



Report to Committee of the Whole

May 13, 2019

Subject: Energy and Greenhouse Gas (GHG) Emissions Update

Recommendation

This report is for the information of the Board.

Status

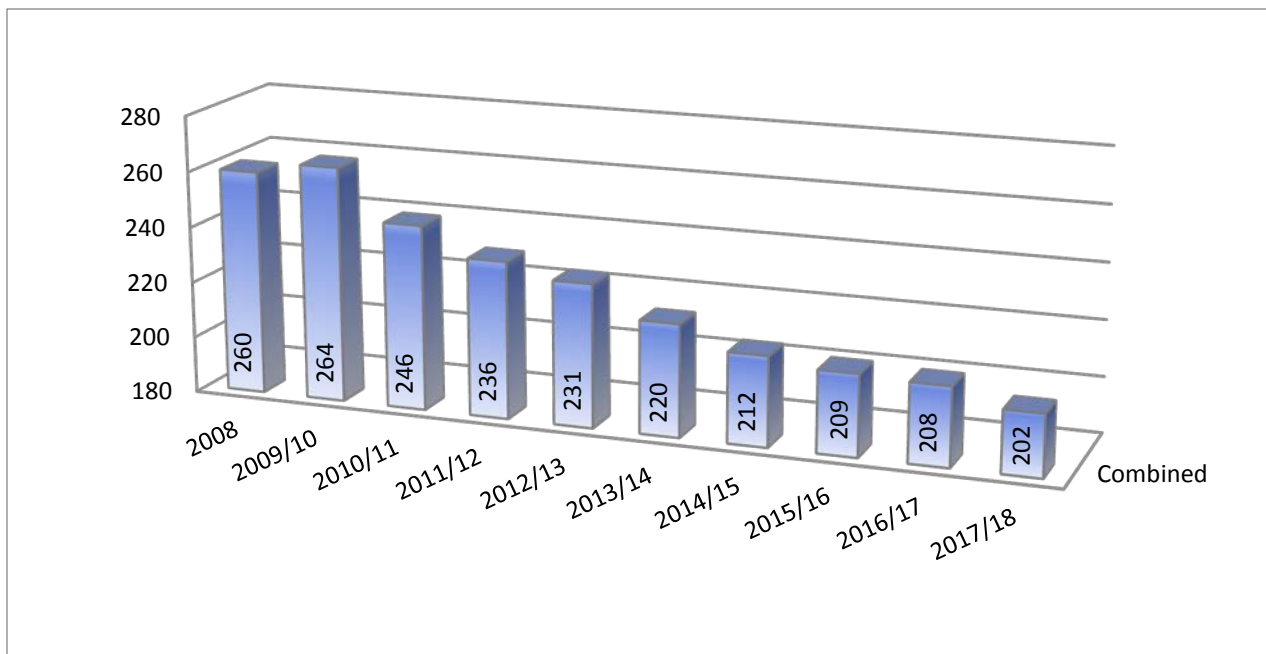
2017/18 Energy Use Intensity, Consumption and GHG Emissions

Energy Use Intensity (EUI) measured in Equivalent Kilowatt Hours per Square Metre (ekWh/m²) is used by the Waterloo Region District School Board (WRDSB) as the base unit for comparison purposes. This metric uses heating degree days to weather normalize the gas consumption from year to year, as its use is nearly exclusive for space heating. Total energy consumption is calculated by adding gas use to non-weather normalized electrical consumption.

Determining intensity involves accounting for square footage of all facilities in our inventory including portables and port-a-packs as well as changes to school areas due to additions or school closures. Leased facilities such as 151 Weber, are excluded.

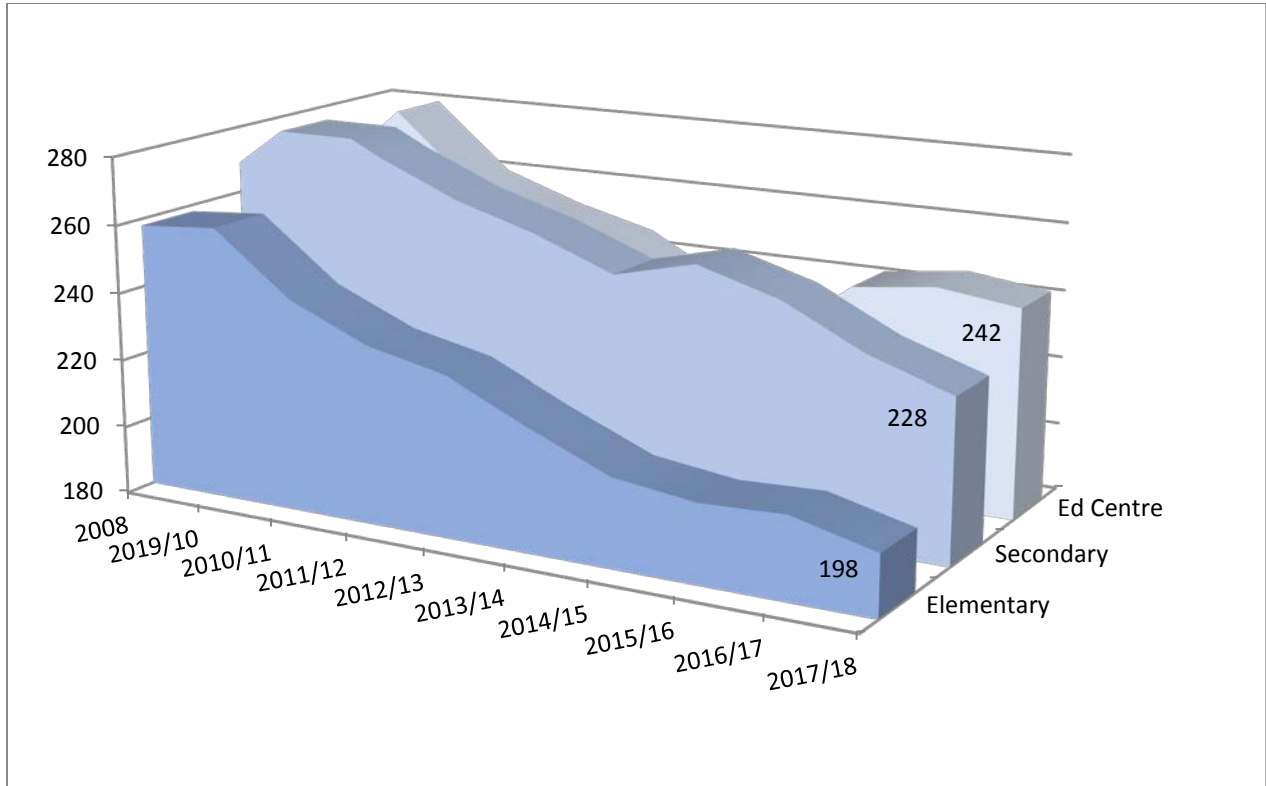
EUI is presented in Figures 1a and 1b as follows;

Figure 1a – Energy Use Intensity Combined (ekWh/m²) versus Year



The WRDSB has experienced a 22.3% reduction in our overall Energy Use Intensity when comparing 2017/18 to 2008. Overall reduction in electricity was 13.5% and natural gas was 25.8% during this same period.

Figure 1b – Energy Use Intensity by Panel (ekWh/m2) versus Year



Detailed energy use intensity for each school is presented in Appendix A for elementary and Appendix B for secondary schools and the Education Centre.

