1,631	1,031	599	-	599	\$ 36	\$ -	\$ 36	\$ -	\$ -	\$ 17.75	\$ 16.65	\$ 124	\$ 117	\$ 241
117	0.0890	11.29	6.76	4.53	35,405	21,205	14,200	-	14,200	\$ 852	\$ -	\$ 852	\$ -	\$ -	\$ 27.90	\$ 35.13	\$ 2,120	\$ 2,670	\$ 4,790
118	0.0200	1.40	0.28	1.12	4,389	878	3,511	-	3,511	\$ 211	\$ -	\$ 211	\$ -	\$ -	\$ 10.86	\$ 10.00	\$ 152	\$ 140	\$ 292
119	0.0470	6.46	4.09	2.38	23,949	15,150	8,800	-	8,800	\$ 528	\$ -	\$ 528	\$ -	\$ -	\$ 17.75	\$ 16.65	\$ 1,544	\$ 1,449	\$ 2,993
120	0.0890	4.90	2.94	1.97	18,169	10,882	7,287	-	7,287	\$ 437	\$ -	\$ 437	\$ -	\$ -	\$ 27.90	\$ 35.13	\$ 921	\$ 1,159	\$ 2,080
121	0.0660	2.34	1.32	1.02	8,677	4,891	3,787	-	3,787	\$ 227	\$ -	\$ 227	\$ -	\$ -	\$ 22.85	\$ 18.00	\$ 457	\$ 360	\$ 817
122	0.0470	21.60	3.38	18.22	80,028	12,538	67,490	-	67,490	\$ 4,049	\$ -	\$ 4,049	\$ -	\$ -	\$ 48.75	\$ 76.30	\$ 3,510	\$ 5,494	\$ 9,004
123	0.0200	3.40	0.68	2.72	12,597	2,519	10,078	-	10,078	\$ 605	\$ -	\$ 605	\$ -	\$ -	\$ 10.86	\$ 10.00	\$ 369	\$ 340	\$ 709
124	0.0470	7.58	2.40	5.18	21,243	6,719	14,524	-	14,524	\$ 871	\$ -	\$ 871	\$ -	\$ -	\$ 78.85	\$ 32.98	\$ 4,021	\$ 1,682	\$ 5,703
125	0.0930	7.50	2.33	5.18	21,023	6,517	14,506	-	14,506	\$ 870	\$ -	\$ 870	\$ -	\$ -	\$ 120.00	\$ 76.30	\$ 3,000	\$ 1,908	\$ 4,908
126	0.0470	2.23	1.41	0.82	6,248	3,952	2,296	-	2,296	\$ 138	\$ -	\$ 138	\$ -	\$ -	\$ 17.75	\$ 21.65	\$ 533	\$ 650	\$ 1,182
127	0.0890	7.13	4.27	2.86	19,993	11,974	8,019	-	8,019	\$ 481	\$ -	\$ 481	\$ -	\$ -	\$ 27.90	\$ 45.13	\$ 1,339	\$ 2,166	\$ 3,505
128	0.0470	1.19	0.75	0.44	3,332	2,108	1,224	-	1,224	\$ 73	\$ -	\$ 73	\$ -	\$ -	\$ 17.75	\$ 21.65	\$ 284	\$ 346	\$ 630
129	0.0890	3.27	1.96	1.31	9,164	5,488	3,675	-	3,675	\$ 221	\$ -	\$ 221	\$ -	\$ -	\$ 27.90	\$ 26.65	\$ 614	\$ 586	\$ 1,200
130	0.0470	1.28	0.71	0.58	3,599	1,976	1,623	-	1,623	\$ 97	\$ -	\$ 97	\$ -	\$ -	\$ 17.75	\$ 29.13	\$ 266	\$ 437	\$ 703
131	0.2320	16.38	8.35	8.03	60,688	30,944	29,744	-	29,744	\$ 1,785	\$ -	\$ 1,785	\$ -	\$ -	\$ 167.00	\$ 131.78	\$ 6,012	\$ 4,744	\$ 10,756
132	0.2320	18.00	7.42	10.58	66,690	27,506	39,184	-	39,184	\$ 2,351	\$ -	\$ 2,351	\$ -	\$ -	\$ 167.00	\$ 131.78	\$ 5,344	\$ 4,217	\$ 9,561
133	0.2320	9.10	4.64	4.46	33,716	17,191	16,524	-	16,524	\$ 991	\$ -	\$ 991	\$ -	\$ -	\$ 167.00	\$ 131.78	\$ 3,340	\$ 2,636	\$ 5,976
134	0.0470	7.43	4.70	2.73	27,528	17,414	10,115	-	10,115	\$ 607	\$ -	\$ 607	\$ -	\$ -	\$ 17.75	\$ 16.65	\$ 1,775	\$ 1,665	\$ 3,440
135	0.0470	3.57	2.26	1.31	13,214	8,358	4,855	-	4,855	\$ 291	\$ -	\$ 291	\$ -	\$ -	\$ 17.75	\$ 16.65	\$ 852	\$ 799	\$ 1,651
136	0.0050	0.42	0.15	0.27	3,679	1,314	2,365	-	2,365	\$ 142	\$ -	\$ 142	\$ -	\$ -	\$ 85.00	\$ 35.00	\$ 2,550	\$ 1,050	\$ 3,600
137	0.0470	1.71	1.08	0.63	4,790	3,030	1,760	-	1,760	\$ 106	\$ -	\$ 106	\$ -	\$ -	\$ 17.75	\$ 16.65	\$ 408	\$ 383	\$ 791
138	0.0890	2.97	1.78	1.19	8,331	4,989	3,341	-	3,341	\$ 200	\$ -	\$ 200	\$ -	\$ -	\$ 27.90	\$ 35.13	\$ 558	\$ 703	\$ 1,261
139	0.0890	2.67	1.60	1.07	7,497	4,490	3,007	-	3,007	\$ 180	\$ -	\$ 180	\$ -	\$ -	\$ 35.50	\$ 33.30	\$ 639	\$ 599	\$ 1,238
140	0.0890	0.23	0.18	0.06	656	499	158	-	158	\$ 9	\$ -	\$ 9	\$ -	\$ -	\$ 22.85	\$ 16.65	\$ 46	\$ 33	\$ 79
141	0.0300	3.75	0.90	2.85	5,625	1,350	4,275	405	4,680	\$ 281	\$ -	\$ 281	\$ 15.00	\$ -	\$ 65.00	\$ 35.00	\$ 1,965	\$ 1,050	\$ 3,015
142	0.0890	12.26	7.34	4.92	53,145	31,830	21,315	-	21,315	\$ 1,279	\$ -	\$ 1,279	\$ -	\$ -	\$ 27.90	\$ 26.65	\$ 2,302	\$ 2,199	\$ 4,500
143	0.0890	4.16	2.49	1.67	36,449	21,830	14,619	-	14,619	\$ 877	\$ -	\$ 877	\$ -	\$ -	\$ 27.90	\$ 26.65	\$ 781	\$ 746	\$ 1,527
144	0.0890	18.72	11.21	7.51	36,698	21,979	14,719	-	14,719	\$ 883	\$ -	\$ 883	\$ -	\$ -	\$ 27.90	\$ 26.65	\$ 3,515	\$ 3,358	\$ 6,873

Annual Existing Maintenance Costs

		Service	Annual	Annual	Unit	Annual		Labor	Install	Unit	Annual	Total
<u>Item Description</u>	<u>Qty</u>	<u>Life</u>	<u>Hours</u>	<u>Failures</u>	<u>Material</u>	<u>Material</u>		<u>Rate</u>	<u>Time(min)</u>	<u>Cost</u>	<u>Cost</u>	<u>Maintenance</u>
					<u>Cost</u>	<u>Cost</u>						<u>Cost</u>
T12 Ballast	5,605	50,000	3,318	372	\$ 9.73	\$ 3,619		\$ -	45	\$ -	\$ -	\$ 3,619
T8 Ballast	1,632	50,000	3,716	121	\$ 12.04	\$ 1,460		\$ -	45	\$ -	\$ -	\$ 1,460
T12 HO Ballast	729	50,000	2,828	41	\$ 25.00	\$ 1,031		\$ -	60	\$ -	\$ -	\$ 1,031
F20T12 Lamp	2	9,000	312	0	\$ 2.00	\$ 0		\$ -	10	\$ -	\$ -	\$ 0
F32T8 Lamp	3,622	20,000	3,750	679	\$ 1.18	\$ 801		\$ -	10	\$ -	\$ -	\$ 801
F34T12 Lamp	10,861	20,000	3,292	1,788	\$ 0.94	\$ 1,680		\$ -	10	\$ -	\$ -	\$ 1,680
F34U T12 Lamp	10	20,000	3,224	2	\$ 4.15	\$ 7		\$ -	10	\$ -	\$ -	\$ 7
F48T12 HO Lamp	300	12,000	2,629	66	\$ 3.50	\$ 230		\$ -	10	\$ -	\$ -	\$ 230
F96T12 HO Lamp	1,158	12,000	2,879	278	\$ 3.50	\$ 972		\$ -	10	\$ -	\$ -	\$ 972
300w Inc Lamp	149	2,000	3,533	263	\$ 5.00	\$ 1,316		\$ -	10	\$ -	\$ -	\$ 1,316
Various Incandescent	272	1,000	3,273	890	\$ 0.50	\$ 445		\$ -	10	\$ -	\$ -	\$ 445
15w Inc Lamp (exit)	90	3,000	8,760	263	\$ 0.60	\$ 158		\$ -	12	\$ -	\$ -	\$ 158
HID Ballast	118	50,000	3,093	7	\$ 45.00	\$ 328		\$ -	60	\$ -	\$ -	\$ 328
HID lamps	118	20,000	3,093	18	\$ 15.00	\$ 274		\$ -	30	\$ -	\$ -	\$ 274
	24,666					\$ 12,322					\$ -	\$ 12,322

Annual Proposed Maintenance Costs

		Unit	Total	Relamp	Total	Unit	Total	Unit	Total			Month	Cost	
		Lamp	Lamp	Sale	Lamp Sale	Labor	Labor	Labor &	Labor &	Rated	Average	To	Per	
Lamps	Qty	Cost	Cost	Price	Price	Cost To	Cost To	Material	Material	Life	Hours	Replace	Month	
F32T8/841 Lamps	4,147	\$ 1.47	\$ 6,096	\$ 1.47	\$ 6,096	\$ -	\$ -	\$ 1.47	\$ 6,096	20,000	2,985	60	\$ 101	
F25T8/4/841 Lamps	10,562	\$ 2.50	\$ 26,405	\$ 2.50	\$ 26,405	\$ -	\$ -	\$ 2.50	\$ 26,405	20,000	3,156	57	\$ 463	
F17T8/841 Lamps	229	\$ 2.25	\$ 515	\$ 2.25	\$ 515	\$ -	\$ -	\$ 2.25	\$ 515	20,000	3,648	49	\$ 10	
F54T5HO/841 Lamps	612	\$ 6.75	\$ 4,131	\$ 6.75	\$ 4,131	\$ -	\$ -	\$ 6.75	\$ 4,131	20,000	4,207	43	\$ 97	
Compact Fluor One Piece	259	\$ 7.00	\$ 1,813	\$ 7.00	\$ 1,813	\$ -	\$ -	\$ 7.00	\$ 1,813	10,000	2,998	30	\$ 60	
42w Compact Lamp	110	\$ 8.00	\$ 880	\$ 8.00	\$ 880	\$ -	\$ -	\$ 8.00	\$ 880	10,000	1,847	49	\$ 18	
LED Exit Signs	45	\$ 12.00	\$ 540	\$ 12.00	\$ 540	\$ -	\$ -	\$ 12.00	\$ 540	100,000	8,760	137	\$ 4	
TOTALS	15,964		\$ 40,380		\$ 40,380		\$ -		\$ 40,380				\$ 753	
												Annual Cost	\$ 9,041	
										(1)	(2)	(3)		
		Unit	Total		Average	Projected		Unit	Total	Annual	Annual	Annual	Annual	
		Material	Material	Rated	hours	Annual	Material	Labor	Labor	Material	Material	Labor &	Labor &	
Ballasts	Qty	Cost	Cost	Life / Hours	Of Use	Failures	Warranty	Cost	Cost / Year	YRS 1-5	YRS 6-10	YRS 1-5	YRS 6-10	
4-lamp T8 electronic	4,240	\$ 12.50	\$ 53,000	50,000	3,104	263	5 YRS	\$ -	\$ -	\$ -	\$ 3,768	\$ -	\$ 3,768	
T5 electronic	153	\$ 25.00	\$ 3,825	50,000	4,207	13	5 YRS	\$ -	\$ -	\$ -	\$ 369	\$ -	\$ 369	
Compact Fluor Ballast	55	\$ 12.00	\$ 660	40,000	1,847	3	1 YR	\$ -	\$ -	\$ 24	\$ 35	\$ 24	\$ 35	
TOTALS	4,448		\$ 57,485			279			\$ -	\$ 24	\$ 4,172	\$ 24	\$ 4,172	
				TOTAL ANNUAL RELAMP COST						\$ 9,041				
				AVERAGE ANNUAL BALLAST REPLACEMENT COST						\$ 24				
				TOTAL COST OF ANNUAL MAINTENANCE CONTRACT						\$ 9,066				
(1) FOR THE HID AND COMPACT FLUORESCENT BALLASTS, 80% OF THE ANNUAL MATERIAL COST WAS USED TO COMPENSATE FOR THE FIRST YEAR REPLACEMENT WARRANTY														
(2) THE MATERIAL COST FOR YEAR 6 HAS BEEN ADJUSTED FOR INFLATION FROM YEAR 1 AT THE RATE OF 2.75% PER YEAR														
(3) MANUFACTURER WILL REIMBURSE \$10 FOR LABOR FOR EACH FAILED FLUORESCENT BALLAST FOR THE FIRST FIVE YEARS.														

