

Energy Analysis

Introduction

An initiative to reduce energy costs and consumptions began during the summer of 2014. The South Orange & Maplewood School District secured the services of CDM Smith (Camp Dresser McKee & Smith) to perform an energy audit for fourteen (14) facilities that were owned and operated by the South Orange & Maplewood School District to develop a comprehensive energy conservation and retrofit measures plan. The costs associated with this study qualified for reimbursement through the New Jersey Clean Energy Local Government Energy Audit Program. A full report was provided October 2014. The report included an evaluation of historical energy usage of the facilities and CDM Smith was successful in identifying opportunities for energy savings measures. Additionally CDM Smith evaluated the potential for renewal energy technologies to offset the district's electrical consumption. Specifically the use of solar panels and wind turbines were investigated. The findings were used to inform facility projects to reduce the district's consumption of energy.

The work presented followed an ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) level 1 and 2 energy audit. ASHRAE was founded in 1894, has more than 50,000 members worldwide, and the society focuses on building systems, energy efficiency, indoor air quality, refrigeration and sustainability.

The ASHRAE Level-1 audit is intended to establish a baseline for measuring improvements and where and how to focus efforts. Level-1 audits also outline the range of potential financial incentives available from Federal, State, Local, and Utility sources.

The ASHRAE Level-2 audit is intended to create a report describing a variety of Energy Efficiency Measures (EEMs) including no- and low-cost measures, modifications to system controls and building automation, operational changes, and potential capital upgrades.

Historical Energy Consumption

The following table summarizes the historical electrical consumption of each of the district's facilities. The data was obtained from the district's utility bills. These values serve as a bench marking tool to quantify energy consumption and energy reductions obtained from the implementation of recommended conservation and retrofit measures.

Historical Electrical Consumption (WH) by Location and School Year											
Location / School Year	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	Total
Marshall	406,060	434,700	387,650	402,410	383,950	391,980	395,140	349,690	798,030	238,140	4,187,750
Columbia	2,382,109	2,512,871	2,347,636	2,468,288	2,562,493	2,376,694	2,397,168	2,333,445	2,097,297	2,156,638	23,634,639
Clinton	417,290	394,230	362,185	420,220	383,605	396,560	359,835	372,804	339,960	250,539	3,697,228
Central Office	168,336	168,402	173,790	260,532	159,168	174,000	222,708	196,332	132,180	129,810	1,785,258
Jefferson	367,600	444,200	521,410	500,800	535,200	500,200	502,000	415,000	375,821	411,085	4,573,316
Maintenance	48,673	45,508	50,410	46,327	52,305	50,048	56,644	58,130	57,488	32,307	497,840
Maplewood	668,360	665,220	673,760	744,600	687,400	733,000	676,500	688,020	470,415	566,433	6,573,708
Montrose	60,680	82,680	62,380	55,640	63,660	75,620	25,640	5,220	56,486	133,495	621,501
Street Lights	129,872	92,899	142,838	132,488	129,341	129,585	108,135	108,508	95,342	94,849	1,163,857
Seth Boyden	409,880	414,832	391,112	401,110	390,404	376,514	421,474	413,051	378,514	260,258	3,857,149
South Mt	271,050	297,975	282,525	291,750	266,475	308,775	282,075	242,400	302,625	238,575	2,784,225
South Mt. An.	81,315	83,220	89,355	95,947	96,825	88,750	96,160	92,080	101,040	87,200	911,892
South Orange	865,200	910,322	840,960	778,320	753,840	751,920	750,120	759,120	664,551	567,007	7,641,360
Street Lights	20,536	20,598	22,643	20,643	20,735	20,643	20,535	20,539	20,536	20,561	207,969
Tuscan	372,356	450,440	400,640	399,780	376,180	375,380	398,220	390,840	246,820	373,040	3,783,696
Underhill	52,485	48,242	48,221	52,136	65,705	69,691	62,882	62,457	67,597	65,471	594,887
Total	6,721,802	7,066,339	6,797,515	7,070,991	6,927,286	6,819,360	6,775,236	6,507,636	6,204,702	5,625,408	66,516,275

The following table summarizes the historical gas consumption of each of the district's facilities. The data was obtained from the district's utility bills. These values serve as a bench marking tool to quantify energy consumption and energy reductions obtained from the implementation of recommended conservation and retrofit measures.