Consumption by commodity is an important factor that drives expenditures. Natural gas continues to be at a comparatively low cost to electricity. As such, a greater reliance on natural gas as a resource for heating continues to be beneficial for our operational budget but generates greater GHG emissions than utilizing electricity as a source of heat.

Air conditioning within schools continues to be endorsed by school administrators, parent councils and student senate, as a major improvement to the classroom environment in support of student achievement and health. Mechanical cooling is often implemented when renovations take place and as part of new schools and additions as it can be executed with greater efficiency, when combined with the construction project and installed when updates to building controls and improvements to the building envelope take place. Cooling by great extent, uses electricity and its GHG emissions impact is much less than that of gas fired heat.

GHG emissions are tabulated based on Ministry of Energy criteria for GHG emissions and include Carbon Dioxide (CO₂), Methane (CH₄) and Nitrous Oxide (N₂O), as the primary contributors to global warming.

GHG emissions are not all equal with respect to their contribution to atmospheric warming. The Intergovernmental Panel on Climate Change identifies the Global Warming Potential (GWP) factors for all GHG emissions in their Assessment Reports. GWPs are used to convert mass emissions of each GHG emission to carbon dioxide equivalent (CO₂e) units. By converting to equivalent units, all GHG emissions can be summed on a consistent basis.

GHG emissions are shown in Figures 2a and 2b as follows;

Figure 2a – Greenhouse Gas Emissions Combined (kGHG/m²) versus Year

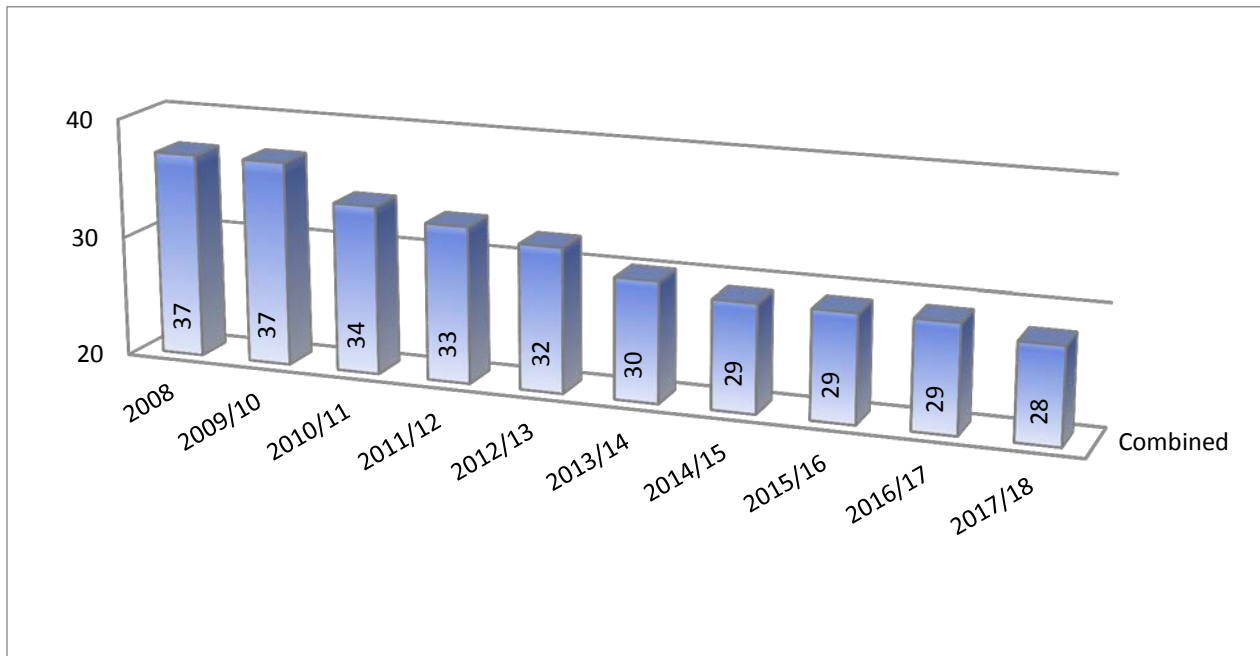
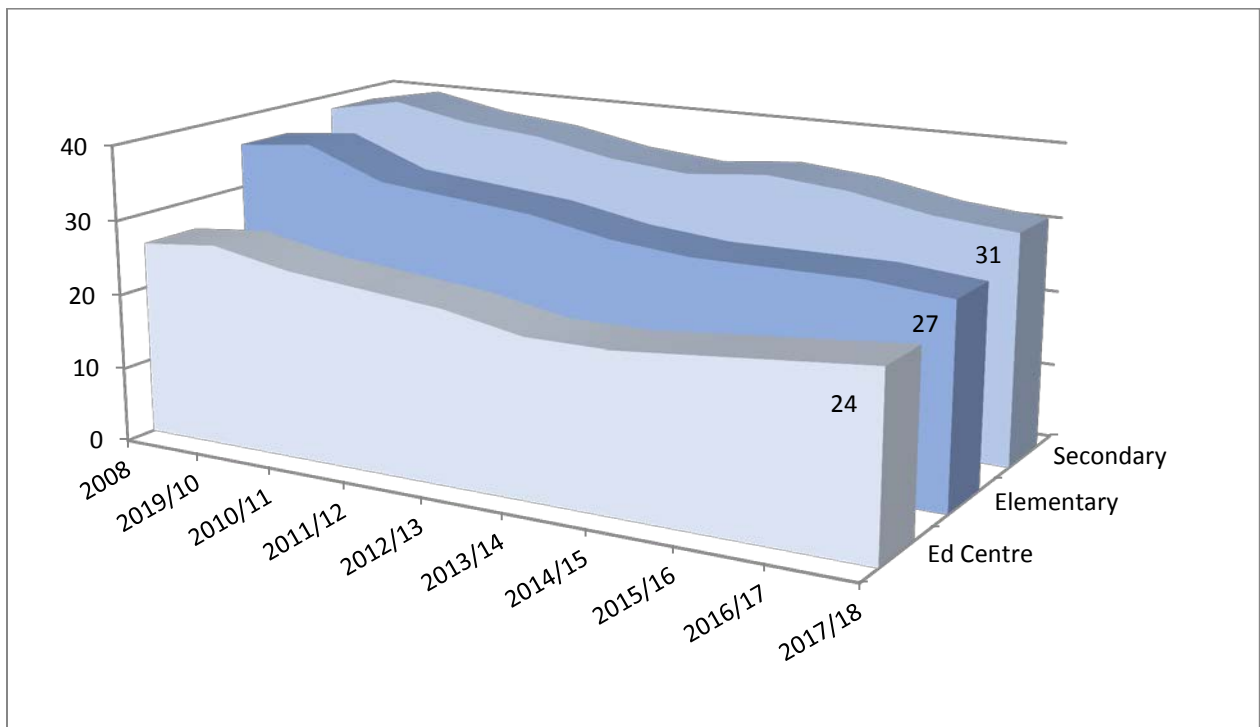


Figure 2b – Greenhouse Gas Emissions by Panel (kGHG/m²) versus Year



Detailed GHG emissions for each school is presented in Appendix C for elementary and Appendix D for secondary schools and the Education Centre.