Annual Maintenance Savings - Material Only

	(A)	(B)	(C)	(D)	(E)	(F)
	Existing	Proposed	Proposed	Proposed	Proposed	
	Annual	Annual	Annual	Annual	Annual	Net
	Maintenance	Cost of	Spot Re-Lamp	Ballast Replacement	Maintenance	Maintenance
	<u>Cost</u>	<u>Re-Lamp</u>	<u>Cost</u>	<u>Cost</u>	<u>Cost</u>	<u>Savings</u>
YEAR 1	\$ 12,322	\$ 9,041	\$ -	\$ 24	\$ 9,066	\$ 3,257
YEAR 2	\$ 12,661	\$ 9,290	\$ -	\$ 25	\$ 9,315	\$ 3,346
YEAR 3	\$ 13,009	\$ 9,545	\$ -	\$ 26	\$ 9,571	\$ 3,438
YEAR 4	\$ 13,367	\$ 9,808	\$ -	\$ 26	\$ 9,834	\$ 3,533
YEAR 5	\$ 13,735	\$ 10,078	\$ -	\$ 27	\$ 10,105	\$ 3,630
YEAR 6	\$ 14,112	\$ 10,355	\$ -	\$ 4,172	\$ 14,527	\$ (414)
YEAR 7	\$ 14,501	\$ 10,640	\$ -	\$ 4,286	\$ 14,926	\$ (426)
YEAR 8	\$ 14,899	\$ 10,932	\$ -	\$ 4,404	\$ 15,337	\$ (437)
YEAR 9	\$ 15,309	\$ 11,233	\$ -	\$ 4,525	\$ 15,758	\$ (449)
YEAR 10	\$ 15,730	\$ 11,542	\$ -	\$ 4,650	\$ 16,192	\$ (462)
YEAR 11	\$ 16,163	\$ 11,859	\$ -	\$ 4,778	\$ 16,637	\$ (474)
YEAR 12	\$ 16,607	\$ 12,185	\$ -	\$ 4,909	\$ 17,094	\$ (487)
TOTALS	\$ 172,416	\$ 126,508	\$ -	\$ 31,853	\$ 158,362	\$ 14,054
AVERAGE ANNUAL MAINTENANCE SAVINGS =			\$1,171			
** ALL CALCULATIONS ASSUME 2.75% INCREASE IN MATERIAL COSTS PER YEAR						
Column E = Column B + Column C + Column D						
Column F = Column A - Column E						

Lighting Disposal Costs

Lamp Disposal

Original (Full Disposal)

Item Description	Qty	Disposal Cost per ft.	Lamp Length (ft.)	Cost
2' T12 Lamp	2	\$ 2.00	EA.	\$ 4
4' T12 Lamp	10,861	\$ 0.06	4	\$ 2,607
8' HO Lamp	1,158	\$ 0.06	8	\$ 556
U T12 Lamp	10	\$ 2.00	EA.	\$ 20
4' T8 Lamp	3,922	\$ 0.06	4	\$ 941
HID Lamps	118	\$ 2.00	EA.	\$ 236
Sub-total:				\$ 4,364

Ballast Disposal

Original (Full Disposal)

Item Description	Qty	Disposal Cost per lb.	Ballast Weight (lb.)	Cost
MH Ballasts	118	\$ 0.60	10	\$ 708
T12 8' HO Ballast	729	\$ 0.60	9	\$ 3,937
T12 Ballast	5,605	\$ 0.60	4.5	\$ 1,513
Sub-total:				\$ 5,450
Total:				\$ 9,814

% Lamps & PCB/DEHP Ballasts (excluding electronic ballasts) to be disposed:

Fluorescent Lamp	100%
Fluorescent Ballast	10%
HID Lamp	100%
HID Ballast	100%

ECM-2: Domestic Water Conservation

GENERAL DATA

No. of employees/visitors	800
No. of students	0
No. of employee days	260
No. of student days	180



USAGE PRIOR TO ECM IMPLEMENTATION		USAGE AFTER ECM IMPLEMENTATION	
Sinks			
Flow rate	2.50 gal/min	Flow rate	0.54 gal/min
Usage	1.00 min/day	Usage	1.00 min/day
Occ./Empl./Visitor Days	208,000 days/yr	Occ./Empl./Visitor Days	208,000 days/yr
Total usage	520,000 gal	Total usage	112,320 gal
Hot water usage	348,400 gal	Hot water usage	75,254 gal
Urinals			
Usage rate	1.41 gal/flush	Usage rate	1.00 gal/flush
Usage per occupant	2.00 flush/day	Usage per occupant	2.00 flush/day
Occ./Empl./Visitor Days	104,000 days/yr	Occ./Empl./Visitor Days	104,000 days/yr
Total usage	293,280 gal	Total usage	208,000 gal
Toilets			
Usage rate	2.90 gal/flush	Usage rate	1.60 gal/flush
Usage per occupant	2.00 flush/day	Usage per occupant	2.00 flush/day
Occ./Empl./Visitor Days	208,000 days/yr	Occ./Empl./Visitor Days	208,000 days/yr
Total usage	1,206,400 gal	Total usage	665,600 gal
Showers			
Flow rate	- gal/min	Flow rate	- gal/min
Usage per occupant	- min/day	Usage per occupant	- min/day
Occ./Empl./Visitor Days	- days/yr	Occ./Empl./Visitor Days	- days/yr
% occ. using shower	0% percent	% occ. using shower	0% percent
Total usage	- gal	Total usage	- gal
Hot water usage	- gal	Hot water usage	- gal
TOTAL GALLONS	2,019,680	TOTAL GALLONS	985,920
		ANNUAL SAVINGS, GAL	1,033,760

Water/sewer unit cost	\$ 8.49	per kgal
Water/sewer savings	\$ 8,777	per year
Hot water saved	273,146	gallons
Hot water saved	2,278,034	lbs.
Avg. hot water temp.	100	deg. F
City water temp.	60	deg. F
Hot water temp. delta	40	deg. F
Thermal energy saved	91	MMBTU
Thermal system efficiency	75%	
Nat. gas unit cost	\$ 6.21	/MMBTU
Thermal energy savings	\$ 754	
Total Annual Savings	\$ 9,531	

GENERAL DATA

No. of employees/inmates	87
No. of students	0
No. of employee days	365
No. of student days	180



USAGE PRIOR TO ECM IMPLEMENTATION		USAGE AFTER ECM IMPLEMENTATION	
Sinks		Sinks	
Flow rate	2.00 gal/min	Flow rate	0.54 gal/min
Usage	5.00 min/day	Usage	5.00 min/day
Occ./Empl./Visitor Days	31,755 days/yr	Occ./Empl./Visitor Days	31,755 days/yr
Total usage	317,550 gal	Total usage	85,739 gal
Hot water usage	212,759 gal	Hot water usage	57,445 gal
Urinals		Urinals	
Usage rate	1.60 gal/flush	Usage rate	1.00 gal/flush
Usage per occupant	5.00 flush/day	Usage per occupant	5.00 flush/day
Occ./Empl./Visitor Days	31,755 days/yr	Occ./Empl./Visitor Days	31,755 days/yr
Total usage	254,040 gal	Total usage	158,775 gal
Toilets		Toilets	
Usage rate	2.90 gal/flush	Usage rate	1.60 gal/flush
Usage per occupant	2.00 flush/day	Usage per occupant	2.00 flush/day
Occ./Empl./Visitor Days	31,755 days/yr	Occ./Empl./Visitor Days	31,755 days/yr
Total usage	184,179 gal	Total usage	101,616 gal
Showers		Showers	
Flow rate	2.50 gal/min	Flow rate	1.90 gal/min
Usage per occupant	12.00 min/day	Usage per occupant	12.00 min/day
Occ./Empl./Visitor Days	31,755 days/yr	Occ./Empl./Visitor Days	31,755 days/yr
% occ. using shower	75% percent	% occ. using shower	75% percent
Total usage	714,488 gal	Total usage	543,011 gal
Hot water usage	478,707 gal	Hot water usage	363,817 gal
TOTAL GALLONS	1,470,257	TOTAL GALLONS	889,140
		ANNUAL SAVINGS, GAL	581,117

Water/sewer unit cost	\$ 6.47	per kgal
Water/sewer savings	\$ 3,760	per year
Hot water saved	270,203	gallons
Hot water saved	2,253,495	lbs.
Avg. hot water temp.	100	deg. F
City water temp.	60	deg. F
Hot water temp. delta	40	deg. F
Thermal energy saved	90	MMBTU
Thermal system efficiency	75%	
No. 2 fuel oil unit cost	\$ 6.83	/MMBTU
Thermal energy savings	\$ 821	
Total Annual Savings	\$ 4,581	

GENERAL DATA

No. of employees/visitors	200
No. of students	0
No. of employee days	312
No. of student days	180



USAGE PRIOR TO ECM IMPLEMENTATION		USAGE AFTER ECM IMPLEMENTATION	
Sinks		Sinks	
Flow rate	1.60 gal/min	Flow rate	0.54 gal/min
Usage	0.40 min/day	Usage	0.40 min/day
Occ./Empl./Visitor Days	62,400 days/yr	Occ./Empl./Visitor Days	62,400 days/yr
Total usage	39,936 gal	Total usage	13,478 gal
Hot water usage	26,757 gal	Hot water usage	9,031 gal
Urinals		Urinals	
Usage rate	1.41 gal/flush	Usage rate	1.00 gal/flush
Usage per occupant	0.40 flush/day	Usage per occupant	0.40 flush/day
Occ./Empl./Visitor Days	31,200 days/yr	Occ./Empl./Visitor Days	31,200 days/yr
Total usage	17,597 gal	Total usage	12,480 gal
Toilets		Toilets	
Usage rate	2.50 gal/flush	Usage rate	1.60 gal/flush
Usage per occupant	0.40 flush/day	Usage per occupant	0.40 flush/day
Occ./Empl./Visitor Days	62,400 days/yr	Occ./Empl./Visitor Days	62,400 days/yr
Total usage	62,400 gal	Total usage	39,936 gal
Showers		Showers	
Flow rate	- gal/min	Flow rate	- gal/min
Usage per occupant	- min/day	Usage per occupant	- min/day
Occ./Empl./Visitor Days	- days/yr	Occ./Empl./Visitor Days	- days/yr
% occ. using shower	0% percent	% occ. using shower	0% percent
Total usage	- gal	Total usage	- gal
Hot water usage	- gal	Hot water usage	- gal
TOTAL GALLONS	119,933	TOTAL GALLONS	65,894
		ANNUAL SAVINGS, GAL	54,038

Water/sewer unit cost	\$	8.56	per kgal
Water/sewer savings	\$	463	per year
Hot water saved		17,727	gallons
Hot water saved		147,840	lbs.
Avg. hot water temp.		100	deg. F
City water temp.		60	deg. F
Hot water temp. delta		40	deg. F
Thermal energy saved		6	MMBTU
Thermal system efficiency		95%	
Electric unit cost	\$	14.65	/MMBTU
Thermal energy savings	\$	91	
Total Annual Savings	\$	554	

GENERAL DATA

No. of employees/visitors	32
No. of students	0
No. of employee days	365
No. of student days	180



USAGE PRIOR TO ECM IMPLEMENTATION		USAGE AFTER ECM IMPLEMENTATION	
Sinks		Sinks	
Flow rate	2.69 gal/min	Flow rate	0.54 gal/min
Usage	1.00 min/day	Usage	1.00 min/day
Occ./Empl./Visitor Days	11,680 days/yr	Occ./Empl./Visitor Days	11,680 days/yr
Total usage	31,419 gal	Total usage	6,307 gal
Hot water usage	21,051 gal	Hot water usage	4,226 gal
Urinals		Urinals	
Usage rate	1.60 gal/flush	Usage rate	1.00 gal/flush
Usage per occupant	2.00 flush/day	Usage per occupant	2.00 flush/day
Occ./Empl./Visitor Days	11,680 days/yr	Occ./Empl./Visitor Days	11,680 days/yr
Total usage	37,376 gal	Total usage	23,360 gal
Toilets		Toilets	
Usage rate	2.50 gal/flush	Usage rate	1.60 gal/flush
Usage per occupant	1.50 flush/day	Usage per occupant	1.50 flush/day
Occ./Empl./Visitor Days	11,680 days/yr	Occ./Empl./Visitor Days	11,680 days/yr
Total usage	43,800 gal	Total usage	28,032 gal
Showers		Showers	
Flow rate	3.00 gal/min	Flow rate	1.90 gal/min
Usage per occupant	8.00 min/day	Usage per occupant	8.00 min/day
Occ./Empl./Visitor Days	11,680 days/yr	Occ./Empl./Visitor Days	11,680 days/yr
% occ. using shower	25% percent	% occ. using shower	25% percent
Total usage	70,080 gal	Total usage	44,384 gal
Hot water usage	46,954 gal	Hot water usage	29,737 gal
TOTAL GALLONS	182,675	TOTAL GALLONS	102,083
		ANNUAL SAVINGS, GAL	80,592