Gas Consumption (Therms) by Location and Year											
Location / School Year	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	Total
Marshall	37,845	39,551	43,623	40,847	42,911	44,147	46,242	48,690	53,751	34,418	432,024
Columbia	289,948	534,115	387,943	386,052	405,227	313,241	368,735	333,741	488,214	416,323	3,923,538
Clinton	70,747	68,629	77,068	73,110	70,750	50,299	78,119	78,106	86,067	44,629	697,523
Central Office	23,448	26,141	27,327	42,909	27,125	19,093	24,404	44,545	34,074	26,644	295,710
Jefferson	62,915	74,667	70,987	57,954	55,482	48,606	63,366	86,558	86,950	82,666	690,151
Maintenance	11,194	11,941	12,308	11,008	13,376	22,252	13,008	26,198	10,904	11,606	143,795
Maplewood	110,143	125,893	128,274	128,166	127,257	91,623	124,361	146,167	110,632	142,956	1,235,473
Montrose	23,747	27,239	26,180	29,285	38,372	22,699	22,375	18,655	37,223	20,473	266,248
Seth Boyden	52,948	43,568	48,018	48,016	61,186	37,981	54,966	61,938	79,739	55,330	543,690
South Mt.	49,353	43,307	55,641	56,935	65,680	75,272	66,742	71,138	98,247	154,567	736,882
South Mt. An.	25,067	22,611	24,892	21,364	22,984	20,106	23,700	20,882	21,052	18,636	221,294
South Orange	5,912	119,064	128,446	112,465	130,695	97,271	118,557	129,292	121,640	94,157	1,057,498
Tuscan	51,464	52,907	58,209	47,758	55,554	40,540	54,335	69,145	58,132	44,868	532,912
Underhill	7,692	8,316	4,780	6,319	6,014	4,215	4,911	4,807	10,639	8,534	66,227
Total	822,422	1,197,950	1,093,698	1,062,186	1,122,612	887,345	1,063,821	1,139,862	1,297,264	1,155,807	10,842,966

Findings and Recommendations

Operation and Maintenance – The study determined that there is no specific person that is responsible for the building systems and energy usage. The person responsible for the operation of boilers has the greatest influence on energy consumption. Having a person trained and responsible in each building can be a benefit to control building energy consumption.

Building Lighting Systems – A recommendation was made to replace bulbs and lighting fixtures with more energy efficient bulbs and fixtures. The installation of room occupancy sensors was recommended. The sensors turn off the lights when no activity in the room is detected.

HVAC Systems – An inventory of the district's HVAC systems was created. The detailed inventory included each unit's estimated efficiency, age, and remaining useful service life for each piece of equipment. From this an estimated remaining useful life can be determined. It is recommended to replace systems that are determined to have exceeded their respective useful life with more energy efficient models.

Condensing Boiler Upgrades – Four hot water boilers at Columbia High School were 43 years old and two hot water boilers at Maplewood Middle School were 52 years old. These boilers were recommended for replacement.

Building Management System – Many of the district's HVAC systems have pneumatic controls. Some buildings have partially functioning pneumatic controls while others have abandoned or bypassed the pneumatics. It is recommended that direct digital control and building management systems be implemented.

Night Setback – The study assumed that systems were not turned off or turned down outside of each facility's normal hours of operation. It was recommended to turn down systems when facilities were not in use.

Steam Boiler Replacement – Four steam boilers at Maplewood Middle are 52 years old, two steam boilers at Clinton are 55 years old, two steam boilers at Montrose are 55 years old, two steam boilers at South Mountain are 54 years old, two steam boilers in Central Office are 53 and 29 years old, are all recommended for replacement.

Alternative Energy – The study concluded that the district can benefit from solar power. After additional investigation, it was determined the buildings' roofing systems were not strong enough to support the weight of solar or wind turbine systems except for South Orange Middle School. All proposals received for South Orange Middle School were not cost effective to move forward.

Projects

Direct Install - As a result of the study the district participated in the direct install program through NJ BPU. This program replaced many lighting fixtures in the district with more energy efficient lighting systems and installed room occupancy sensors through out the district.

HVAC and Boiler Replacements – Currently the district is in the middle of a multi-year project replacing boilers in Columbia High School. The project will take about two more years to complete. It is expected that gas consumption decreases when the project is completed. Additional boiler and HVAC replacements are expected to be included in the district's long range facility plan.