Energy consumption and expenditures for 2017/18 are presented in Figures 3 and 4 respectively;

Figure 3 – Energy Consumption by Commodity

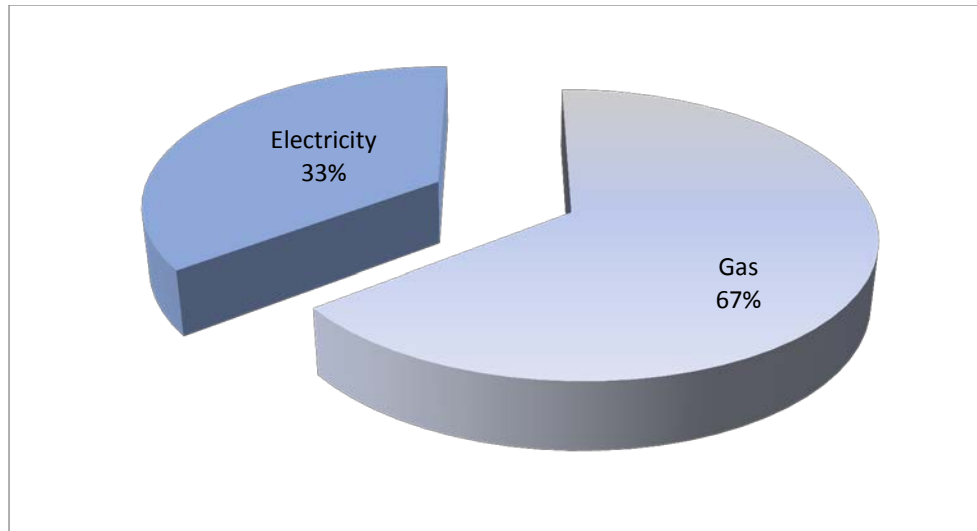
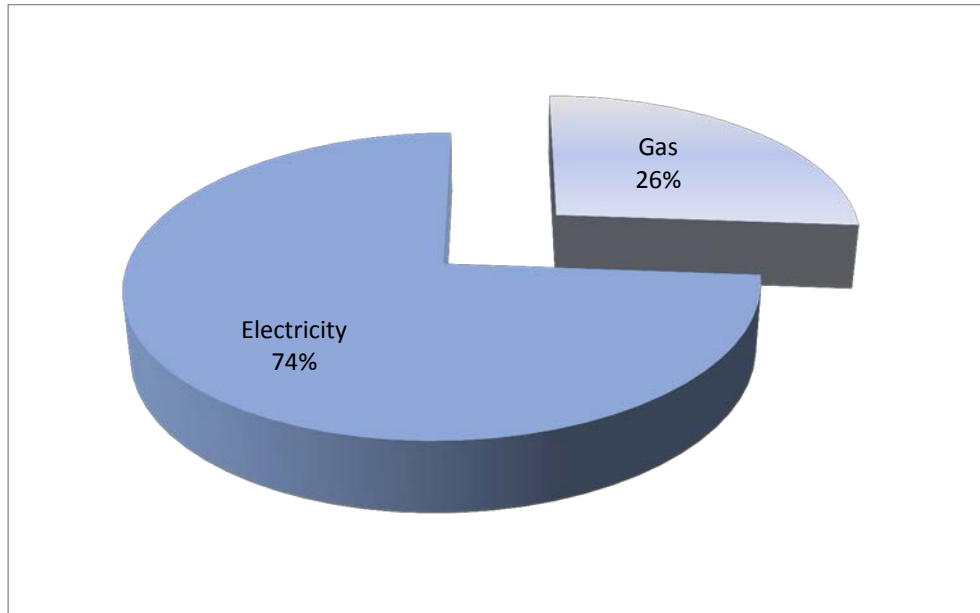


Figure 4 – Energy Expenditures by Commodity



On average for 2017/18, gas cost was approximately 3.0 cents per ekWh and electricity cost was approximately 16.7 cents per ekWh with a combined cost for both commodities at 7.5 cents. The combined utility cost appears to have stabilized and remains consistent from that of the previous years.

Energy intensity and resulting GHG emissions are driven by consumption. Consumption is an aspect over which the WRDSB and its stakeholders have partial control. Factors that are controllable may include:

- Student and staff behavior (i.e. turning lights off when not in use)
- Waste minimization (i.e. proper temperature control and time of day use)
- Efficient technologies (i.e. high part load efficiency compressors, LED lighting)
- Occupancy sensors and building automation systems (i.e. motion controls for lighting, CO2 based demand for ventilation air)
- Building envelope improvements (i.e. 40% max window to wall ratio, low E glass)
- Reduction of equipment power use and heat gain (i.e. LED lighting require less space cooling, Chromebooks and tablets charged at home)
- Designated periods of set-back and/or shut down (i.e. synchronize cooling with instructional days and classroom hours)

Consumption is also driven by factors beyond stakeholder control and can include factors such as:

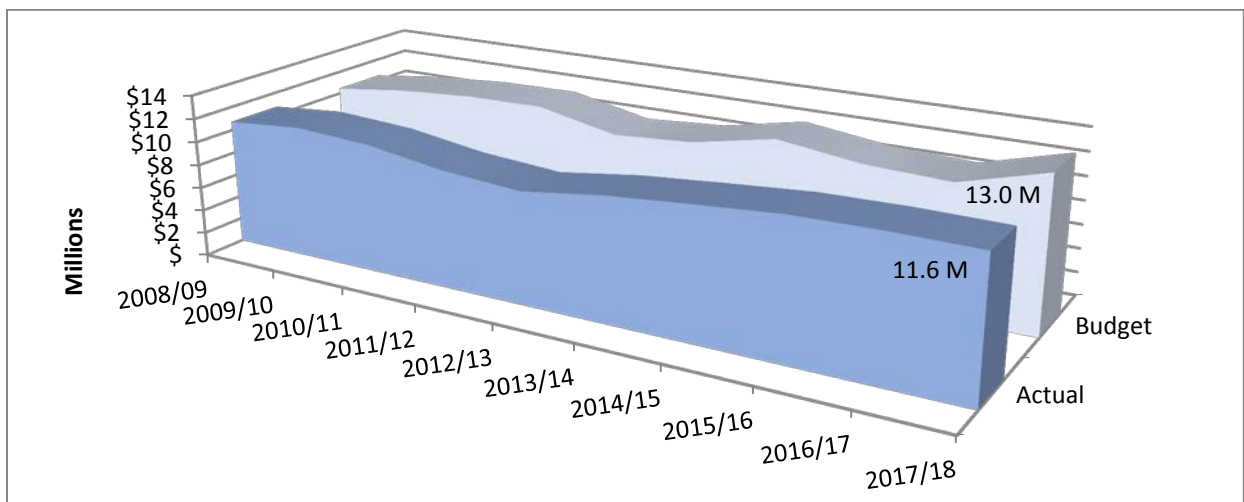
- Weather (i.e. warmer summer and shoulder season drives cooling demand)
- Hours of operation (i.e. extended use Ministry initiatives such as Community Use)
- School closures (i.e. disposal of redundant school sites, surplus port-a-packs and portables)
- Expansion of facilities and square footage (i.e. new schools or school additions)

Energy Budget and Expenditure

A ten year history of the WRDSB budgets and expenditures for electricity and gas are presented in Appendix E. The WRDSB gas and electricity budget for 2017/18 was \$13.0M and expenditures were \$11.6M. Figure 5 presents the WRDSB's budget versus expenditures since 2008.