Water/sewer unit cost	\$ 8.82	per kgal
Water/sewer savings	\$ 711	per year
Hot water saved	34,041	gallons
Hot water saved	283,905	lbs.
Avg. hot water temp.	100	deg. F
City water temp.	60	deg. F
Hot water temp. delta	40	deg. F
Thermal energy saved	11	MMBTU
Thermal system efficiency	75%	
Nat. gas unit cost	\$ 10.68	/MMBTU
Thermal energy savings	\$ 162	
Total Annual Savings	\$ 873	

GENERAL DATA

No. of employees/visitors	46
No. of students	587
No. of employee days	260
No. of student days	180



USAGE PRIOR TO ECM IMPLEMENTATION		USAGE AFTER ECM IMPLEMENTATION	
Sinks		Sinks	
Flow rate	2.40 gal/min	Flow rate	0.54 gal/min
Usage	0.50 min/day	Usage	0.50 min/day
Occ./Empl./Visitor Days	117,620 days/yr	Occ./Empl./Visitor Days	117,620 days/yr
Total usage	141,144 gal	Total usage	31,757 gal
Hot water usage	94,566 gal	Hot water usage	21,277 gal
Urinals		Urinals	
Usage rate	1.50 gal/flush	Usage rate	1.00 gal/flush
Usage per occupant	0.25 flush/day	Usage per occupant	0.25 flush/day
Occ./Empl./Visitor Days	352,860 days/yr	Occ./Empl./Visitor Days	352,860 days/yr
Total usage	132,323 gal	Total usage	88,215 gal
Toilets		Toilets	
Usage rate	2.40 gal/flush	Usage rate	1.60 gal/flush
Usage per occupant	0.25 flush/day	Usage per occupant	0.25 flush/day
Occ./Empl./Visitor Days	529,290 days/yr	Occ./Empl./Visitor Days	529,290 days/yr
Total usage	317,574 gal	Total usage	211,716 gal
Showers		Showers	
Flow rate	3.50 gal/min	Flow rate	1.90 gal/min
Usage per occupant	- min/day	Usage per occupant	- min/day
Occ./Empl./Visitor Days	1,270,296 days/yr	Occ./Empl./Visitor Days	1,270,296 days/yr
% occ. using shower	0% percent	% occ. using shower	0% percent
Total usage	- gal	Total usage	- gal
Hot water usage	- gal	Hot water usage	- gal
TOTAL GALLONS	591,041	TOTAL GALLONS	331,688
		ANNUAL SAVINGS, GAL	259,352

Water/sewer unit cost	\$ 7.57	per kgal
Water/sewer savings	\$ 1,963	per year
Hot water saved	73,289	gallons
Hot water saved	611,230	lbs.
Avg. hot water temp.	100	deg. F
City water temp.	60	deg. F
Hot water temp. delta	40	deg. F
Thermal energy saved	24	MMBTU
Thermal system efficiency	95%	
Electric unit cost	\$ 17.58	/MMBTU
Thermal energy savings	\$ 452	
Total Annual Savings	\$ 2,416	

GENERAL DATA

No. of employees/visitors	118
No. of students	1099
No. of employee days	260
No. of student days	180



USAGE PRIOR TO ECM IMPLEMENTATION		USAGE AFTER ECM IMPLEMENTATION	
Sinks		Sinks	
Flow rate	2.69 gal/min	Flow rate	0.54 gal/min
Usage	0.50 min/day	Usage	0.50 min/day
Occ./Empl./Visitor Days	228,500 days/yr	Occ./Empl./Visitor Days	228,500 days/yr
Total usage	307,333 gal	Total usage	61,695 gal
Hot water usage	205,913 gal	Hot water usage	41,336 gal
Urinals		Urinals	
Usage rate	1.60 gal/flush	Usage rate	1.00 gal/flush
Usage per occupant	0.25 flush/day	Usage per occupant	0.25 flush/day
Occ./Empl./Visitor Days	768,331 days/yr	Occ./Empl./Visitor Days	768,331 days/yr
Total usage	307,333 gal	Total usage	192,083 gal
Toilets		Toilets	
Usage rate	2.50 gal/flush	Usage rate	1.60 gal/flush
Usage per occupant	0.25 flush/day	Usage per occupant	0.25 flush/day
Occ./Empl./Visitor Days	1,229,330 days/yr	Occ./Empl./Visitor Days	1,229,330 days/yr
Total usage	768,331 gal	Total usage	491,732 gal
Showers		Showers	
Flow rate	3.50 gal/min	Flow rate	1.90 gal/min
Usage per occupant	- min/day	Usage per occupant	- min/day
Occ./Empl./Visitor Days	3,073,325 days/yr	Occ./Empl./Visitor Days	3,073,325 days/yr
% occ. using shower	0% percent	% occ. using shower	0% percent
Total usage	- gal	Total usage	- gal
Hot water usage	- gal	Hot water usage	- gal
TOTAL GALLONS	1,382,996	TOTAL GALLONS	745,510
		ANNUAL SAVINGS, GAL	637,486

Water/sewer unit cost	\$ 6.09	per kgal
Water/sewer savings	\$ 3,882	per year
Hot water saved	164,577	gallons
Hot water saved	1,372,573	lbs.
Avg. hot water temp.	100	deg. F
City water temp.	60	deg. F
Hot water temp. delta	40	deg. F
Thermal energy saved	55	MMBTU
Thermal system efficiency	95%	
Electric unit cost	\$ 14.65	/MMBTU
Thermal energy savings	\$ 847	
Total Annual Savings	\$ 4,729	

GENERAL DATA

No. of employees/visitors	141
No. of students	1497
No. of employee days	260
No. of student days	180



USAGE PRIOR TO ECM IMPLEMENTATION		USAGE AFTER ECM IMPLEMENTATION	
Sinks		Sinks	
Flow rate	2.00 gal/min	Flow rate	0.54 gal/min
Usage	0.60 min/day	Usage	0.60 min/day
Occ./Empl./Visitor Days	306,120 days/yr	Occ./Empl./Visitor Days	306,120 days/yr
Total usage	367,344 gal	Total usage	99,183 gal
Hot water usage	246,120 gal	Hot water usage	66,453 gal
Urinals		Urinals	
Usage rate	1.60 gal/flush	Usage rate	1.00 gal/flush
Usage per occupant	0.40 flush/day	Usage per occupant	0.40 flush/day
Occ./Empl./Visitor Days	832,646 days/yr	Occ./Empl./Visitor Days	832,646 days/yr
Total usage	532,894 gal	Total usage	333,059 gal
Toilets		Toilets	
Usage rate	2.30 gal/flush	Usage rate	1.60 gal/flush
Usage per occupant	0.50 flush/day	Usage per occupant	0.50 flush/day
Occ./Empl./Visitor Days	1,332,234 days/yr	Occ./Empl./Visitor Days	1,332,234 days/yr
Total usage	1,532,069 gal	Total usage	1,065,787 gal
Showers		Showers	
Flow rate	3.50 gal/min	Flow rate	1.90 gal/min
Usage per occupant	5.00 min/day	Usage per occupant	5.00 min/day
Occ./Empl./Visitor Days	3,064,139 days/yr	Occ./Empl./Visitor Days	3,064,139 days/yr
% occ. using shower	1% percent	% occ. using shower	1% percent
Total usage	536,224 gal	Total usage	291,093 gal
Hot water usage	359,270 gal	Hot water usage	195,032 gal
TOTAL GALLONS	2,968,531	TOTAL GALLONS	1,789,122
		ANNUAL SAVINGS, GAL	1,179,409

Water/sewer unit cost	\$ 6.25	per kgal
Water/sewer savings	\$ 7,371	per year
Hot water saved	343,906	gallons
Hot water saved	2,868,174	lbs.
Avg. hot water temp.	100	deg. F
City water temp.	60	deg. F
Hot water temp. delta	40	deg. F
Thermal energy saved	115	MMBTU
Thermal system efficiency	95%	
Electric unit cost	\$ 14.65	/MMBTU
Thermal energy savings	\$ 1,769	
Total Annual Savings	\$ 9,141	

**Domestic Water Conservation
Detailed Estimate Sheet.xls**

Installation Cost Estimate - COUNTY FACILITIES

<i>Item Description</i>	<i>Quantity</i>	<i>U.M.</i>	<i>Unit Price</i>	<i>Cost - Material</i>	<i>Cost - Lab/Equip</i>	<i>Total M,L,E</i>	<i>Fully Loaded Total</i>	<i>Notes</i>
Flushometers, flush valves, urinal valves, faucet restrictors, china, etc. - Admin.	1	L.S.	\$ 28,100	\$ 28,100	\$ 18,827	\$ 46,927	\$ 52,708	---
Flushometers, flush valves, urinal valves, faucet restrictors, china, etc. - Jail East	1	L.S.	\$ 13,900	\$ 13,900	\$ 9,313	\$ 23,213	\$ 26,072	---
Flushometers, flush valves, urinal valves, faucet restrictors, china, etc. - Gayton	1	L.S.	\$ 1,300	\$ 1,300	\$ 871	\$ 2,171	\$ 2,438	---
Flushometers, flush valves, urinal valves, faucet restrictors, china, etc. - F.S. No.12	1	L.S.	\$ 1,400	\$ 1,400	\$ 1,260	\$ 2,660	\$ 2,988	---
	0	L.S.	\$ -	\$ -	\$ -	\$ -		---
	0	L.S.	\$ -	\$ -	\$ -	\$ -		---
	0	L.S.	\$ -	\$ -	\$ -	\$ -		---
SUBTOTALS				\$ 44,700	\$ 30,271	\$ 74,971		
TAXES ON MATERIAL						\$ 2,682		
PAYMENT AND PERFORMANCE BONDING						\$ 1,553		
SUBCONTRACT ENGINEERING						\$ 5,000		\$ 9,235
TOTAL INSTALLED COST						\$ 84,206	\$ 84,206	

Installation Cost Estimate - SCHOOL FACILITIES

<i>Item Description</i>	<i>Quantity</i>	<i>U.M.</i>	<i>Unit Price</i>	<i>Cost - Material</i>	<i>Cost - Lab/Equip</i>	<i>Total M,L,E</i>	<i>Fully Loaded Total</i>	<i>Notes</i>
Flushometers, flush valves, urinal valves, faucet restrictors, china, etc. - Carver ES	1	L.S.	\$ 7,800	\$ 7,800	\$ 5,226	\$ 13,026	\$ 14,573	---
Flushometers, flush valves, urinal valves, faucet restrictors, china, etc. - Byrd MS	1	L.S.	\$ 13,900	\$ 13,900	\$ 9,313	\$ 23,213	\$ 25,970	---
Flushometers, flush valves, urinal valves, faucet restrictors, china, etc. - Hermitage HS	1	L.S.	\$ 26,500	\$ 26,500	\$ 17,755	\$ 44,255	\$ 49,511	---
	0	L.S.	\$ -	\$ -	\$ -	\$ -	\$ -	---
	0	L.S.	\$ -	\$ -	\$ -	\$ -		---
	0	L.S.	\$ -	\$ -	\$ -	\$ -		---
	0	L.S.	\$ -	\$ -	\$ -	\$ -		---
SUBTOTALS				\$ 48,200	\$ 32,294	\$ 80,494		
TAXES ON MATERIAL						\$ 2,892		
PAYMENT AND PERFORMANCE BONDING						\$ 1,668		
SUBCONTRACT ENGINEERING						\$ 5,000		\$ 9,560
TOTAL INSTALLED COST						\$ 90,054	\$ 90,054	

Notes

- 1
- 2

ECM-3: Energy Management System Upgrades

County Admin. Building
Henrico County EMS Savings.xls

Value	Units	Description	Comment
6,642,720	kWh	Existing annual electric energy usage	All AHUs run 24 / 7 / 365, even office areas
12%	Percent	Savings achievable	Scheduling (on/off), setbacks, tighter control
5,845,594	kWh	Proposed annual electric energy usage	
797,126	kWh	Proposed annual electric energy savings	
\$ 0.045	per kWh	Electric unit cost	
\$ 35,871		Proposed annual electric cost savings	
12,265	MMBTU	Existing annual nat. gas energy usage	
12%	Percent	Savings achievable	Scheduling (on/off), setbacks, tighter control
10,793	MMBTU	Proposed annual energy usage	
1,472	MMBTU	Proposed annual nat. gas energy savings	
\$ 7.02	per MMBTU	Nat. gas unit cost	
\$ 10,332		Proposed annual nat. gas cost savings	
\$46,203	TOTAL SAVINGS		

NOTES

- (1) See model
- (2)

Value	Units	Description	Comment
332,550	kWh	Existing annual electric energy usage	All AHUs run 24 / 7 / 365, even office areas
15%	Percent	Savings achievable	Scheduling (on/off), setbacks, tighter control
282,668	kWh	Proposed annual electric energy usage	
49,883	kWh	Proposed annual electric energy savings	
\$ 0.061	per kWh	Electric unit cost	
\$ 3,043		Proposed annual electric cost savings	
-	MMBTU	Existing annual nat. gas energy usage	
0%	Percent	Savings achievable	Scheduling (on/off), setbacks, tighter control
-	MMBTU	Proposed annual energy usage	
-	MMBTU	Proposed annual nat. gas energy savings	
\$ -	per MMBTU	Nat. gas unit cost	
\$ -		Proposed annual nat. gas cost savings	
\$3,043	TOTAL SAVINGS		

NOTES

- (1) See model
- (2)