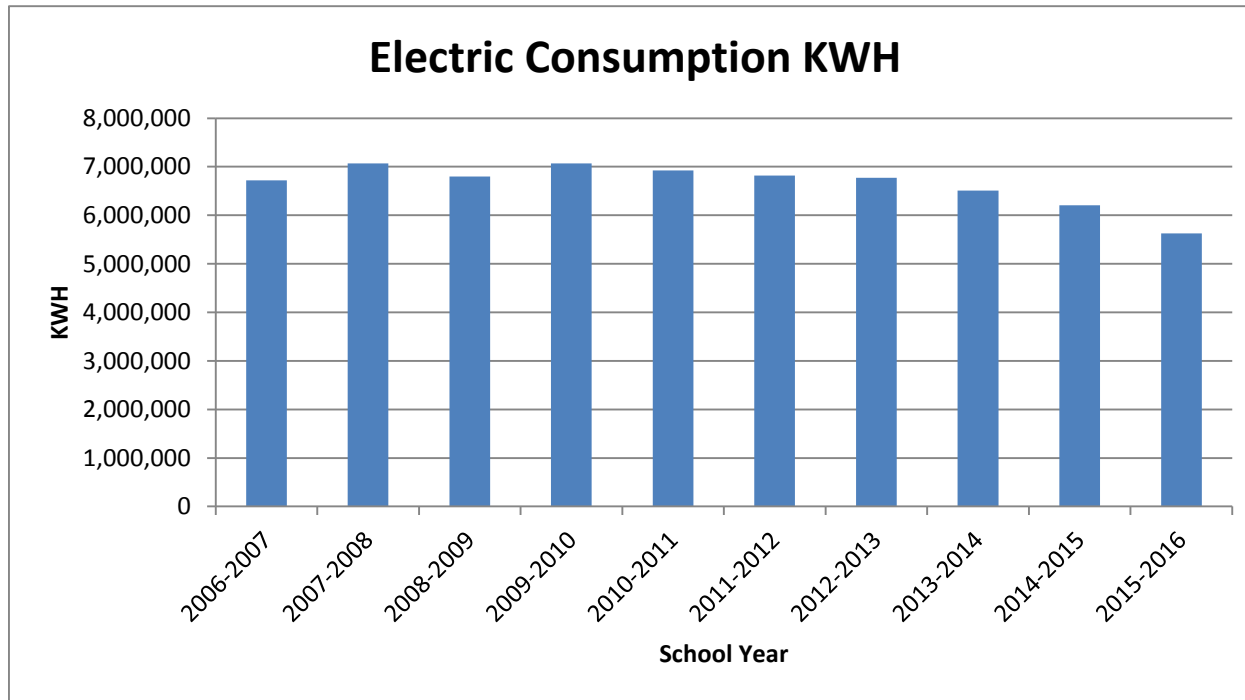
Auditorium Stage / House Lighting – The district is in the process of changing older incandescent stage and house lighting systems to LED systems in all auditoriums. Currently Columbia, South Mountain, Seth Boyden, Marshall were completed. Tuscan, Clinton and South Orange Middle schools were completed during the summer of 2016 and Maplewood Middle, Jefferson, and South Mountain Annex are planned for the 2017-2018 school year. The Columbia High School Auditorium used an average of 24,000 watt hours of electricity before converting to LED lighting. After the conversion it is estimated that the auditorium consumes about 5,000 watt hours of electricity. Additionally, LED bulbs last considerably longer than incandescent systems, reducing overall bulb replacement costs. It is expected that electrical consumption will continue to decrease as these projects are completed.

Night Setback – It was confirmed that the district does reduce lighting and turn down heating systems when the facilities are not in use.

Building Envelop – Recommendations include replacing windows and roofing systems with newer systems that provide greater insulation. The district has replaced windows in a number of schools and will continue to include replacing these systems in the district's long range facility plan. Currently the district advertised bids to replace windows in Tuscan School.