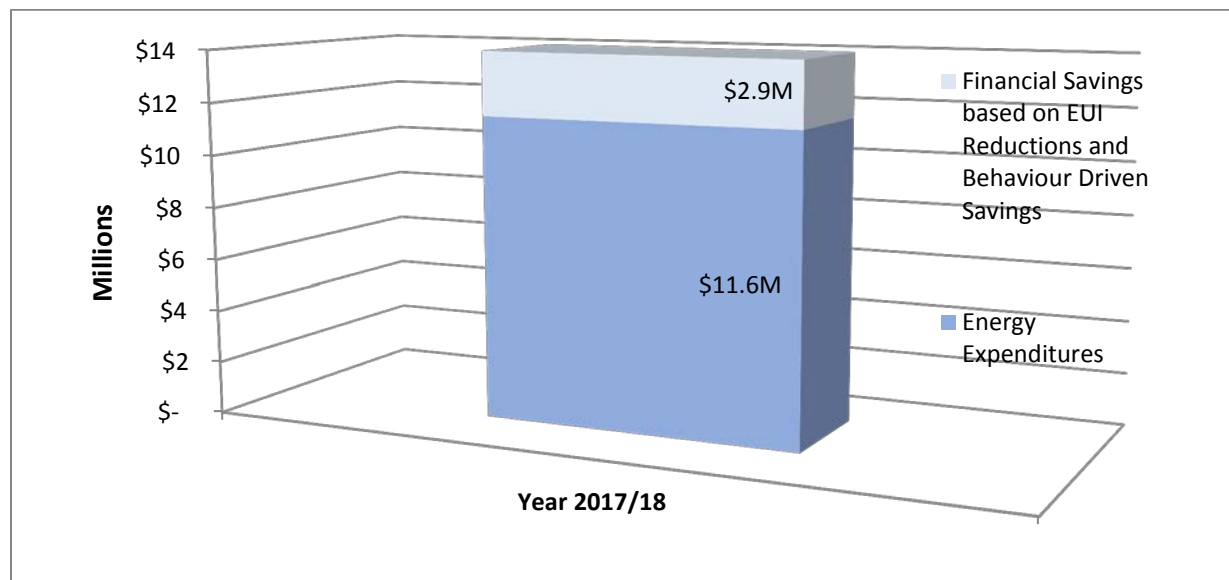
It is important to note when reviewing this information that budget and actual expenses cannot be compared directly year over year as a metric for operational efficiencies. Consumption is user and weather dependent and costs are market dependent. Market pricing and weather is something the WRDSB has limited to no control over and both fluctuate year to year.

Figure 5 – Budget and Expenditures (Dollars) versus Year



Costs offset by energy efficiency measures, from gains through building upgrades and changes in occupant practices, are estimated as noted below. This compares the base line EUI for 2008 at 260 ekWh/m² vs the EUI for 2017/18 at 202 ekWh/m² with both at the current cost of 7.5 cents. Figure 6 represents almost \$2.9M in offset costs for 2017/18 due to EUI reductions and behaviour driven savings.

Figure 6 – Reduction as compared to base line (Dollars) for 2017/18



Regardless of our best efforts to reduce consumption by driving down EUI, energy costs are likely to continue to rise in the future. Offsetting these costs by reducing our EUI is critical to minimizing the anticipated increases in future budgets and expenditures.

Operations

Changing human behaviour is our most promising as well as our most challenging area in resource conservation. Presentations by Facility Services staff to students and educators at schools, as well as custodial and maintenance personnel, administrators and others continue to raise awareness and training.

Changing some everyday habits to conserve energy included memos and notices to schools in encouraging turning lights off when not in need, eliminating the habit of propping vestibule doors open during winter months and limiting the use of personal heaters in schools. These messages continue throughout the year raising awareness and the importance of saving energy.

The continuation of the Summer Experience Program (SEP) or Canada Summer Jobs (CSJ) program, assisting Facility Services with energy efficiency and resource conservation, was not funded for WRDSB in 2018 by the Province or the Government of Canada. It's anticipated the CSJ program may again be funded in 2019 but feedback from the Ministry of Employment and Social Development has not yet flowed through.

The new Sustainability Working Group has met three times this past year and has gained participation with teachers, Learning Services, Facility Services, Planning Department and Financial Services, and will continue to support competency development among central services and schools.

The continued implementation of Preventative Maintenance (PM) programs and reallocation of staff to further support building maintenance and controls in order to improve performance extends the working life of equipment and its efficient operation.

This continues to be a challenge despite increases in square footage and equipment, our trade staff compliment has remained stagnant since 2008.

Technologies

As we maintain, construct new or renew older schools, Facility Services continue to implement suitable energy efficiency technologies. Those of greatest impact include;

- Energy modeling of new schools with targets for architects and engineers on exceeding building energy codes by 25% or more
- Design Briefs for architects and designers to ensure roofs, windows, vestibules and other building envelope components are designed and constructed in a energy efficient manner
- LED lighting throughout all WRDSB facilities to replace fluorescent and HID lamps, implemented each time renovations occur or when repairs or replacement of lamps or fixtures is required
- Conversion from pneumatic to DDC building controls implemented each time renovations occur
- Commissioning of boiler and HVAC equipment fresh air dampers and pneumatic building controls, in particular for older / poor performing schools
- Provision of condensing boilers and water heaters whenever possible when replacing older heating plants

However, less significant technologies and pilot continue to assist in the toolbox required to efficiently operate schools.

In addition, a number of pilot programs continue to pursue energy and resource conservation, including;

- Cooling through high efficiency Variable Refrigerant Flow (VRF) electric or Gas Heat Pump (GHP) systems
- Load shedding cooling controls for secondary schools offering a summer program
- Eyedro and AlertLabs point of use remote power or water monitoring meters
- Installation of water meters and monitoring at all cooling towers and play field irrigation systems
- Desiduous shade trees and glazing / overhang orientation in strategic areas to minimize solar heat gain
- Envelope thermography to assist in determining breaches in the building
- Replacement of free flowing urinal tanks with low flow flush valves or installation of timers
- Media Induced Crystallization (MIC) in place of water softeners to reduce salt / water use and maintenance needs
- Direct replacement LED lamps or light fixtures for non-renovated spaces as part of regular school maintenance

As implementations of these technologies help reduce consumption, Business Services staff intends to continue the expansion and use of such technologies in line with available funding, while targeting a reasonable, 3 year to 7.5 year, return on investment (ROI). It should be noted that while technology is a great resource to reduce consumption, our greatest opportunity to leverage reductions is to change behaviours and reduce waste.

The WRDSB has been an observing member of Sustainable Waterloo for three years and will become a pledging member and our setting of target reductions for GHG

emissions will be published by sustainable Waterloo and detailed in the WRDSB's new five year Energy Conservation and Demands Management Plan

Renewables

The WRDSB received approximately \$1M for five renewable energy projects from the Ministry in 2010/2011. These projects were completed in late 2011 and have generated more than \$324,400 in revenue over 81 months of operation. Appendix F presents a summary of photovoltaic production and revenues.

It is important to recognize that despite generating significant revenue, the payback on the \$1M capital investment under the MicroFIT program at 80 cents per kWh provides a 20.8 year payback. This time frame would be significantly longer if not subsidized at 80 cents per kWh rate.

Incentives and Reinvestment

In addition to the projects implemented and the saving generated through reduced consumption, the WRDSB has actively sought out incentive programs that generate savings that can be reinvested into schools and further help with resource conservation board wide.