Value	Units	Description	Comment
157,850	kWh	Existing annual electric energy usage	Non-programmable t-stats
7%	Percent	Savings achievable	Setbacks, tighter control
146,801	kWh	Proposed annual electric energy usage	
11,050	kWh	Proposed annual electric energy savings	
\$ 0.059	per kWh	Electric unit cost	
\$ 652		Proposed annual electric cost savings	
329	MMBTU	Existing annual nat. gas energy usage	
7%	Percent	Savings achievable	Setbacks, tighter control
306	MMBTU	Proposed annual energy usage	
23	MMBTU	Proposed annual nat. gas energy savings	
\$ 11.38	per MMBTU	Nat. gas unit cost	
\$ 262		Proposed annual nat. gas cost savings	
\$914	TOTAL SAVINGS		

NOTES

- (1)
- (2)

ECM-4: Motor and Drive Upgrades

Motor and Drive Upgrades
Jail East SHWP-3,5 & SCHWP-9,11

Percent Flow	Existing Motor Demand (kW)	Operating Hours (Hrs)	Existing Pump Demand (kW)	Proposed VSD Load (kW)	Power Savings (kW)	On-Peak Energy Savings (kWh)	Off-Peak Energy Savings (kWh)
[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]
20%	72.7	0	72.7	0.0	72.7	0	0
25%	72.7	0	72.7	0.0	72.7	0	0
30%	72.7	88	72.7	6.5	66.2	5,798	0
35%	72.7	88	72.7	8.0	64.7	5,671	0
40%	72.7	175	72.7	9.5	63.3	11,087	0
45%	72.7	350	72.7	10.9	61.8	21,663	0
50%	72.7	526	72.7	13.1	59.6	31,348	0
55%	72.7	701	72.7	17.5	55.3	38,739	0
60%	72.7	876	72.7	21.1	51.6	45,238	0
65%	72.7	1,051	72.7	25.5	47.3	49,698	0
70%	72.7	1,226	72.7	31.3	41.5	50,845	0
75%	72.7	1,226	72.7	37.8	34.9	42,817	0
80%	72.7	1,051	72.7	45.1	27.6	29,054	0
85%	72.7	876	72.7	53.1	19.6	17,203	0
90%	72.7	350	72.7	61.8	10.9	3,823	0
95%	72.7	175	72.7	72.7	0.0	0	0
100%	72.7	0	72.7	0.0	72.7	0	0
Totals		8,760				352,986	0

Item	Value	Units	Cell Ref	Remarks
Total Pump HP	130.0	HP	[C25]	Total HP of Pumps to receive VSDs
Motor Load Factor	75%		[C26]	Estimated
Annual On-Peak Hours	8,760	On-Peak Hrs	[C27]	From Baseline
Annual Off-Peak Hours	0	On-Peak Hrs	[C28]	From Baseline

Table 1 Typical Power Consumption of Various Control Systems

	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
Load Ratio	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
Bypass VAV or CV	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
VSD	9%	9%	9%	11%	13%	15%	18%	24%	29%	35%	43%	52%	62%	73%	85%	100%	108%
Ideal	2%	3%	5%	7%	9%	12%	15%	18%	24%	29%	37%	44%	53%	64%	75%	86%	100%

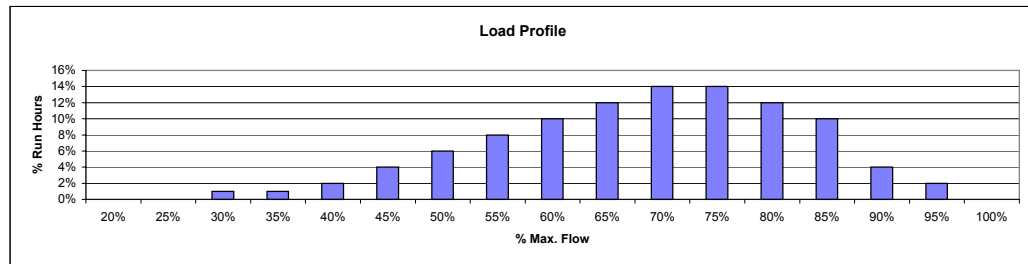
Note: these power consumption values include motor efficiencies and drive losses
Reference: "Profit Improvement of Variable Speed Drives", from "Energy Engineering", the Journal of the Association of Energy Engineers, Vol 86, No. 3, 1989, page 8.

Assumed Load Profile for Pumps

	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
% max flow	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
% run hours	0%	0%	1%	1%	2%	4%	6%	8%	10%	12%	14%	14%	12%	10%	4%	2%	0%

Cell Ref.	Comment
A	Percent Flow of Pump
B	= [C25] x 0.746 x [C26]
C	Operating hours proportioned to expected load curve
D	Existing motor demand proportioned to expected load curve
E	Proposed VSD demand proportioned to expected load curve
F	= [D] - [E]
G	= ([C27] + ([C27] + [C28])) x [F] x [C]
H	= ([C28] + ([C27] + [C28])) x [F] x [C]

- NOTES:
 (1) Assume 1 of 2 SHWPs & 1 of 2 SCHWPs runs 8760 hrs per year
 (2) Rather than using on-peak/off-peak, use blended average energy cost



Motor and Drive Upgrades

Baseline Energy Check

Motor	kWh Saved	\$/kWh	Cost Savings	hp	kW/hp	kW	hrs	Eff.	Load	kWh
Jail East SHWP-3,5 & SCHWP-9,11	352,986	\$ 0.046	\$ 16,237	130	0.746	96.98	8760	93.0%	75%	685,117

Baseline Energy Check

ECM-5: HVAC System Upgrades

Replace Admin. Bldg. AHUs with VSD AHUs

Baseline Energy Check

Motor	kWh Saved	\$/kWh	Cost Savings	hp	kW/hp	kW	hrs	Eff.	Load	kWh
AHU-001	98,643	\$ 0.045	\$ 4,439	60	0.746	44.76	5,304	93.6%	75%	190,230

Baseline Energy Check

Motor	kWh Saved	\$/kWh	Cost Savings	hp	kW/hp	kW	hrs	Eff.	Load	kWh
AHU-002	65,762	\$ 0.045	\$ 2,959	40	0.746	29.84	5,304	93.0%	75%	127,638

Baseline Energy Check

Motor	kWh Saved	\$/kWh	Cost Savings	hp	kW/hp	kW	hrs	Eff.	Load	kWh
AHU-003	82,202	\$ 0.045	\$ 3,699	50	0.746	37.3	5,304	93.0%	75%	159,548

Baseline Energy Check

Motor	kWh Saved	\$/kWh	Cost Savings	hp	kW/hp	kW	hrs	Eff.	Load	kWh
AHU-004	12,330	\$ 0.045	\$ 555	7.5	0.746	5.595	5,304	89.5%	75%	24,868

Baseline Energy Check

Motor	kWh Saved	\$/kWh	Cost Savings	hp	kW/hp	kW	hrs	Eff.	Load	kWh
AHU-005	49,321	\$ 0.045	\$ 2,219	30	0.746	22.38	5,304	92.4%	75%	96,350

Baseline Energy Check

Motor	kWh Saved	\$/kWh	Cost Savings	hp	kW/hp	kW	hrs	Eff.	Load	kWh
AHU-006	65,762	\$ 0.045	\$ 2,959	40	0.746	29.84	5,304	93.0%	75%	127,638

Baseline Energy Check

Motor	kWh Saved	\$/kWh	Cost Savings	hp	kW/hp	kW	hrs	Eff.	Load	kWh
AHU-007	24,661	\$ 0.045	\$ 1,110	15	0.746	11.19	5,304	91.0%	75%	48,916

Baseline Energy Check

Motor	kWh Saved	\$/kWh	Cost Savings	hp	kW/hp	kW	hrs	Eff.	Load	kWh
AHU-008	4,932	\$ 0.045	\$ 222	3	0.746	2.238	5,304	87.5%	75%	10,175

	kWh Saved	Cost Savings
TOTALS	403,613	\$ 18,163

Replace Admin. Bldg. AHUs with VSD AHUs
AHU-001

Percent Flow	Existing Motor Demand (kW)	Operating Hours (Hrs)	Existing Fan Demand (kW)	Proposed VSD Load (kW)	Power Savings (kW)	On-Peak Energy Savings (kWh)	Off-Peak Energy Savings (kWh)
[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]
20%	33.6	0	33.6	0.0	33.6	0	0
25%	33.6	0	33.6	0.0	33.6	0	0
30%	33.6	53	33.6	3.0	30.5	1,620	0
35%	33.6	53	33.6	3.7	29.9	1,585	0
40%	33.6	106	33.6	4.4	29.2	3,098	0
45%	33.6	212	33.6	5.0	28.5	6,054	0
50%	33.6	318	33.6	6.0	27.5	8,760	0
55%	33.6	424	33.6	8.1	25.5	10,826	0
60%	33.6	530	33.6	9.7	23.8	12,642	0
65%	33.6	636	33.6	11.7	21.8	13,888	0
70%	33.6	743	33.6	14.4	19.1	14,209	0
75%	33.6	743	33.6	17.5	16.1	11,965	0
80%	33.6	636	33.6	20.8	12.8	8,119	0
85%	33.6	530	33.6	24.5	9.1	4,807	0
90%	33.6	212	33.6	28.5	5.0	1,068	0
95%	33.6	106	33.6	33.6	0.0	0	0
100%	33.6	0	33.6	0.0	33.6	0	0
Totals		5,304				98,643	0

Item	Value	Units	Cell Ref	Remarks
Total Fan HP	60.0	HP	[C25]	Total HP of Fans to receive VSDs
Motor Load Factor	75%		[C26]	Estimated
Annual On-Peak Hours	5,304	On-Peak Hrs	[C27]	From Baseline
Annual Off-Peak Hours	0	On-Peak Hrs	[C28]	From Baseline

Table 1 Typical Power Consumption of Various Control Systems

	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
Load Ratio	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
Bypass VAV or CV	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
VSD	9%	9%	9%	11%	13%	15%	18%	24%	29%	35%	43%	52%	62%	73%	85%	100%	108%
Ideal	2%	3%	5%	7%	9%	12%	15%	18%	24%	29%	37%	44%	53%	64%	75%	86%	100%

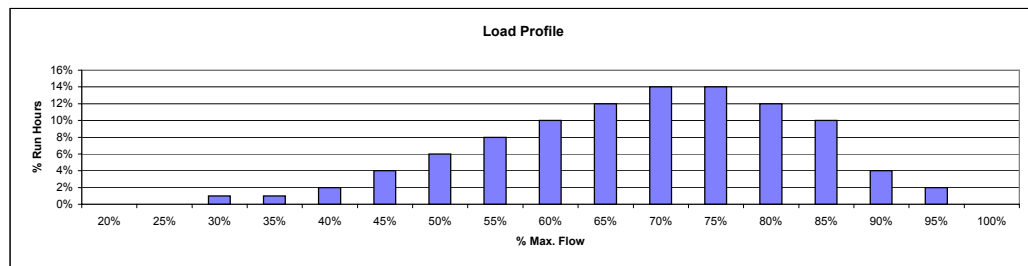
Note: these power consumption values include motor efficiencies and drive losses
Reference: "Profit Improvement of Variable Speed Drives", from "Energy Engineering", the Journal of the Association of Energy Engineers, Vol 86, No. 3, 1989, page 8.

Assumed Load Profile for Pumps

	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
% max flow	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
% run hours	0%	0%	1%	1%	2%	4%	6%	8%	10%	12%	14%	14%	12%	10%	4%	2%	0%

Cell Ref.	Comment
A	Percent Flow of Fan
B	= [C25] x 0.746 x [C26]
C	Operating hours proportioned to expected load curve
D	Existing motor demand proportioned to expected load curve
E	Proposed VSD demand proportioned to expected load curve
F	= [D] - [E]
G	= ([C27] + ([C27] + [C28])) x [F] x [C]
H	= ([C28] + ([C27] + [C28])) x [F] x [C]

- NOTES:
(1) Rather than using on-peak/off-peak, use blended average energy cost
(2)



Replace Admin. Bldg. AHUs with VSD AHUs
AHU-002

Percent Flow	Existing Motor Demand (kW)	Operating Hours (Hrs)	Existing Fan Demand (kW)	Proposed VSD Load (kW)	Power Savings (kW)	On-Peak Energy Savings (kWh)	Off-Peak Energy Savings (kWh)
[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]
20%	22.4	0	22.4	0.0	22.4	0	0
25%	22.4	0	22.4	0.0	22.4	0	0
30%	22.4	53	22.4	2.0	20.4	1,080	0
35%	22.4	53	22.4	2.5	19.9	1,056	0
40%	22.4	106	22.4	2.9	19.5	2,065	0
45%	22.4	212	22.4	3.4	19.0	4,036	0
50%	22.4	318	22.4	4.0	18.4	5,840	0
55%	22.4	424	22.4	5.4	17.0	7,217	0
60%	22.4	530	22.4	6.5	15.9	8,428	0
65%	22.4	636	22.4	7.8	14.5	9,259	0
70%	22.4	743	22.4	9.6	12.8	9,473	0
75%	22.4	743	22.4	11.6	10.7	7,977	0
80%	22.4	636	22.4	13.9	8.5	5,413	0
85%	22.4	530	22.4	16.3	6.0	3,205	0
90%	22.4	212	22.4	19.0	3.4	712	0
95%	22.4	106	22.4	22.4	0.0	0	0
100%	22.4	0	22.4	0.0	22.4	0	0
Totals		5,304				65,762	0

Item	Value	Units	Cell Ref	Remarks
Total Fan HP	40.0	HP	[C25]	Total HP of Fans to receive VSDs
Motor Load Factor	75%		[C26]	Estimated
Annual On-Peak Hours	5,304	On-Peak Hrs	[C27]	From Baseline
Annual Off-Peak Hours	0	On-Peak Hrs	[C28]	From Baseline

Table 1 Typical Power Consumption of Various Control Systems

	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
Load Ratio	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
Bypass VAV or CV	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
VSD	9%	9%	9%	11%	13%	15%	18%	24%	29%	35%	43%	52%	62%	73%	85%	100%	108%
Ideal	2%	3%	5%	7%	9%	12%	15%	18%	24%	29%	37%	44%	53%	64%	75%	86%	100%

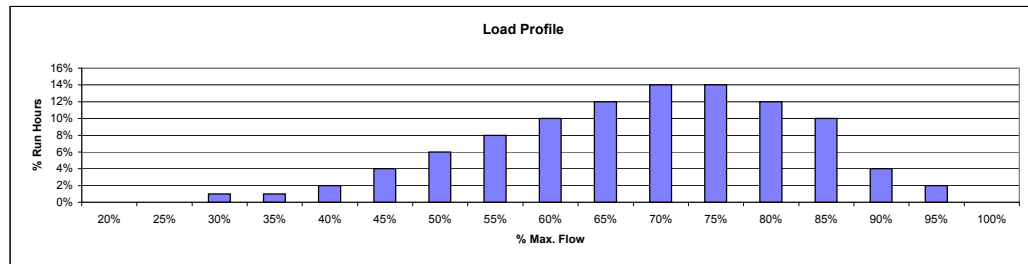
Note: these power consumption values include motor efficiencies and drive losses
Reference: "Profit Improvement of Variable Speed Drives", from "Energy Engineering", the Journal of the Association of Energy Engineers, Vol 86, No. 3, 1989, page 8.