Electrical Consumption Analysis

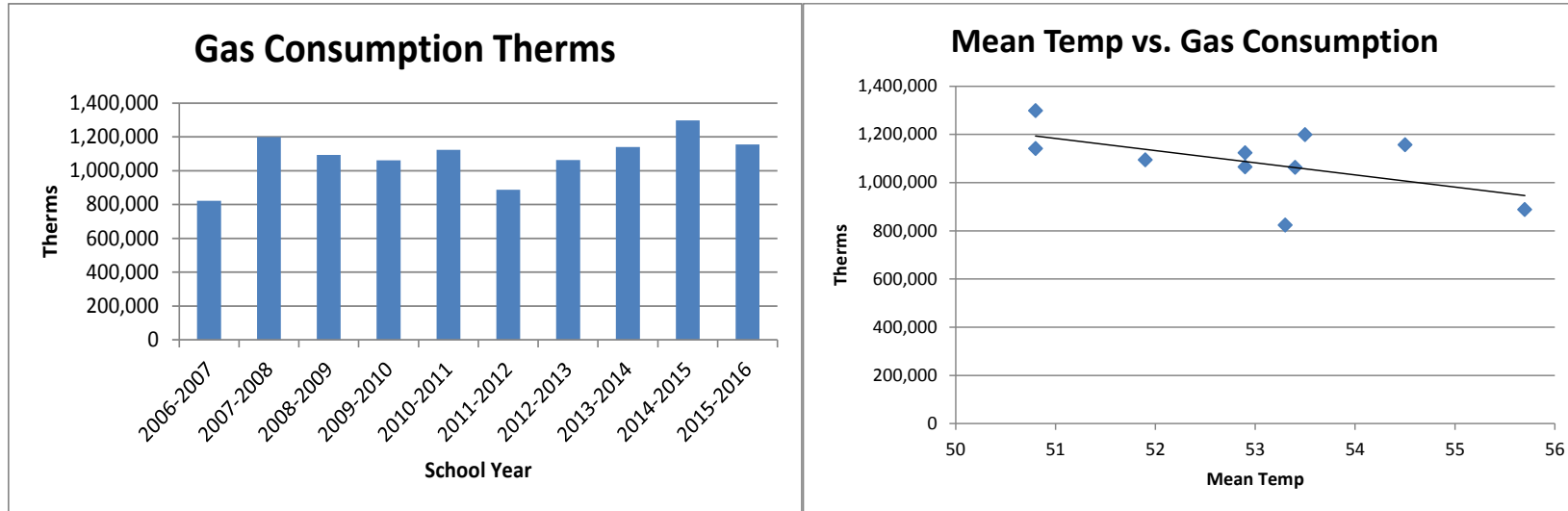
The table below shows the overall electrical consumption across the district. As noted in this report, the district began to implement recommendations that were provided in October 2014. Electrical consumption as reported on the district's utility bills has decreased by about 882,000 watt hours. This energy savings was realized while the district has increased the number of computer and air conditioning systems. The district still has a number of electrical system upgrades to perform and additional electrical consumption reductions are expected.



The data suggests the district decreased electrical consumption by about 900 KWH (900,000 WH) between 2013-2014 and 2015-2016. This represents about a 14% decrease in electrical consumption. This data does not take into account additional expected savings from planned and ongoing projects.

Gas Consumption Analysis

The tables below show the overall gas consumption across the district and compares gas consumption to average temperatures for each school year. As noted in this report, the district began to implement recommendations that were provided in October 2014. The data in the charts below show gas consumption is basically flat. The scatter gram shows gas consumption matches average temperatures and therefore does not suggest a decrease in consumption.



The district is currently working on replacing the boilers in Columbia High School. Additionally, future boiler replacements will be included in the district's long range facility plan. Due to the expense and regulations involved with these projects it takes considerable time to implement these projects. Gas consumption is expected to decrease when these projects are completed.

Recommendation

There were basically 4 strategies that were recommended to help reduce energy costs. They are:

1. Change behavioral practices – The district is employing technology (i.e. proximity sensors and timers to turn down boilers during off hours) to replace relying on people to change behaviors.
2. Purchase and install more efficient systems – The district replaced many electrical systems, and is in process of changing boilers, windows, roofing system, and additional electrical systems.
3. Restructure energy plans to reduce costs – Every year the district uses services through ACES to obtain the most competitive rates and billing structures.
4. Implement alternative energy generation – The district investigated alternative energy generation systems. In most cases the district's facilities cannot support the weight of solar panels and wind turbines and in other areas it was determined that it was not cost effective to implement alternative energy generation systems.