Since 2009, the WRDSB has received more than \$0.5M in incentives from partners that include:

- Cambridge and North Dumfries, Kitchener Wilmot and Waterloo North Hydro
- Reliance Commercial Solutions
- Region of Waterloo
- Union Gas

These incentives continue to be reinvested each year into upgrades directly related to energy conservation. Appendix F presents the recent energy and sustainability enhancements funded from these incentives.

Background

The Green Energy Act (O.Reg. 397/11), came into effect in 2009 repealed the Energy Conservation Leadership Act and the Energy Efficiency Act. Under this Act the Ministry Education implemented the Utility Consumption Database (UCD). The UCD reports on annual utility consumption and GHG emissions for more than 5,000 schools and administrative buildings across 72 boards and required the implementation of a 5 year Conservation and Demand Management Plan (CDMP) initiated in 2013/14 and due for reporting to the Ministry of Education in June 2019. The WRDSB targeted reduction in energy of 6.1% was surpassed by a reasonable margin for a total reduction of approx. 9.5% over the same period.

The Board is currently working on the next phase of the CDMP and associated GHG emission reductions with the official format and timelines and yet to be outlined by the Province.

It should be noted that the Green Energy Act was repealed on January 1, 2019.

In school calendar years 2009/10, 2010/11, and 2011/12, Business Services provided energy updates to the Board through the Energy Efficient School Funding (EESF) annual capital report. EESF funding targeted capital investment into schools that were below the

average in terms of energy performance and was discontinued by the Ministry at the end of 2011/12.

From 2012/13 to 2016/17 capital funding through School Renewal (SR), School Condition Improvement (SCI) or new capital investment supported energy efficiency measures as Business Services continued to deliver capital projects across the region.

Funding for energy efficiency and GHG emission reductions was made available in April of 2018 through the GHG Emission Reduction Fund with \$1.6M in projects successfully implemented.

Financial Implications

While the utility budget may represent less than two percent of the overall Board budget, the active management of the utility portfolio is required to mitigate risk exposure as cost over runs or savings can have a significant impact on the operating budget.

The utility budget will continue to be monitored regularly and developed on an annual basis within Business Services in consultation with external agencies as required (consortium, Ministry, OMC Energy Sub-Committee, School Energy Coalition), Coordinating Council, and brought forward through regular budget deliberations.

Communications

The Green Energy Act required that this Energy Update be presented to the Board and available publicly on an annual basis. In addition, the Energy Conservation and Demand Management Plan and Energy Consumption and Greenhouse Gas Emission annual reports, as available through the UCD, are available in hard copy at the Education Centre or online for public access as required under the Green Energy Act:

- [Energy Conservation and Demand Management Plan](#)
- [Energy Conservation at the Waterloo Region District School Board](#)

It is intended that this report be shared with the Sustainability Working Group, the Elementary Accommodation Committee (EAC), and Secondary Accommodation Committee (SAC) in an effort to enhance awareness and build a knowledge base and momentum for energy conservation in the schools.

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**WATERLOO REGION DISTRICT SCHOOL BOARD
BUSINESS SERVICES DIVISION
FACILITY SERVICES DEPARTMENT
ENERGY AND GREENHOUSE GAS UPDATE
ANNUAL ENERGY USE INTENSITY - ELEMENTARY SCHOOLS**

Fiscal Year (Sep to Aug) or Calendar Year (Jan to Dec) as available

School	2008 EkWh/m ²	2009/10 EkWh/m ²	2010/11 EkWh/m ²	2011/12 EkWh/m ²	2012/13 EkWh/m ²	2013/14 EkWh/m ²	2014/15 EkWh/m ²	2015/16 EkWh/m ²	2016/17 EkWh/m ²	2017/18 EkWh/m ²
A R Kaufman P.S.	212	267	244	234	239	229	186	204	176	185
Abraham Erb P.S.	189	166	173	167	171	162	157	148	148	146
Alpine P.S.	287	330	318	334	307	284	285	293	296	286
Avenue Road P.S.	242	400	331	197	170	180	173	172	180	173
Ayr P.S.	238	292	277	268	257	246	220	213	209	212
Baden P.S.	232	176	168	156	161	163	166	153	155	160
Blair O.E.C.	Unavail	297	267	292	271	266	250	280	205	220
Blair Road P.S.	422	249	224	246	212	214	208	214	191	190
Breslau P.S.	336	393	268	267	248	330	236	226	231	219
Bridgeport P.S.	246	241	245	269	262	186	160	161	108	172
Brigadoon P.S.	199	296	213	181	185	188	162	154	169	168
Cedar Creek P.S.	211	206	182	174	175	184	168	174	187	185
Cedarbrae P.S.	289	245	308	264	255	245	250	241	238	225
Centennial (Camb) P.S.	269	286	254	251	266	244	224	228	237	226
Centennial (Wloo) P.S.	389	264	244	246	247	253	233	226	232	238
Central P.S.	269	294	268	284	277	272	261	274	265	214
Chalmers Street P.S.	265	274	288	316	267	253	232	229	204	206
Chicopee Hills P.S.	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	151
Clemens Mill P.S.	223	219	206	209	213	203	221	248	225	219
Conestogo P.S.	261	271	252	273	244	235	221	249	236	212
Coronation P.S.	440	378	364	326	329	318	327	342	354	343
Country Hills P.S.	190	224	229	301	268	226	215	179	168	170
Courtland Senior P.S.	246	254	244	219	223	269	222	194	182	203
Crestview P.S.	242	322	299	279	311	291	313	288	292	288
Dickson P.S.	184	183	185	161	171	169	96	Disposed	Disposed	Disposed
Doon P.S.	279	304	281	219	211	200	164	151	167	196
Driftwood Park P.S.	232	199	183	185	180	179	190	151	121	159
Edna Staebler P.S.	Not Open	171	159	149	158	155	155	140	143	142
Elgin Street P.S.	196	226	204	187	196	187	179	194	202	220
Elizabeth Ziegler P.S.	272	278	268	251	226	234	236	234	215	180
Empire P.S.	238	246	239	227	239	158	203	209	208	207
Floradale P.S.	209	191	218	233	232	202	176	217	200	177
Forest Glen P.S.	281	260	240	221	202	228	210	195	201	205
Forest Hill P.S.	316	269	246	248	208	196	192	224	213	227
Franklin P.S.	236	258	233	234	227	215	206	215	260	241
Glencairn P.S.	156	177	182	173	187	210	181	168	181	185
GrandView (Camb) P.S.	230	251	239	143	168	171	159	150	169	156
Grandview (NH) P.S.	197	326	228	233	217	215	187	199	187	189
Groh P.S.	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	125
Hespeler P.S.	206	205	184	166	168	177	173	158	163	165
Highland P.S.	326	281	275	204	189	202	201	211	213	203
Hillcrest P.S.	232	221	209	191	205	181	179	157	152	158
Howard Robertson P.S.	407	343	335	280	287	257	264	281	185	285
J F Carmichael P.S.	217	198	192	183	161	169	164	174	169	163
J.W. Gerth P.S.	Not Open	125	137	120	141	146	147	133	159	144
Jean Steckle PS	Not Open	Not Open	Not Open	Not Open	Not Open	146	119	122	121	127
John Darling P.S.	179	215	170	171	177	180	192	181	180	178
John Mahood P.S.	323	258	228	221	213	189	181	178	173	178
Keatsway P.S.	250	197	172	154	132	149	144	143	147	147
King Edward P.S.	594	268	261	252	256	243	272	332	266	236
Lackner Woods P.S.	192	213	203	210	209	215	214	199	196	223
Laurelwood P.S.	223	235	216	220	205	204	199	186	178	177
Laurentian P.S.	293	321	303	264	258	299	356	255	285	242
Lester B. Pearson P.S.	217	173	171	173	175	161	163	150	155	142
Lexington P.S.	307	287	291	261	256	289	223	237	236	230
Lincoln Avenue P.S.	289	358	332	330	313	149	143	Disposed	Disposed	Disposed
Lincoln Heights P.S.	298	258	232	233	234	209	197	286	289	213
Linwood P.S.	356	268	252	273	247	248	234	244	229	210
MacGregor Sr P.S.	201	212	204	201	202	194	188	202	198	204
MacKenzie King P.S.	294	319	299	313	281	295	211	214	220	214
Manchester P.S.	281	316	304	286	258	246	189	176	157	138