Assumed Load Profile for Pumps

	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
% max flow	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
% run hours	0%	0%	1%	1%	2%	4%	6%	8%	10%	12%	14%	14%	12%	10%	4%	2%	0%

Cell Ref.	Comment
A	Percent Flow of Fan
B	= [C25] x 0.746 x [C26]
C	Operating hours proportioned to expected load curve
D	Existing motor demand proportioned to expected load curve
E	Proposed VSD demand proportioned to expected load curve
F	= [D] - [E]
G	= ([C27] + ([C27] + [C28])) x [F] x [C]
H	= ([C28] + ([C27] + [C28])) x [F] x [C]

NOTES:
(1) Rather than using on-peak/off-peak, use blended average energy cost
(2)



Replace Admin. Bldg. AHUs with VSD AHUs
 AHU-003

Percent Flow	Existing Motor Demand (kW)	Operating Hours (Hrs)	Existing Fan Demand (kW)	Proposed VSD Load (kW)	Power Savings (kW)	On-Peak Energy Savings (kWh)	Off-Peak Energy Savings (kWh)
[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]
20%	28.0	0	28.0	0.0	28.0	0	0
25%	28.0	0	28.0	0.0	28.0	0	0
30%	28.0	53	28.0	2.5	25.5	1,350	0
35%	28.0	53	28.0	3.1	24.9	1,321	0
40%	28.0	106	28.0	3.6	24.3	2,582	0
45%	28.0	212	28.0	4.2	23.8	5,045	0
50%	28.0	318	28.0	5.0	22.9	7,300	0
55%	28.0	424	28.0	6.7	21.3	9,021	0
60%	28.0	530	28.0	8.1	19.9	10,535	0
65%	28.0	636	28.0	9.8	18.2	11,574	0
70%	28.0	743	28.0	12.0	15.9	11,841	0
75%	28.0	743	28.0	14.5	13.4	9,971	0
80%	28.0	636	28.0	17.3	10.6	6,766	0
85%	28.0	530	28.0	20.4	7.6	4,006	0
90%	28.0	212	28.0	23.8	4.2	890	0
95%	28.0	106	28.0	28.0	0.0	0	0
100%	28.0	0	28.0	0.0	28.0	0	0
Totals		5,304				82,202	0

Item	Value	Units	Cell Ref	Remarks
Total Fan HP	50.0	HP	[C25]	Total HP of Fans to receive VSDs
Motor Load Factor	75%		[C26]	Estimated
Annual On-Peak Hours	5,304	On-Peak Hrs	[C27]	From Baseline
Annual Off-Peak Hours	0	On-Peak Hrs	[C28]	From Baseline

Table 1 Typical Power Consumption of Various Control Systems

	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
Load Ratio	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
Bypass VAV or CV	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
VSD	9%	9%	9%	11%	13%	15%	18%	24%	29%	35%	43%	52%	62%	73%	85%	100%	108%
Ideal	2%	3%	5%	7%	9%	12%	15%	18%	24%	29%	37%	44%	53%	64%	75%	86%	100%

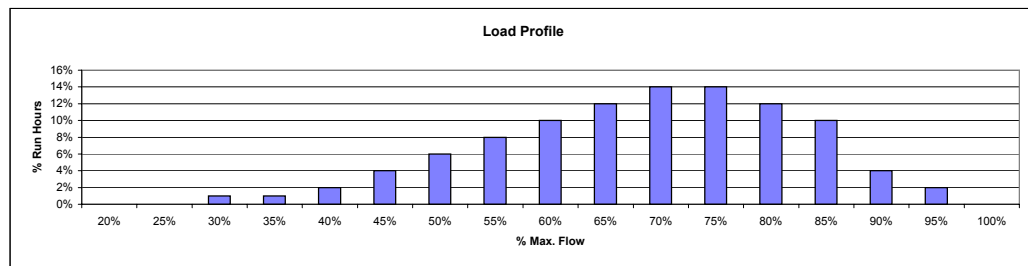
Note: these power consumption values include motor efficiencies and drive losses
 Reference: "Profit Improvement of Variable Speed Drives", from "Energy Engineering", the Journal of the Association of Energy Engineers, Vol 86, No. 3, 1989, page 8.

Assumed Load Profile for Pumps

	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
% max flow	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
% run hours	0%	0%	1%	1%	2%	4%	6%	8%	10%	12%	14%	14%	12%	10%	4%	2%	0%

Cell Ref.	Comment
A	Percent Flow of Fan
B	= [C25] x 0.746 x [C26]
C	Operating hours proportioned to expected load curve
D	Existing motor demand proportioned to expected load curve
E	Proposed VSD demand proportioned to expected load curve
F	= [D] - [E]
G	= ([C27] + ([C27] + [C28])) x [F] x [C]
H	= ([C28] + ([C27] + [C28])) x [F] x [C]

NOTES:
 (1) Rather than using on-peak/off-peak, use blended average energy cost
 (2)



Replace Admin. Bldg. AHUs with VSD AHUs
AHU-004

Percent Flow	Existing Motor Demand (kW)	Operating Hours (Hrs)	Existing Fan Demand (kW)	Proposed VSD Load (kW)	Power Savings (kW)	On-Peak Energy Savings (kWh)	Off-Peak Energy Savings (kWh)
[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]
20%	4.2	0	4.2	0.0	4.2	0	0
25%	4.2	0	4.2	0.0	4.2	0	0
30%	4.2	53	4.2	0.4	3.8	203	0
35%	4.2	53	4.2	0.5	3.7	198	0
40%	4.2	106	4.2	0.5	3.7	387	0
45%	4.2	212	4.2	0.6	3.6	757	0
50%	4.2	318	4.2	0.8	3.4	1,095	0
55%	4.2	424	4.2	1.0	3.2	1,353	0
60%	4.2	530	4.2	1.2	3.0	1,580	0
65%	4.2	636	4.2	1.5	2.7	1,736	0
70%	4.2	743	4.2	1.8	2.4	1,776	0
75%	4.2	743	4.2	2.2	2.0	1,496	0
80%	4.2	636	4.2	2.6	1.6	1,015	0
85%	4.2	530	4.2	3.1	1.1	601	0
90%	4.2	212	4.2	3.6	0.6	134	0
95%	4.2	106	4.2	4.2	0.0	0	0
100%	4.2	0	4.2	0.0	4.2	0	0
Totals		5,304				12,330	0

Item	Value	Units	Cell Ref	Remarks
Total Fan HP	7.5	HP	[C25]	Total HP of Fans to receive VSDs
Motor Load Factor	75%		[C26]	Estimated
Annual On-Peak Hours	5,304	On-Peak Hrs	[C27]	From Baseline
Annual Off-Peak Hours	0	On-Peak Hrs	[C28]	From Baseline

Table 1 Typical Power Consumption of Various Control Systems

	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
Load Ratio	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
Bypass VAV or CV	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
VSD	9%	9%	9%	11%	13%	15%	18%	24%	29%	35%	43%	52%	62%	73%	85%	100%	108%
Ideal	2%	3%	5%	7%	9%	12%	15%	18%	24%	29%	37%	44%	53%	64%	75%	86%	100%

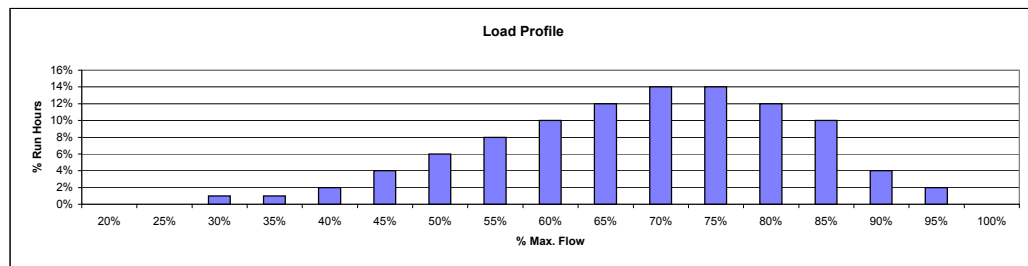
Note: these power consumption values include motor efficiencies and drive losses
Reference: "Profit Improvement of Variable Speed Drives", from "Energy Engineering", the Journal of the Association of Energy Engineers, Vol 86, No. 3, 1989, page 8.

Assumed Load Profile for Pumps

	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
% max flow	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
% run hours	0%	0%	1%	1%	2%	4%	6%	8%	10%	12%	14%	14%	12%	10%	4%	2%	0%

Cell Ref.	Comment
A	Percent Flow of Fan
B	= [C25] x 0.746 x [C26]
C	Operating hours proportioned to expected load curve
D	Existing motor demand proportioned to expected load curve
E	Proposed VSD demand proportioned to expected load curve
F	= [D] - [E]
G	= ([C27] + ([C27] + [C28])) x [F] x [C]
H	= ([C28] + ([C27] + [C28])) x [F] x [C]

- NOTES:
(1) Rather than using on-peak/off-peak, use blended average energy cost
(2)



Replace Admin. Bldg. AHUs with VSD AHUs
AHU-005

Percent Flow	Existing Motor Demand (kW)	Operating Hours (Hrs)	Existing Fan Demand (kW)	Proposed VSD Load (kW)	Power Savings (kW)	On-Peak Energy Savings (kWh)	Off-Peak Energy Savings (kWh)
[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]
20%	16.8	0	16.8	0.0	16.8	0	0
25%	16.8	0	16.8	0.0	16.8	0	0
30%	16.8	53	16.8	1.5	15.3	810	0
35%	16.8	53	16.8	1.8	14.9	792	0
40%	16.8	106	16.8	2.2	14.6	1,549	0
45%	16.8	212	16.8	2.5	14.3	3,027	0
50%	16.8	318	16.8	3.0	13.8	4,380	0
55%	16.8	424	16.8	4.0	12.8	5,413	0
60%	16.8	530	16.8	4.9	11.9	6,321	0
65%	16.8	636	16.8	5.9	10.9	6,944	0
70%	16.8	743	16.8	7.2	9.6	7,104	0
75%	16.8	743	16.8	8.7	8.1	5,983	0
80%	16.8	636	16.8	10.4	6.4	4,060	0
85%	16.8	530	16.8	12.3	4.5	2,404	0
90%	16.8	212	16.8	14.3	2.5	534	0
95%	16.8	106	16.8	16.8	0.0	0	0
100%	16.8	0	16.8	0.0	16.8	0	0
Totals		5,304				49,321	0

Item	Value	Units	Cell Ref	Remarks
Total Fan HP	30.0	HP	[C25]	Total HP of Fans to receive VSDs
Motor Load Factor	75%		[C26]	Estimated
Annual On-Peak Hours	5,304	On-Peak Hrs	[C27]	From Baseline
Annual Off-Peak Hours	0	On-Peak Hrs	[C28]	From Baseline

Table 1 Typical Power Consumption of Various Control Systems

	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
Load Ratio	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
Bypass VAV or CV	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
VSD	9%	9%	9%	11%	13%	15%	18%	24%	29%	35%	43%	52%	62%	73%	85%	100%	108%
Ideal	2%	3%	5%	7%	9%	12%	15%	18%	24%	29%	37%	44%	53%	64%	75%	86%	100%

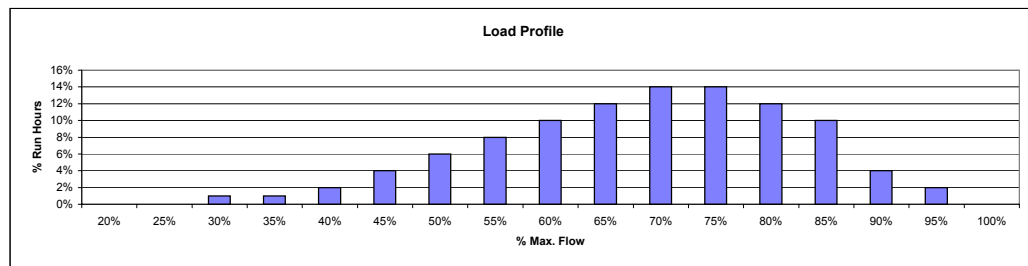
Note: these power consumption values include motor efficiencies and drive losses
Reference: "Profit Improvement of Variable Speed Drives", from "Energy Engineering", the Journal of the Association of Energy Engineers, Vol 86, No. 3, 1989, page 8.