Average Temperature Data

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Avg	Depart From Normal
1895	25.5	22.3	34.7	47.8	60.4	70.9	69.8	72.4	66.5	47.9	43.6	35.6	49.8	-1.8
1896	26.6	29.6	31.3	51.1	64.5	66.9	73.5	72	61.8	49.2	45.9	30.1	50.2	-1.4
1897	27.8	30.8	37.8	49	59.2	64.7	73.2	69.2	62.2	53.9	41.6	33.7	50.3	-1.3
1898	29.9	30.2	43.2	46.1	57.5	69.5	74.3	73.3	65.4	54.2	40.4	31.2	51.3	-0.3
1899	27	24	36.3	48.8	60.2	71.1	73.2	71.2	61	54.8	42	34	50.3	-1.3
1900	30.6	28.6	33.8	49.3	59.5	69.7	74.5	74.9	66.7	58.7	45	33.7	52.1	0.5
1901	28.5	22.8	37.3	47.3	57.6	69.1	76.1	72.1	63.6	52.7	36.3	31.1	49.5	-2.1
1902	26.2	25.8	42.4	48.6	58.9	65.8	71.4	68.3	61.6	54.3	47.1	29.5	50	-1.6
1903	27.9	31	46.6	49.3	61.8	62.7	72	66.5	62.1	54.3	37.6	27.1	49.9	-1.7
1904	19.6	22.2	35	45.1	61.9	67.7	71.1	69.2	61.5	50.1	38.1	25.8	47.3	-4.3
1905	24.9	21.2	37.7	48.3	60.2	67.1	73.4	69.7	62.2	53.5	39.8	35	49.4	-2.2
1906	34.3	28.5	31.8	49.4	59.7	69.2	71.6	73.2	65.5	52.9	41.5	30.7	50.7	-0.9
1907	28.5	20.9	39	43.7	54.1	64	72.2	68.9	63.8	48.5	41.4	34.2	48.3	-3.3
1908	29.9	25.3	39	49.2	60.3	69.2	74.3	69.6	63.6	55.5	40.9	32.5	50.8	-0.8
1909	30.7	34.5	36.3	48.2	58.5	69.1	70.2	69.1	61.4	49.1	44.6	28.6	50	-1.6
1910	27.7	28.5	41.7	52	58.4	65.8	74.1	69.2	63.6	55.5	38.3	27	50.2	-1.4
1911	31	28.6	35.7	46	63.6	67.4	74.7	70.6	62.8	51.5	38.8	36.9	50.6	-1
1912	19.8	25.3	35.4	49.2	61.2	67.2	72.5	67.7	63.5	55.6	43.5	35.8	49.7	-1.9
1913	36.7	27.2	42.5	50.5	58.6	68.1	72.9	70.3	60.9	57.2	44.4	36.5	52.2	0.6
1914	28.8	22.1	34.1	46.4	61.6	66.9	70	71.4	61.1	56.6	40.8	29.2	49.1	-2.5
1915	30.5	33.2	34.4	52.9	56.1	65.9	71	68.7	65.6	53.9	42	30.5	50.4	-1.2
1916	33.1	25.1	29.6	46.8	59.6	63.1	73.6	72.1	62.4	53.2	41.3	31.4	49.3	-2.3
1917	29.3	25.5	36.4	47.1	52.7	67.6	73	72.7	58.5	48.6	37.8	23	47.7	-3.9
1918	18.2	26.8	40.6	48.4	63.8	65.2	70.9	73.2	58.8	55.3	42.2	35.9	49.9	-1.7
1919	32.2	32	41.7	47.8	59.5	69.2	72.4	68.4	62.8	56.3	41.5	27.1	50.9	-0.7
1920	20.8	25.3	37.3	45.8	56.6	67.1	70.1	70.9	64.1	57.5	40.6	34.6	49.2	-2.4
1921	30.5	31.9	46.4	55	59.5	69.8	75.6	68.5	67.2	52.1	41.8	30.7	52.4	0.8
1922	24.6	31.6	39	49.4	62.1	70.1	71.8	69.9	63.9	54.8	42.2	30.5	50.8	-0.8
1923	26.4	23.2	34.1	48.5	58.1	71.6	70.9	69.4	64.1	51.9	41.1	39.2	49.9	-1.7
1924	29.3	26.1	36.8	46.6	55.3	65.7	70.3	70.4	59	52.3	40.8	30.7	48.6	-3
1925	24.2	35	41.3	50	56.4	72.1	70.1	70	64.2	46.1	39.9	32.5	50.2	-1.4
1926	28.7	26.9	33	44.3	58	63.3	71.6	71.2	61.4	50.5	40.6	26.9	48	-3.6
1927	27	33.8	40.6	46.5	56.8	64.4	71.6	65.7	62.8	55.1	45.8	33.5	50.3	-1.3
1928	30.9	29.8	36.4	45.7	56.9	65	72.9	73.1	59.6	54.3	43	35.8	50.3	-1.3
1929	27.8	29.2	42.4	49.3	58.7	68.5	71.7	68.1	64.4	50.1	42	32	50.4	-1.2
1930	29.1	33.7	38.1	46.7	61.5	69.7	72.6	69.6	66.2	50.5	42	31.7	51	-0.6
1931	29.2	31.1	38.1	48.6	59.7	68.7	75.5	72.2	68.9	56.7	48.5	37.1	52.9	1.3
1932	40.1	33.3	35.1	46.8	60.1	68.3	72.9	72.6	65.2	54.7	39.6	34.1	51.9	0.3
1933	36.5	31.2	36.4	49.4	61.8	70.2	72.9	72	66.3	52	38.5	29.8	51.4	-0.2
1934	31.6	16.9	35.2	48.4	61.6	71.6	74.8	68.9	65.9	51	45.4	31.1	50.2	-1.4