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Margaret Avenue P.S.	229	285	198	236	237	191	243	259	369	238
Mary Johnston P.S.	174	176	176	175	165	180	166	163	160	155
McQuarrie Centre	539	531	561	411	522	421	294	262	272	261
Meadowlane P.S.	225	271	270	255	247	246	228	211	257	251
Millen Woods P.S.	Not Open	Not Open	196	153	162	165	149	152	155	156
Moffat Creek P.S.	Not Open	Not Open	Not Open	Not Open	138	123	114	134	132	128
N A MacEachern P.S.	326	338	317	250	256	248	276	214	203	197
New Dawn	412	424	403	430	368	260	204	166	170	146
New Dundee P.S.	188	215	205	209	208	189	192	193	195	198
Northlake Woods P.S.	311	234	241	234	217	195	189	201	211	194
Park Manor P.S.	341	313	284	272	276	273	271	206	335	353
Parkway P.S.	289	260	256	280	337	260	234	224	215	233
Pioneer Park P.S.	236	274	248	255	260	219	215	208	235	225
Preston P.S.	180	188	194	191	191	175	157	158	166	168
Prueter P.S.	169	286	277	219	259	239	190	201	212	212
Queen Elizabeth P.S.	220	252	251	277	268	232	200	229	271	241
Queensmount Sr P.S.	400	309	342	324	258	282	321	252	257	304
Riverside P.S.	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	141	136
Riverside (old location)	171	217	175	175	186	151	128	126	87	91
Rockway P.S.	265	311	281	311	257	311	265	311	299	285
Rosemount P.S.	245	299	287	269	271	267	294	303	306	292
Ryerson P.S.	260	264	246	199	207	200	192	176	189	200
Saginaw P.S.	250	281	248	232	251	237	229	232	223	218
Sandhills P.S.	238	251	226	224	246	231	202	193	205	194
Sandowne P.S.	285	206	221	293	274	246	255	238	226	181
Sheppard P.S.	224	277	268	249	241	245	237	217	212	252
Silverheights P.S.	229	209	203	186	183	157	143	143	155	143
Sir Adam Beck P.S.	Not Open	Not Open	124	164	130	132	130	131	131	132
Smithson P.S.	216	259	249	255	250	191	235	228	222	234
Southridge P.S.	284	318	294	183	287	269	300	255	290	292
St Andrew's P.S.	247	191	196	173	174	169	170	175	156	164
St Jacobs P.S.	236	253	250	235	239	233	218	220	223	223
Stanley Park P.S.	299	331	314	299	280	309	256	246	270	251
Stewart Avenue P.S.	270	306	191	170	179	163	166	171	190	169
Suddaby P.S.	149	197	192	192	146	154	153	151	148	150
Sunnyside P.S.	226	243	218	198	205	204	204	188	185	186
Tait Street P.S.	227	243	241	229	230	236	173	173	180	177
Three Bridges P.S.	193	200	187	193	169	175	92	Disposed	Disposed	Disposed
Trillium P.S.	262	342	255	251	253	245	221	239	243	227
Vista Hills P.S.	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	144	131
W.T. Townshend P.S.	158	161	156	139	147	151	141	138	129	133
Wellesley P.S.	243	261	252	242	243	235	219	202	215	205
Westheights P.S.	309	339	255	232	235	228	232	229	210	233
Westmount P.S.	244	256	248	223	241	235	371	166	133	137
Westvale P.S.	151	145	141	128	140	132	131	125	129	132
William G. Davis P.S.	308	410	331	328	303	288	270	277	282	261
Williamsburg P.S.	159	149	145	149	150	154	153	139	157	145
Wilson Avenue P.S.	225	185	234	223	226	226	214	181	192	181
Winston Churchill P.S.	217	234	216	163	179	178	194	201	207	194
Woodland Park P.S.	177	191	179	167	162	152	152	142	139	127
Wrigley's Corners O.E.C.	Unavail	251	225	282	236	230	244	249	223	228
Energy Intensity Average (EkWh/m2)	258	260	242	231	227	216	206	203	205	198

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Bluevale C.I.	274	291	237	249	255	241	240	231	214	230
Cameron Heights C.I.	385	379	368	357	337	338	597	398	358	299
Eastwood C.I.	211	237	221	213	224	249	228	229	198	205
Elmira District S.S.	278	303	277	258	238	227	238	237	247	220
Forest Heights C.I.	325	328	321	341	287	273	263	247	257	296
Galt C.I.	254	248	258	296	287	273	262	265	262	241
Glenview Park S.S.	275	298	313	284	275	242	218	218	201	201
Grand River C.I.	244	283	264	246	260	250	254	260	228	220
Huron Heights S.S.	252	280	282	264	272	238	224	247	236	226
Jacob Hespeler S.S.	219	281	290	250	265	249	211	249	209	184
Kitchener-Waterloo C. & V.S.	291	269	266	251	253	261	232	229	226	223
Preston H.S.	260	306	267	259	257	260	245	259	257	254
Sir John A. Macdonald S.S.	246	257	242	240	218	205	199	210	210	206
Southwood S.S.	275	225	193	177	164	162	156	158	161	157
Waterloo C.I.	265	278	272	249	256	246	233	240	242	240
Waterloo-Oxford District S.S.	243	322	321	307	281	271	274	283	265	248
Energy Intensity Average (EkWh/m²)	269	287	275	265	258	249	255	251	237	228
Education Centre (EkWh/m²)	258	280	260	252	246	233	223	242	245	242