Assumed Load Profile for Pumps

	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
% max flow	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
% run hours	0%	0%	1%	1%	2%	4%	6%	8%	10%	12%	14%	14%	12%	10%	4%	2%	0%

Cell Ref.	Comment
A	Percent Flow of Fan
B	= [C25] x 0.746 x [C26]
C	Operating hours proportioned to expected load curve
D	Existing motor demand proportioned to expected load curve
E	Proposed VSD demand proportioned to expected load curve
F	= [D] - [E]
G	= ([C27] + ([C27] + [C28])) x [F] x [C]
H	= ([C28] + ([C27] + [C28])) x [F] x [C]

- NOTES:
(1) Rather than using on-peak/off-peak, use blended average energy cost
(2)



Replace Admin. Bldg. AHUs with VSD AHUs
AHU-006

Percent Flow	Existing Motor Demand (kW)	Operating Hours (Hrs)	Existing Fan Demand (kW)	Proposed VSD Load (kW)	Power Savings (kW)	On-Peak Energy Savings (kWh)	Off-Peak Energy Savings (kWh)
[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]
20%	22.4	0	22.4	0.0	22.4	0	0
25%	22.4	0	22.4	0.0	22.4	0	0
30%	22.4	53	22.4	2.0	20.4	1,080	0
35%	22.4	53	22.4	2.5	19.9	1,056	0
40%	22.4	106	22.4	2.9	19.5	2,065	0
45%	22.4	212	22.4	3.4	19.0	4,036	0
50%	22.4	318	22.4	4.0	18.4	5,840	0
55%	22.4	424	22.4	5.4	17.0	7,217	0
60%	22.4	530	22.4	6.5	15.9	8,428	0
65%	22.4	636	22.4	7.8	14.5	9,259	0
70%	22.4	743	22.4	9.6	12.8	9,473	0
75%	22.4	743	22.4	11.6	10.7	7,977	0
80%	22.4	636	22.4	13.9	8.5	5,413	0
85%	22.4	530	22.4	16.3	6.0	3,205	0
90%	22.4	212	22.4	19.0	3.4	712	0
95%	22.4	106	22.4	22.4	0.0	0	0
100%	22.4	0	22.4	0.0	22.4	0	0
Totals		5,304				65,762	0

Item	Value	Units	Cell Ref	Remarks
Total Fan HP	40.0	HP	[C25]	Total HP of Fans to receive VSDs
Motor Load Factor	75%		[C26]	Estimated
Annual On-Peak Hours	5,304	On-Peak Hrs	[C27]	From Baseline
Annual Off-Peak Hours	0	On-Peak Hrs	[C28]	From Baseline

Table 1 Typical Power Consumption of Various Control Systems

Load Ratio	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
Bypass VAV or CV	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
VSD	9%	9%	9%	11%	13%	15%	18%	24%	29%	35%	43%	52%	62%	73%	85%	100%	108%
Ideal	2%	3%	5%	7%	9%	12%	15%	18%	24%	29%	37%	44%	53%	64%	75%	86%	100%

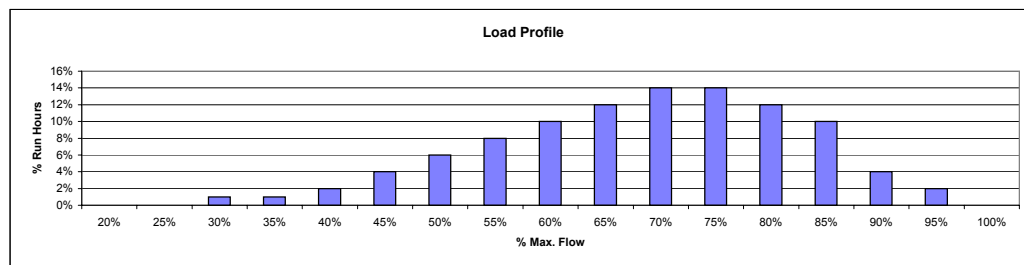
Note: these power consumption values include motor efficiencies and drive losses
Reference: "Profit Improvement of Variable Speed Drives", from "Energy Engineering", the Journal of the Association of Energy Engineers, Vol 86, No. 3, 1989, page 8.

Assumed Load Profile for Pumps

% max flow	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
% run hours	0%	0%	1%	1%	2%	4%	6%	8%	10%	12%	14%	14%	12%	10%	4%	2%	0%

Cell Ref.	Comment
A	Percent Flow of Fan
B	= [C25] x 0.746 x [C26]
C	Operating hours proportioned to expected load curve
D	Existing motor demand proportioned to expected load curve
E	Proposed VSD demand proportioned to expected load curve
F	= [D] - [E]
G	= ([C27] + ([C27] + [C28])) x [F] x [C]
H	= ([C28] + ([C27] + [C28])) x [F] x [C]

NOTES:
(1) Rather than using on-peak/off-peak, use blended average energy cost
(2)



Replace Admin. Bldg. AHUs with VSD AHUs
AHU-007

Percent Flow	Existing Motor Demand (kW)	Operating Hours (Hrs)	Existing Fan Demand (kW)	Proposed VSD Load (kW)	Power Savings (kW)	On-Peak Energy Savings (kWh)	Off-Peak Energy Savings (kWh)
[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]
20%	8.4	0	8.4	0.0	8.4	0	0
25%	8.4	0	8.4	0.0	8.4	0	0
30%	8.4	53	8.4	0.8	7.6	405	0
35%	8.4	53	8.4	0.9	7.5	396	0
40%	8.4	106	8.4	1.1	7.3	775	0
45%	8.4	212	8.4	1.3	7.1	1,513	0
50%	8.4	318	8.4	1.5	6.9	2,190	0
55%	8.4	424	8.4	2.0	6.4	2,706	0
60%	8.4	530	8.4	2.4	6.0	3,160	0
65%	8.4	636	8.4	2.9	5.5	3,472	0
70%	8.4	743	8.4	3.6	4.8	3,552	0
75%	8.4	743	8.4	4.4	4.0	2,991	0
80%	8.4	636	8.4	5.2	3.2	2,030	0
85%	8.4	530	8.4	6.1	2.3	1,202	0
90%	8.4	212	8.4	7.1	1.3	267	0
95%	8.4	106	8.4	8.4	0.0	0	0
100%	8.4	0	8.4	0.0	8.4	0	0
Totals		5,304				24,661	0

Item	Value	Units	Cell Ref	Remarks
Total Fan HP	15.0	HP	[C25]	Total HP of Fans to receive VSDs
Motor Load Factor	75%		[C26]	Estimated
Annual On-Peak Hours	5,304	On-Peak Hrs	[C27]	From Baseline
Annual Off-Peak Hours	0	On-Peak Hrs	[C28]	From Baseline

Table 1 Typical Power Consumption of Various Control Systems

	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
Load Ratio	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
Bypass VAV or CV	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
VSD	9%	9%	9%	11%	13%	15%	18%	24%	29%	35%	43%	52%	62%	73%	85%	100%	108%
Ideal	2%	3%	5%	7%	9%	12%	15%	18%	24%	29%	37%	44%	53%	64%	75%	86%	100%

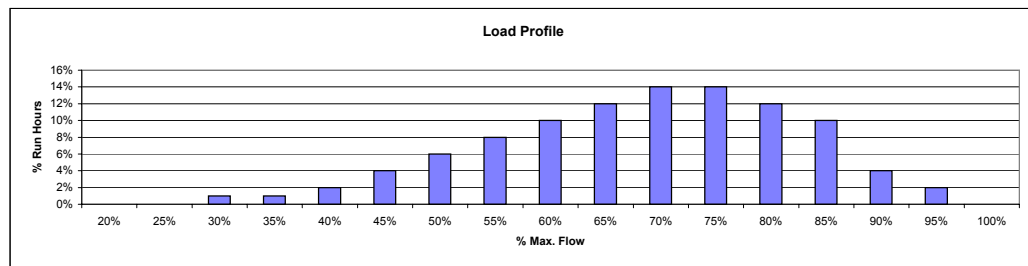
Note: these power consumption values include motor efficiencies and drive losses
Reference: "Profit Improvement of Variable Speed Drives", from "Energy Engineering", the Journal of the Association of Energy Engineers, Vol 86, No. 3, 1989, page 8.

Assumed Load Profile for Pumps

	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
% max flow	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
% run hours	0%	0%	1%	1%	2%	4%	6%	8%	10%	12%	14%	14%	12%	10%	4%	2%	0%

Cell Ref.	Comment
A	Percent Flow of Fan
B	= [C25] x 0.746 x [C26]
C	Operating hours proportioned to expected load curve
D	Existing motor demand proportioned to expected load curve
E	Proposed VSD demand proportioned to expected load curve
F	= [D] - [E]
G	= ([C27] + ([C27] + [C28])) x [F] x [C]
H	= ([C28] + ([C27] + [C28])) x [F] x [C]

- NOTES:
(1) Rather than using on-peak/off-peak, use blended average energy cost
(2)



Replace Admin. Bldg. AHUs with VSD AHUs
AHU-008

Percent Flow	Existing Motor Demand (kW)	Operating Hours (Hrs)	Existing Fan Demand (kW)	Proposed VSD Load (kW)	Power Savings (kW)	On-Peak Energy Savings (kWh)	Off-Peak Energy Savings (kWh)
[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]
20%	1.7	0	1.7	0.0	1.7	0	0
25%	1.7	0	1.7	0.0	1.7	0	0
30%	1.7	53	1.7	0.2	1.5	81	0
35%	1.7	53	1.7	0.2	1.5	79	0
40%	1.7	106	1.7	0.2	1.5	155	0
45%	1.7	212	1.7	0.3	1.4	303	0
50%	1.7	318	1.7	0.3	1.4	438	0
55%	1.7	424	1.7	0.4	1.3	541	0
60%	1.7	530	1.7	0.5	1.2	632	0
65%	1.7	636	1.7	0.6	1.1	694	0
70%	1.7	743	1.7	0.7	1.0	710	0
75%	1.7	743	1.7	0.9	0.8	598	0
80%	1.7	636	1.7	1.0	0.6	406	0
85%	1.7	530	1.7	1.2	0.5	240	0
90%	1.7	212	1.7	1.4	0.3	53	0
95%	1.7	106	1.7	1.7	0.0	0	0
100%	1.7	0	1.7	0.0	1.7	0	0
Totals		5,304				4,932	0

Item	Value	Units	Cell Ref	Remarks
Total Fan HP	3.0	HP	[C25]	Total HP of Fans to receive VSDs
Motor Load Factor	75%		[C26]	Estimated
Annual On-Peak Hours	5,304	On-Peak Hrs	[C27]	From Baseline
Annual Off-Peak Hours	0	On-Peak Hrs	[C28]	From Baseline

Table 1 Typical Power Consumption of Various Control Systems

Load Ratio	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
Bypass VAV or CV	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%	110%
VSD	9%	9%	9%	11%	13%	15%	18%	24%	29%	35%	43%	52%	62%	73%	85%	100%	108%
Ideal	2%	3%	5%	7%	9%	12%	15%	18%	24%	29%	37%	44%	53%	64%	75%	86%	100%

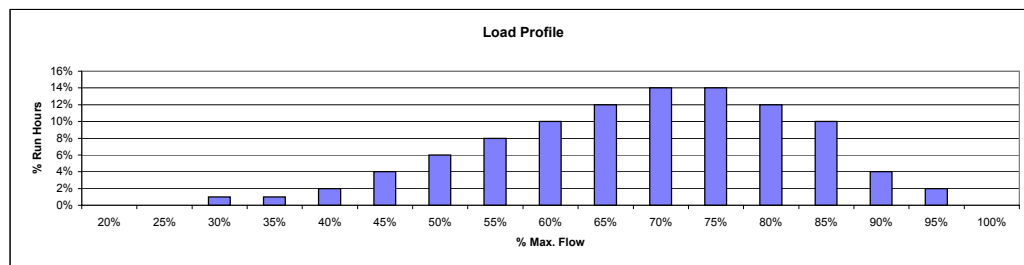
Note: these power consumption values include motor efficiencies and drive losses
Reference: "Profit Improvement of Variable Speed Drives", from "Energy Engineering", the Journal of the Association of Energy Engineers, Vol 86, No. 3, 1989, page 8.