**WATERLOO REGION DISTRICT SCHOOL BOARD
BUSINESS SERVICES DIVISION
FACILITY SERVICES DEPARTMENT**

**ENERGY AND GREENHOUSE GAS UPDATE
ANNUAL GREENHOUSE GAS INTENSITY - ELEMENTARY SCHOOLS**

Fiscal Year (Sep to Aug) or Calendar Year (Jan to Dec) as available

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A R Kaufman P.S.	26	36	31	30	30	29	22	27	21	23
Abraham Erb P.S.	25	21	21	21	21	19	20	19	19	19
Alpine P.S.	40	46	45	48	43	40	40	42	43	41
Avenue Road P.S.	36	64	52	29	23	24	24	23	25	23
Ayr P.S.	38	46	44	43	40	38	32	31	30	30
Baden P.S.	31	19	18	18	18	17	19	17	18	19
Blair O.E.C.	unavail	50	44	47	43	41	39	45	31	32
Blair Road P.S.	56	31	26	30	26	26	25	26	22	21
Breslau P.S.	53	62	39	39	34	45	33	32	33	30
Bridgeport P.S.	37	35	35	40	39	25	21	22	12	23
Brigadoon P.S.	20	36	24	18	18	17	16	15	17	17
Cedar Creek P.S.	26	27	22	20	20	21	19	19	23	20
Cedarbrae P.S.	44	36	46	38	37	36	37	36	35	33
Centennial (Camb) P.S.	39	42	35	34	38	34	31	33	35	33
Centennial (Wloo) P.S.	63	40	37	37	38	39	35	34	35	32
Central P.S.	40	45	40	42	43	41	40	43	42	32
Chalmers Street P.S.	38	39	37	41	37	34	30	30	27	26
Chicopee Hills P.S.	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	21
Clemens Mill P.S.	27	25	22	23	24	25	25	30	27	26
Conestogo P.S.	38	39	36	39	34	32	31	35	34	29
Coronation P.S.	69	58	54	49	48	47	49	53	57	54
Country Hills P.S.	17	19	20	39	32	28	28	22	20	20
Courtland Senior P.S.	38	39	38	33	34	41	33	29	27	31
Crestview P.S.	37	50	47	43	49	45	49	44	46	45
Dickson P.S.	27	27	27	24	26	26	16	Disposed	Disposed	Disposed
Doon P.S.	40	45	41	31	29	27	24	22	24	28
Driftwood Park P.S.	27	22	19	20	18	17	20	14	10	16
Edna Staebler P.S.	Not Open	20	18	17	18	17	18	17	17	17
Elgin Street P.S.	23	27	23	21	23	21	21	23	24	29
Elizabeth Ziegler P.S.	44	46	44	41	35	35	36	36	31	27
Empire P.S.	33	35	33	31	33	20	28	29	28	27
Floradale P.S.	27	24	28	30	30	24	22	29	24	21
Forest Glen P.S.	41	38	34	31	29	32	30	27	26	26
Forest Hill P.S.	49	40	37	38	31	28	27	33	32	34
Franklin P.S.	34	36	32	33	32	30	29	30	38	35
Glencairn P.S.	18	22	22	22	24	29	24	22	25	25
GrandView (Camb) P.S.	35	39	37	21	19	17	18	17	21	17
Grandview (NH) P.S.	30	50	33	34	31	28	26	29	27	27
Groh P.S.	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	17
Hespeler P.S.	23	24	22	20	19	21	20	18	19	18
Highland P.S.	50	42	41	29	25	28	29	31	32	30
Hillcrest P.S.	31	28	25	24	25	24	25	22	21	22
Howard Robertson P.S.	63	54	53	43	44	39	40	44	44	44
J F Carmichael P.S.	31	28	27	26	22	24	23	25	24	23
J.W. Gerth P.S.	Not Open	14	16	14	15	15	18	16	19	17
Jean Steckle PS	Not Open	Not Open	Not Open	Not Open	Not Open	16	11	11	11	11
John Darling P.S.	24	31	22	22	23	24	27	26	26	26
John Mahood P.S.	43	33	28	28	26	23	23	23	21	21
Keatsway P.S.	31	24	19	17	13	15	17	17	17	17
King Edward P.S.	103	43	42	41	41	39	44	55	44	38
Lackner Woods P.S.	19	23	22	24	23	23	23	23	22	28
Laurelwood P.S.	26	26	22	22	21	22	21	20	19	21
Laurentian P.S.	42	48	46	39	39	45	56	39	45	38
Lester B. Pearson P.S.	20	16	16	18	18	18	19	16	17	16
Lexington P.S.	45	42	42	38	39	45	34	37	35	34
Lincoln Avenue P.S.	42	52	48	48	46	22	21	Disposed	Disposed	Disposed
Lincoln Heights P.S.	46	38	34	35	35	31	29	44	45	31
Linwood P.S.	54	39	36	40	36	36	33	36	32	30
MacGregor Sr P.S.	29	31	29	28	28	27	27	29	29	29
MacKenzie King P.S.	42	48	45	47	41	43	30	31	32	31
Manchester P.S.	44	50	48	45	40	37	24	24	22	18

**WATERLOO REGION DISTRICT SCHOOL BOARD
BUSINESS SERVICES DIVISION
FACILITY SERVICES DEPARTMENT**

**ENERGY AND GREENHOUSE GAS UPDATE
ANNUAL GREENHOUSE GAS INTENSITY - ELEMENTARY SCHOOLS**

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Margaret Avenue P.S.	33	43	28	35	36	26	35	38	58	36
Mary Johnston P.S.	20	23	24	24	21	24	21	21	23	21
McQuarrie Centre	87	88	93	70	91	72	50	45	47	45
Meadowlane P.S.	26	35	34	34	31	30	26	24	33	30
Millen Woods P.S.	Not Open	Not Open	25	17	18	19	16	17	18	18
Moffat Creek P.S.	Not Open	Not Open	Not Open	Not Open	18	16	13	16	16	15
N A MacEachern P.S.	46	42	39	30	31	28	34	26	26	24
New Dawn	65	72	64	68	58	43	32	29	30	22
New Dundee P.S.	29	32	30	31	30	28	29	29	29	30
Northlake Woods P.S.	45	31	32	32	30	26	25	26	25	25
Park Manor P.S.	49	47	40	38	39	37	36	27	52	54
Parkway P.S.	39	35	34	39	43	34	30	29	28	30
Pioneer Park P.S.	29	40	35	35	36	30	29	29	33	31
Preston P.S.	21	22	22	23	24	23	20	20	22	22
Prueter P.S.	25	39	37	35	42	38	29	31	32	32
Queen Elizabeth P.S.	33	39	38	43	42	34	30	35	42	38
Queensmount Sr P.S.	62	48	52	51	39	42	49	38	39	45
Riverside P.S.	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	19	18
Riverside (old location)	20	25	21	21	23	19	16	17	12	14
Rockway P.S.	41	49	43	50	41	50	42	51	49	46
Rosemount P.S.	39	50	47	44	44	44	49	50	51	49
Ryerson P.S.	39	35	31	24	24	23	22	20	21	23
Saginaw P.S.	30	35	28	28	30	29	28	29	28	27
Sandhills P.S.	29	30	25	26	29	28	26	25	27	25
Sandowne P.S.	36	27	29	40	38	33	34	32	31	23
Sheppard P.S.	33	41	40	37	36	37	36	32	32	38
Silverheights P.S.	30	25	24	22	21	19	17	17	19	15
Sir Adam Beck P.S.	Not Open	Not Open	17	22	15	16	15	14	15	15
Smithson P.S.	35	42	40	41	40	30	37	37	34	37
Southridge P.S.	42	50	45	44	45	42	47	39	45	44
St Andrew's P.S.	37	27	28	24	23	23	23	25	22	23
St Jacobs P.S.	35	37	38	36	36	33	30	32	32	33
Stanley Park P.S.	45	51	47	45	42	47	38	37	41	38
Stewart Avenue P.S.	37	41	23	21	21	19	20	21	26	22
Suddaby P.S.	23	31	30	32	23	24	24	24	23	23
Sunnyside P.S.	33	37	33	30	30	30	31	28	27	28
Tait Street P.S.	34	36	36	34	34	33	25	25	25	24
Three Bridges P.S.	29	26	22	24	19	20	15	Disposed	Disposed	Disposed
Trillium P.S.	34	44	34	34	32	31	28	31	32	27
Vista Hills P.S.	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	Not Open	19	17
W.T. Townshend P.S.	15	15	15	14	14	17	17	15	15	16
Wellesley P.S.	35	39	38	37	36	34	32	29	31	29
Westheights P.S.	40	46	32	28	27	25	26	27	23	27
Westmount P.S.	27	31	29	28	28	26	48	22	17	16
Westvale P.S.	15	13	13	11	12	12	12	11	12	12
William G. Davis P.S.	49	66	52	52	47	45	42	44	45	41
Williamsburg P.S.	20	18	17	17	16	17	18	16	20	18
Wilson Avenue P.S.	28	24	31	29	29	29	27	22	24	23
Winston Churchill P.S.	31	35	31	21	23	23	26	28	29	25
Woodland Park P.S.	21	22	21	19	18	16	16	16	16	14
Wrigley's Corners O.E.C.	unavail	40	35	unavail	33	29	34	38	unavail	34
Green House Gas Intensity Average (kGHG/m²)	36	37	33	32	31	29	28	28	28	27