Assumed Load Profile for Pumps

% max flow	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
% run hours	0%	0%	1%	1%	2%	4%	6%	8%	10%	12%	14%	14%	12%	10%	4%	2%	0%

Cell Ref.	Comment
A	Percent Flow of Fan
B	= [C25] x 0.746 x [C26]
C	Operating hours proportioned to expected load curve
D	Existing motor demand proportioned to expected load curve
E	Proposed VSD demand proportioned to expected load curve
F	= [D] - [E]
G	= ([C27] + ([C27] + [C28])) x [F] x [C]
H	= ([C28] + ([C27] + [C28])) x [F] x [C]

- NOTES:
(1) Rather than using on-peak/off-peak, use blended average energy cost
(2)



Installation Cost Estimate

Item Description	Quantity	U.M.	Unit Price	Cost - Material	Cost - Lab/Equip	Total M,L,E	Notes
Air handling unit, CHW coil, HW coil, VSD SAF, 31900 cfm, sp=7" w.c.	1	each	\$ 63,800	\$ 63,800	\$ 21,054	\$ 84,854	1
Air handling unit, CHW coil, HW coil, VSD SAF, 19490 cfm, sp=7.5" w.c.	1	each	\$ 38,980	\$ 38,980	\$ 12,863	\$ 51,843	1
Air handling unit, CHW coil, HW coil, VSD SAF, 20675 cfm, sp=7.75" w.c.	1	each	\$ 41,350	\$ 41,350	\$ 13,646	\$ 54,996	1
Air handling unit, CHW coil, HW coil, VSD SAF, 4020 cfm, sp=4.75" w.c.	1	each	\$ 8,040	\$ 8,040	\$ 5,628	\$ 13,668	1
Air handling unit, CHW coil, HW coil, VSD SAF, 14470 cfm, sp=5.1" w.c.	1	each	\$ 28,940	\$ 28,940	\$ 9,550	\$ 38,490	1
Air handling unit, CHW coil, HW coil, VSD SAF, 20515 cfm, sp=7.25" w.c.	1	each	\$ 41,030	\$ 41,030	\$ 13,540	\$ 54,570	1
Air handling unit, CHW coil, HW coil, VSD SAF, 6000 cfm, sp=4.3" w.c.	1	each	\$ 12,000	\$ 12,000	\$ 9,600	\$ 21,600	1
Air handling unit, CHW coil, HW coil, VSD SAF, 1765 cfm, sp=4.15" w.c.	1	each	\$ 3,530	\$ 3,530	\$ 2,824	\$ 6,354	1
	0	each	\$ -	\$ -	\$ -	\$ -	---
	0	each	\$ -	\$ -	\$ -	\$ -	---
	0	each	\$ -	\$ -	\$ -	\$ -	---
	0	each	\$ -	\$ -	\$ -	\$ -	---
	0	each	\$ -	\$ -	\$ -	\$ -	---
SUBTOTALS				\$ 237,670	\$ 88,705	\$ 326,375	
TAXES ON MATERIAL						\$ 14,260	
PAYMENT AND PERFORMANCE BONDING						\$ 6,813	
SUBCONTRACT ENGINEERING						40,000	
TOTAL INSTALLED COST						\$ 387,448	

Notes

- 1 Labor & equipment cost includes demo of old unit and repiping of new unit
- 2

Economizer Analyzer- County Admin Building
Revision Date: 11/12/04

Economizer Analyzer				
Project Description			Admin	
City			Henrico Co.	
Calculation Date			3/25/2005	
Economizer Type (Air Side/Water Side)			Water	
Maximum Economizer Load (Tons) (Note 4)			175	
Economizer On/Off dry or wet bulb temp (F) (Note 4)			38	
Cooling Source Efficiency (KW/Ton) (= EER x .0833)			0.6	
Electrical Rate (\$/Kwh)			\$ 0.045	
Month	Econo. Load-Hrs (Note 5)	Ton-Hrs Saved	KWH Saved	Cost Savings
January	339.35	59,386	35,632	\$ 1,591
February	278.7	48,773	29,264	\$ 1,307
March	87.8	15,365	9,219	\$ 412
April	22.15	3,876	2,326	\$ 104
May	0.00	-	-	\$ -
June	0.00	-	-	\$ -
July	0.00	-	-	\$ -
August	0.00	-	-	\$ -
September	0.00	-	-	\$ -
October	0.00	-	-	\$ -
November	53.9	9,433	5,660	\$ 253
December	197.45	34,554	20,732	\$ 926
Annual	979.35	171,386	102,832	\$ 4,592

County Admin Building Load Profile (%)

Hour	Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	30	30	30	30	30	25	25
2	30	30	30	30	30	25	25
3	30	30	30	30	30	25	25
4	30	30	30	30	30	25	25
5	30	30	30	30	30	25	25
6	30	30	30	30	30	25	25
7	100	100	100	100	100	50	50
8	100	100	100	100	100	50	50
9	100	100	100	100	100	50	50
10	100	100	100	100	100	50	50
11	100	100	100	100	100	50	50
12	100	100	100	100	100	50	50
13	100	100	100	100	100	50	50
14	100	100	100	100	100	50	50
15	100	100	100	100	100	50	50
16	100	100	100	100	100	50	50
17	100	100	100	100	100	50	50
18	50	50	50	50	50	25	25
19	50	50	50	50	50	25	25
20	50	50	50	50	50	25	25
21	50	50	50	50	50	25	25
22	50	50	50	50	50	25	25
23	50	50	50	50	50	25	25
24	50	50	50	50	50	25	25

Richmond, VA Weather Data Used

Economizer Analyzer- Eastern Jail

Revision Date: 11/12/04

Economizer Analyzer				
Project Description			Jail	
City			Henrico Co.	
Calculation Date			3/25/2005	
Economizer Type (Air Side/Water Side)			Water	
Maximum Economizer Load (Tons) (Note 4)			300	
Economizer On/Off dry or wet bulb temp (F) (Note 4)			38	
Cooling Source Efficiency (KW/Ton) (= EER x .0833)			0.5	
Electrical Rate (\$/Kwh)			\$ 0.046	
Month	Econo. Load-Hrs (Note 5)	Ton-Hrs Saved	KWH Saved	Cost Savings
January	551	165,300	82,650	\$ 3,839
February	474.5	142,350	71,175	\$ 3,306
March	158.75	47,625	23,813	\$ 1,106
April	38.75	11,625	5,813	\$ 270
May	0.00	-	-	\$ -
June	0.00	-	-	\$ -
July	0.00	-	-	\$ -
August	0.00	-	-	\$ -
September	0.00	-	-	\$ -
October	0.00	-	-	\$ -
November	106.5	31,950	15,975	\$ 742
December	334.25	100,275	50,138	\$ 2,329
Annual	1663.75	499,125	249,563	\$ 11,592

Eastern Jail Load Profile (%)

Hour	Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	75	75	75	75	75	75	75
2	75	75	75	75	75	75	75
3	75	75	75	75	75	75	75
4	75	75	75	75	75	75	75
5	75	75	75	75	75	75	75
6	100	100	100	100	100	100	100
7	100	100	100	100	100	100	100
8	100	100	100	100	100	100	100
9	100	100	100	100	100	100	100
10	100	100	100	100	100	100	100
11	100	100	100	100	100	100	100
12	100	100	100	100	100	100	100
13	100	100	100	100	100	100	100
14	100	100	100	100	100	100	100
15	100	100	100	100	100	100	100
16	100	100	100	100	100	100	100
17	100	100	100	100	100	100	100
18	100	100	100	100	100	100	100
19	100	100	100	100	100	100	100
20	100	100	100	100	100	100	100
21	100	100	100	100	100	100	100
22	100	100	100	100	100	100	100
23	100	100	100	100	100	100	100
24	100	100	100	100	100	100	100

Richmond, VA Weather Data Used

COMPUTATION SHEET

AMERESCO, Inc.

PROJECT Henrico County Audit
 MEASURE Primary/Secondary CHW Pumping, Admin. Building

JOB NO.

BY ekb

CK'D BY

DATE

3/25/2005

Assumptions:

A	Blended energy cost for this facility is	\$ 0.045	per kWh
B			
C	Central plant load varies linearly from 100% at	102.5	F db
	to a minimum of 0% at	55	F db
D	Chilled water flow rate required varies linearly with central plant load		
E	One chilled water pump runs continuously	5,277	hr/yr
F	Pump motor size is 3 @ 20hp	60	hp
G	Static head on pump	50	feet
H	Pump Design total dynamic head	80	feet
I	at	1,194	gpm
J	Pump motor efficiency	90	%
K	Pump Efficiency	80	%
L	VSD Efficiency	99	%
M	Energy reduction will be gpm reduction raised to the following power	2.5	exponent
N	Minimum pump flow	25	%
AA	New primary chilled water pump	1,194	gpm
BB	at	20	feet
CC	Operating hours for primary pump	5,277	hrs/yr

Calculations

Existing Conditions

R	S	T	U	V
Bin Temp	Total	CHW Load	Existing CHW	Existing CHW
Mid-pts	Hrs	(D)	Pump kWh	Pump kW
(Binmaker)	(Binmaker)		$S*((H*I)/(3960*K))*0.746/J$	U/S
102.5	23	100.0	575	25
97.5	103	89.5	2,574	25
92.5	261	78.9	6,523	25
87.5	380	68.4	9,497	25
82.5	585	57.9	14,620	25
77.5	682	47.4	17,045	25
72.5	882	36.8	22,043	25
67.5	853	26.3	21,318	25
62.5	796	15.8	19,894	25
57.5	712	5.3	17,794	25
52.5				
47.5				
42.5				
37.5				
32.5				
27.5				
22.5				
17.5				
	5,277		131,884	25

Proposed Conditions

R	S	T	X	Y	Z
Bin Temp	Total	CHW Load	New Design	New Design	New Design
Mid-pts	Hrs	(%)	CHW Flow	CHW Pump	CHW Pump
(Binmaker)	(Binmaker)		Rate (gpm)	Static Hd kWh	Dyn Hd kWh
			T*I or T*N	$S*((X*G)/(3960*K))*0.746/J/L$	$S*(((X*(H-G))/(3960*K))*0.746/J/L)*(X/I)^M$
102.5	23	100.0	1,194	363	216
97.5	103	89.5	1,068	1,454	731
92.5	261	78.9	943	3,251	1,355
87.5	380	68.4	817	4,102	1,379
82.5	585	57.9	691	5,344	1,398
77.5	682	47.4	566	5,097	987
72.5	882	36.8	440	5,127	681
67.5	853	26.3	314	3,542	284
62.5	796	15.8	299	3,140	74
57.5	712	5.3	299	2,808	4
52.5					
47.5					
42.5					
37.5					
32.5					
27.5					
22.5					
17.5					
				34,228	7,109

New Primary Chilled Water Pump Energy Usage
 New Primary Chilled Water Pump Power Usage

33,913 kWh/yr
 6 kW

BB Pump Energy Savings 56,634 kWh/yr
 CC Power Savings

Total Electric Cost Savings \$ 1,526 per year

COMPUTATION SHEET

AMERESCO, Inc.

PROJECT **Henrico County Audit**
 MEASURE **Primary/Secondary CHW Pumping, Byrd Middle School**
 BY **ekb** CK'D BY

JOB NO.

DATE **3/25/2005**

Assumptions:

A	Blended energy cost for this facility is	\$ 0.069	per kWh
B			
C	Central plant load varies linearly from 100% at	102.5	F db
	to a minimum of 0% at	55	F db
D	Chilled water flow rate required varies linearly with central plant load		
E	One chilled water pump runs continuously	5,277	hr/yr
F	Pump motor size is 1 @ 40hp	40	hp
G	Static head on pump	50	feet
H	Pump Design total dynamic head	80	feet
I	at	1,000	gpm
J	Pump motor efficiency	90	%
K	Pump Efficiency	80	%
L	VSD Efficiency	99	%
M	Energy reduction will be gpm reduction raised to the following power	2.5	exponent
N	Minimum pump flow	25	%
AA	New primary chilled water pump	1,000	gpm
BB	at	15	feet
CC	Operating hours for primary pump	5,277	hrs/yr

Calculations

Existing Conditions

R	S	T	U	V
Bin Temp	Total	CHW Load	Existing CHW	Existing CHW
Mid-pts	Hrs	(D)	Pump kWh	Pump kW
(Binmaker)	(Binmaker)		$S*((H^1)/(3960*K))*0.746/J$	U/S
102.5	23	100.0	481	21
97.5	103	89.5	2,156	21
92.5	261	78.9	5,463	21
87.5	380	68.4	7,954	21
82.5	585	57.9	12,245	21
77.5	682	47.4	14,275	21
72.5	882	36.8	18,462	21
67.5	853	26.3	17,855	21
62.5	796	15.8	16,662	21
57.5	712	5.3	14,903	21
52.5				
47.5				
42.5				
37.5				
32.5				
27.5				
22.5				
17.5				
	5,277		110,456	21

Proposed Conditions

R	S	T	X	Y	Z
Bin Temp	Total	CHW Load	New Design	New Design	New Design
Mid-pts	Hrs	(%)	CHW Flow	CHW Pump	CHW Pump
(Binmaker)	(Binmaker)		Rate (gpm)	Static Hd kWh	Dyn Hd kWh
			T*1 or T*N	$S*((X*G)/(3960*K))*0.746/J/L$	$S*((X*(H-G))/(3960*K))*0.746/J/L*(X/I)^M$
102.5	23	100.0	1,000	304	181
97.5	103	89.5	895	1,218	612
92.5	261	78.9	789	2,723	1,135
87.5	380	68.4	684	3,436	1,155
82.5	585	57.9	579	4,475	1,171
77.5	682	47.4	474	4,269	827
72.5	882	36.8	368	4,294	570
67.5	853	26.3	263	2,966	238
62.5	796	15.8	250	2,630	62
57.5	712	5.3	250	2,352	4
52.5					
47.5					
42.5					
37.5					
32.5					
27.5					
22.5					
17.5					
				28,667	5,954

New Primary Chilled Water Pump Energy Usage
New Primary Chilled Water Pump Power Usage

21,302 kWh/yr
4 kW

BB Pump Energy Savings 54,533 kWh/yr
CC Power Savings

Total Electric Cost Savings \$ 1,470 per year

Recommissioning

East Jail

Value	Units	Description	Comment
1,051,758	kWh	Existing annual electric energy usage	AHUs run 24 / 7 / 365
8%	Percent	Savings achievable	Recalibrations, rebalancing/commissioning
967,617	kWh	Proposed annual electric energy usage	
84,141	kWh	Proposed annual electric energy savings	
\$ 0.046	per kWh	Electric unit cost	
\$ 3,870		Proposed annual electric cost savings	
2,717	MMBTU	Existing annual fossil fuel energy usage	
8%	Percent	Savings achievable	Recalibrations, rebalancing/commissioning
2,500	MMBTU	Proposed annual fossil fuel energy usage	
217	MMBTU	Proposed annual fossil fuel energy savings	
\$ 6.95	per MMBTU	Fossil fuel unit cost	
\$ 1,511		Proposed annual fossil fuel cost savings	
\$5,381	TOTAL SAVINGS		

NOTES

- (1) Blended fuel cost for oil is \$18,876 for 2,717 MMBTU or \$6.95 per MMBTU
- (2)

New Condensing Units
Henrico County - Gayton Condensing Units.xls

Ameresco, Inc.

Parameter	Value	Units
<u>Cooling Mode, Units 1a, 2 & 3</u>		
Annual oper. hours	3,294	hrs
Percent time cycling on	40%	
Energy cost	\$ 0.061	per kWh
Existing unit size (3@10)	30.00	tons
Existing unit efficiency	9.00	EER
Existing unit efficiency	1.33	kW/ton
Existing ton-hrs	39,528	ton-hrs
Existing energy usage	52,704	kWh
Proposed unit size (3@10)	30.00	tons
Proposed unit efficiency	12.00	EER
Proposed unit efficiency	1.00	kW/ton
Proposed ton-hrs	39,528	ton-hrs
Proposed energy usage	39,528	kWh
Cooling energy saved	13,176	kWh
Cost savings	\$ 804	
<u>Heating Mode, Units 1a, 2 & 3</u>		
Existing unit size (3@10)	30.00	tons
Existing unit efficiency	9.00	EER
Existing unit efficiency	3.64	COP
Existing heating hrs	3,294	hrs
Existing energy usage	14,488	kWh
Proposed unit size (3@10)	30.00	tons
Proposed unit efficiency	12.00	EER
Proposed unit efficiency	4.52	COP
Proposed heating hrs	3,294	hrs
Proposed energy usage	8,751	kWh
Heating energy saved	5,737	kWh
Cost savings	\$ 350	
Total energy savings	18,913	kWh
Total cost savings	\$ 1,154	

Grand total energy savings	37,826	kWh
Grand total cost savings	\$ 2,307	

Parameter	Value	Units
<u>Cooling Mode, Units 1b & 1c</u>		
Annual oper. hours	3,294	hrs
Percent time cycling on	40%	
Energy cost	\$ 0.061	per kWh
Existing unit size (2@15)	30.00	tons
Existing unit efficiency	9.00	EER
Existing unit efficiency	1.33	kW/ton
Existing ton-hrs	39,528	ton-hrs
Existing energy usage	52,704	kWh
Proposed unit size (2@15)	30.00	tons
Proposed unit efficiency	12.00	EER
Proposed unit efficiency	1.00	kW/ton
Proposed ton-hrs	39,528	ton-hrs
Proposed energy usage	39,528	kWh
Cooling energy saved	13,176	kWh
Cost savings	\$ 804	
<u>Heating Mode, Units 1b & 1c</u>		
Existing unit size (2@15)	30.00	tons
Existing unit efficiency	9.00	EER
Existing unit efficiency	3.64	COP
Existing heating hrs	3,294	hrs
Existing energy usage	14,488	kWh
Proposed unit size (2@15)	30.00	tons
Proposed unit efficiency	12.00	EER
Proposed unit efficiency	4.52	COP
Proposed heating hrs	3,294	hrs
Proposed energy usage	8,751	kWh
Heating energy saved	5,737	kWh
Cost savings	\$ 350	
Total energy savings	18,913	kWh
Total cost savings	\$ 1,154	

ECM-6: Deduct Meters for Cooling Towers

Cooling Tower Water Deduct Meter- Henrico County: Eastern Jail				
Cell Ref.	Value	Units	Description	Comment
[A]	68,105	ccf	Annual water usage at MCP	
[B]	0.748	kgal/ccf	Conversion factor	
[C]	50,943	kgal	Annual water usage at MCP	= [A] * [B]
[D]	1,500	gpm	Flow rate of 1 cond wtr pump & 1 tower cell	
[E]	0.05%		Average percent cooling tower drift	NCDENR "Water Mgt Options"
[F]	0.50%		Average percent cooling tower evaporation	State of NM; 1%/10 degF, assume 5 degF
[G]	0.50%		Average percent cooling tower blowdown	towertechinc.com
[H]	1.05%		Total average percent cooling tower loss	
[I]	24	hours	Cooling tower operating hours per day	
[J]	7	days	Cooling tower operating days per week	
[K]	45	weeks	Cooling tower operating weeks per year	
[L]	453,600	min	Cooling tower operating minutes per year	= 60 * [I] * [J] * [K]
[M]	7,144,200	gal	Gallons lost per year	= [D] * [H] * [L]
[N]	7,144	kgal	Gallons lost per year	= [M] / 1000
[O]	9,551	ccf	100 cu. ft. lost per year	= [N] / [B]
[P]	\$ 2.42	per ccf	Unit sewer cost	Sewer usage charge + indus. WW charge
[Q]	\$ 23,114		Annual sewer cost savings	= [O] * [P]

Cooling Tower Water Deduct Meter- Henrico County: Byrd Middle School				
Cell Ref.	Value	Units	Description	Comment
[A]	2,221	ccf	Annual water usage at MCP	
[B]	0.748	kgal/ccf	Conversion factor	
[C]	1,661	kgal	Annual water usage at MCP	= [A] * [B]
[D]	400	gpm	Flow rate of 1 cond wtr pump & 1 tower cell	
[E]	0.05%		Average percent cooling tower drift	NCDENR "Water Mgt Options"
[F]	0.50%		Average percent cooling tower evaporation	State of NM; 1%/10 degF, assume 5 degF
[G]	0.50%		Average percent cooling tower blowdown	towertechinc.com
[H]	1.05%		Total average percent cooling tower loss	
[I]	16	hours	Cooling tower operating hours per day	
[J]	5	days	Cooling tower operating days per week	
[K]	20	weeks	Cooling tower operating weeks per year	
[L]	96,000	min	Cooling tower operating minutes per year	= 60 * [I] * [J] * [K]
[M]	403,200	gal	Gallons lost per year	= [D] * [H] * [L]
[N]	403	kgal	Gallons lost per year	= [M] / 1000
[O]	539	ccf	100 cu. ft. lost per year	= [N] / [B]
[P]	\$ 2.42	per ccf	Unit sewer cost	Sewer usage charge + indus. WW charge
[Q]	\$ 1,304		Annual sewer cost savings	= [O] * [P]

Cooling Tower Water Deduct Meter- Henrico County: Hermitage High School				
Cell Ref.	Value	Units	Description	Comment
[A]	6,543	ccf	Annual water usage at MCP	
[B]	0.748	kgal/ccf	Conversion factor	
[C]	4,894	kgal	Annual water usage at MCP	= [A] * [B]
[D]	850	gpm	Flow rate of 1 cond wtr pump & 1 tower cell	
[E]	0.05%		Average percent cooling tower drift	NCDENR "Water Mgt Options"
[F]	0.50%		Average percent cooling tower evaporation	State of NM; 1%/10 degF, assume 5 degF
[G]	0.50%		Average percent cooling tower blowdown	towertechinc.com
[H]	1.05%		Total average percent cooling tower loss	
[I]	20	hours	Cooling tower operating hours per day	
[J]	5	days	Cooling tower operating days per week	
[K]	20	weeks	Cooling tower operating weeks per year	
[L]	120,000	min	Cooling tower operating minutes per year	= 60 * [I] * [J] * [K]
[M]	1,071,000	gal	Gallons lost per year	= [D] * [H] * [L]
[N]	1,071	kgal	Gallons lost per year	= [M] / 1000
[O]	1,432	ccf	100 cu. ft. lost per year	= [N] / [B]
[P]	\$ 2.33	per ccf	Unit sewer cost	Sewer usage charge + indus. WW charge
[Q]	\$ 3,336		Annual sewer cost savings	= [O] * [P]

ECM-7: Vending Machine Controls

Henrico County Virginia

VendingMiser ECM *County Admin Building*

Energy Costs (\$0.000 per kwh)	\$0.0538
Number of Cold Drink Vending Machines	8

Present Annual Cost	\$1,503.99
Projected Annual Cost	\$810.18
Total Annual Savings	\$693.80

Material	\$1,432.00
Labor	\$320.00
Engineering	\$350.40
Bonding	\$6.40
Subtotal	<u>\$2,102.40</u>
Profit	\$558.71
Total	<u>\$2,661.11</u>

Project Summary

Annual Savings	\$693.80
Installation Cost	\$2,661.11
Return On Investment (years)	3.84
Return On Investment (Months)	46.03

Henrico County Virginia

VendingMiser ECM
Hermitage High School

Energy Costs (\$0.000 per kwh)	\$0.0538
Number of Cold Drink Vending Machines	8

Present Annual Cost	\$1,503.99
Projected Annual Cost	\$810.18
Total Annual Savings	\$693.80

Material	\$1,432.00
Labor	\$320.00
Engineering	\$350.40
Bonding	\$6.40
Subtotal	\$2,102.40
Profit	\$558.71
Total	\$2,661.11

Project Summary

Annual Savings	\$693.80
Installation Cost	\$2,661.11
Return On Investment (years)	3.84
Return On Investment (Months)	46.03

Cold Drink and Snack Vending Machine Energy Conservation Project

Energy Analysis Prepared For:

Henrico County

Input Variables	
Energy Costs (\$0.000 per kwh)	\$0.0538
Facility Occupied Hours per Week	75
Number of Cold Drink Vending Machines	8
Number of Uncooled Snack Machines	0
Power Requirements of Cold Drink Machine (avg watts)	400
Power Requirements of Snack Machine (avg watts)	80
VendingMiser Sale Price (for cold drink machines)	\$179.00
SnackMiser Sale Price (for snack machines)	\$79.00

Savings Analysis*

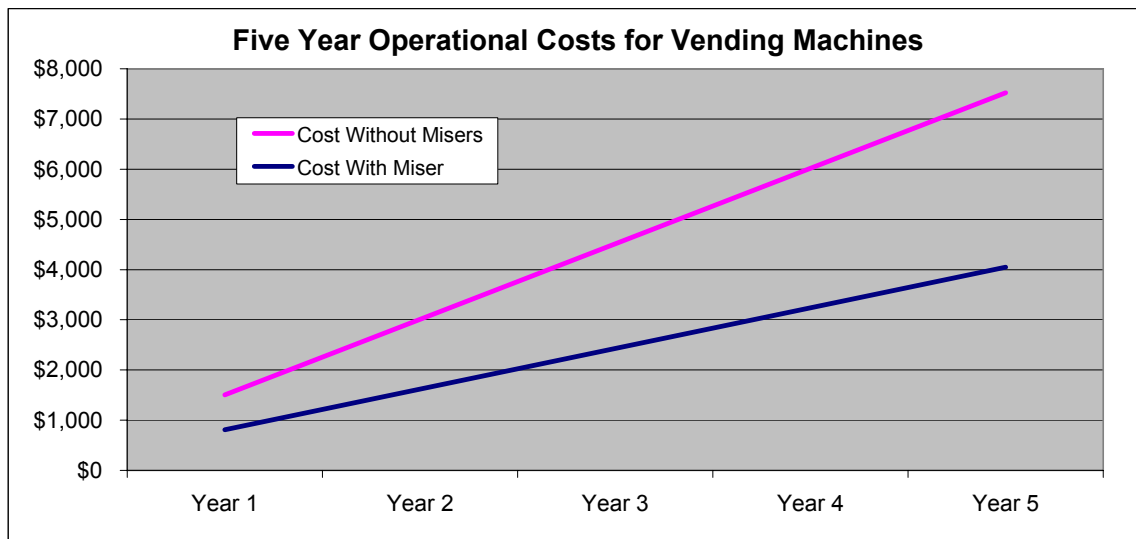
	Before	After	
Cold Drink Machines	\$1,503.99	\$810.18	Cost of Operation
	27,955	15,059	kWh
		46%	% Energy Savings
Snack Machines	\$0.00	\$0.00	Cost of Operation
	0	0	kWh
		0%	% Energy Savings

Project Summary

Present kWh	Projected kWh	kWh Savings per Year
27,955	15,059	12,896

Present Cost	Projected Costs	Annual Savings	Per Cent Savings	Total Project Cost	Break Even (Months)
\$1,503.99	\$810.18	\$693.80	46%	\$1,432.00	24.8

Five Year Savings on 8 Machines = \$3,469.02
Five Year Return on Investment = 142%



Version 1.0

	Year 1	Year 2	Year 3	Year 4	Year 5
Cost With Miser	\$810.18	\$1,620.37	\$2,430.55	\$3,240.74	\$4,050.92
Cost Without Misers	\$1,503.99	\$3,007.98	\$4,511.97	\$6,015.96	\$7,519.95
Total Number of machines	8				

* Savings results shown are estimates only. Estimates are based on average savings, as documented by hundreds of tests performed by independent parties. Actual "% Energy Savings" for individual machines may be higher or lower than estimated. All calculations depend upon the actual values for energy costs, facility occupied hours, machine power requirements and other variables.