**WATERLOO REGION DISTRICT SCHOOL BOARD
BUSINESS SERVICES DIVISION
FACILITY SERVICES DEPARTMENT**

**ENERGY AND GREENHOUSE GAS UPDATE
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Bluevale C.I.	37	39	31	33	33	32	32	31	28	31
Cameron Heights C.I.	51	50	48	48	44	43	92	56	50	38
Eastwood C.I.	27	31	29	27	29	33	30	30	25	26
Elmira District S.S.	41	43	39	36	33	32	33	34	36	31
Forest Heights C.I.	48	48	46	51	42	39	37	35	38	45
Galt C.I.	38	34	36	43	42	39	37	37	37	34
Glenview Park S.S.	42	44	47	43	42	37	32	32	28	29
Grand River C.I.	32	40	36	34	36	34	35	37	31	30
Huron Heights S.S.	32	33	35	32	33	28	26	30	28	26
Jacob Hespeler S.S.	26	36	38	31	35	33	26	34	26	22
Kitchener-Waterloo C. & V.S.	44	40	39	37	37	39	34	33	33	32
Preston H.S.	40	47	39	39	38	38	37	39	39	38
Sir John A. Macdonald S.S.	30	31	28	28	25	23	23	24	24	23
Southwood S.S.	40	29	24	22	20	20	19	20	21	21
Waterloo C.I.	39	40	39	35	36	35	34	35	35	35
Waterloo-Oxford District S.S.	35	48	48	46	42	40	40	42	39	36
Green House Gas Intensity Average (kGHG/m²)	38	40	38	37	35	34	35	34	32	31
Education Centre (kGHG/m²)	26	27	25	24	23	21	21	22	23	24

**WATERLOO REGION DISTRICT SCHOOL BOARD
BUSINESS SERVICES DIVISION
FACILITY SERVICES DEPARTMENT**

**ENERGY AND GREENHOUSE GAS UPDATE
ENERGY BUDGET AND EXPENDITURES**

Commodity	2008/09		2009/10	
	Budget	Actual	Budget	Actual
Electricity	\$ 4,616,900	\$ 5,755,988	\$ 5,733,000	\$ 6,797,223
Gas	\$ 5,832,400	\$ 4,966,345	\$ 5,505,900	\$ 4,480,301
Total	\$ 10,449,300	\$ 10,722,333	\$ 11,238,900	\$ 11,277,524

Commodity	2010/11		2011/12	
	Budget	Actual	Budget	Actual
Electricity	\$ 6,759,525	\$ 6,549,661	\$ 6,809,909	\$ 6,572,072
Gas	\$ 4,915,515	\$ 4,352,896	\$ 4,958,342	\$ 3,357,832
Total	\$ 11,675,040	\$ 10,902,557	\$ 11,768,251	\$ 9,929,904

Commodity	2012/13		2013/14	
	Budget	Actual	Budget	Actual
Electricity	\$ 7,204,740	\$ 7,062,058	\$ 7,315,200	\$ 7,432,158
Gas	\$ 3,163,721	\$ 2,377,512	\$ 3,512,270	\$ 2,934,994
Total	\$ 10,368,461	\$ 9,439,570	\$ 10,827,470	\$ 10,367,152

Commodity	2014/15		2015/16	
	Budget	Actual	Budget	Actual
Electricity	\$ 9,213,000	\$ 8,018,535	\$ 8,263,900	\$ 8,803,203
Gas	\$ 3,007,590	\$ 2,934,994	\$ 3,055,500	\$ 2,686,392
Total	\$ 12,220,590	\$ 10,953,529	\$ 11,319,400	\$ 11,489,595

Commodity	2016/17		2017/18	
	Budget	Actual	Budget	Actual
Electricity	\$ 8,164,700	\$ 8,892,776	\$ 10,303,000	\$ 8,510,009
Gas	\$ 2,891,800	\$ 2,726,342	\$ 2,714,000	\$ 3,044,841
Total	\$ 11,056,500	\$ 11,619,118	\$ 13,017,000	\$ 11,554,850

**WATERLOO REGION DISTRICT SCHOOL BOARD
BUSINESS SERVICES DIVISION
FACILITY SERVICES DEPARTMENT
ENERGY AND GREENHOUSE GAS UPDATE
PHOTOVOLTAIC GENERATION AND REVENUES (LIFETIME)***

	kWh Production	Revenue
Blair Road P.S.	73,642	\$ 59,061
Forest Glen P.S.	84,825	\$ 68,029
Forest Heights C.I.	73,523	\$ 58,966
Lincoln Heights P.S.	83,323	\$ 66,825
Waterloo C.I.	<u>89,175</u>	<u>\$ 71,518</u>
Total	404,488	\$ 324,399

Notes:

* Based on energy produced between November and December 2011 through August 2018.

Links to websites are as follows:

Blair Road P.S.	http://www.cachelan.com/green/solarVuLive.php?ac=blairdps&dr=dakon
Forest Glen P.S.	http://www.cachelan.com/green/solarVu.php?ac=forestglenps
Forest Heights C.I.	http://www.foresthtsc.solarvu.net/green/solarVu.php?ac=foresthtsc
Lincoln Heights P.S.	http://lincolnhgtsp.solarvu.net/green/solarVuLive.php?ac=lincolnhgtsp&dr=dakon
Waterloo C.I.	http://www.waterlooci.solarvu.net/green/solarVu.php?ac=waterlooci

2017/18 Utility Rebates Reinvestments

SJAM and 3 others	Remote Monitoring Sensors on Main Water Meter
HHSS	LED Retrofit of Hallway and Corridor Lighting
Winston Churchill	Energy Efficient Destratification Fans in 3 Classrooms

2017/18 Capital Funded Energy Efficiency Upgrades

Abraham Erb	Lighting Occupancy Sensors for all Corrido's and LED Night Lights
HHSS and 5 others	Remote Monitoring Sensors on Main Water Meter
CHCI	Upgrade Office Area Building Controls to DDC
CHCI	Pneumatic to DDC Upgrade for 4 Main Air Handling Units
Clemmens Mill	Upgrade 8 Fan Coils and Zone Controls from Elec/Mech to DDC
Tait St	Energy Efficient Destratification Fans in 2 Classrooms
Vista Hills	Post Construction Commissioning of Building Controls
BCI and various others	Astronomical Clock Control for all Exterior