1935	26	28.1	41.2	47.7	56.6	68.1	75.3	71.3	61.6	53.5	46.1	27.4	50.2	-1.4
1936	25.3	22.5	43.6	46.5	62.2	68.2	73.9	73.3	65.5	53.6	39	35.6	50.8	-0.8
1937	36.9	32.6	34	47.9	61.7	69.6	73.5	74.2	62.2	51.7	41.9	31.5	51.5	-0.1
1938	28.6	33.4	41.7	51.7	58.2	67.9	73.7	74.5	61.7	55	43.8	33.4	52	0.4
1939	29.1	34.1	37.3	46.4	62.5	69.9	72.6	74	64.7	53.1	40.1	33.5	51.4	-0.2
1940	21.3	30.1	32.4	44.4	58.8	67.1	72.9	67.7	61.7	46.8	41.7	34.5	48.3	-3.3
1941	27.2	28.1	32.8	55.1	61.4	68.7	73.1	69.6	65.6	56.8	45.3	35.3	51.6	0
1942	26.9	28	40.8	52.3	63	68.4	73.3	70.1	64.3	54.1	42.9	28	51	-0.6
1943	28.1	30.5	37.2	44.1	60.7	73.1	73.6	72.2	63.5	51.8	40.4	28.7	50.3	-1.3
1944	30.7	30.2	35.1	46.4	64.5	69.5	74.9	73.7	65.4	51.8	42.2	28.8	51.1	-0.5
1945	22.1	30.3	48.5	53.5	57.1	68.4	72.4	70.2	67.6	52.2	43.9	27.4	51.1	-0.5
1946	30.6	29.8	46.9	48.8	59.2	67.2	72.5	67.8	66	57.3	46.5	34.4	52.3	0.7
1947	34.2	27.1	35.4	48.9	58.6	66.3	72.7	73.7	65.4	58.5	40.4	30.6	51	-0.6
1948	21.9	27	40.2	49.7	58.7	67.6	73.9	72.4	65.4	52.3	48.3	33.6	50.9	-0.7
1949	35.9	36.3	41.2	50.8	60.4	71.5	77.1	73.6	62.6	58.8	42.2	35.4	53.8	2.2
1950	38.1	29.5	34.8	46.9	57.8	67.7	71.9	70.3	61.4	56	44.8	30.5	50.8	-0.8
1951	32.6	33.2	39.9	50.2	60.7	67.7	73	70.8	63.8	55.3	39.2	34.1	51.7	0.1
1952	33.3	33.5	37.9	52.2	57.5	70.6	75.9	71.2	64.6	50.2	43.7	34.9	52.1	0.5
1953	34.1	35.9	41.2	49.6	61.7	69.8	73.7	71.1	65.6	55.3	43.9	36.9	53.2	1.6
1954	27.1	36.9	39.7	51.7	56.9	69	72.6	69.9	63.7	57.4	41.7	32.8	51.6	0
1955	28.1	31.3	39.6	52.3	62.7	66.6	78.6	75.7	63.8	56	42	27.2	52	0.4
1956	30.3	34	35	46.2	57.3	69.5	70.6	70.8	61.7	54.1	43.6	37.5	50.9	-0.7
1957	25.2	34.4	39.1	51.3	60	71.6	73	69.1	65.4	51.5	45.1	36.3	51.8	0.2
1958	28.8	25.2	37.9	50.7	56.6	64.3	73.9	71.3	63.6	51.5	44.1	25.5	49.5	-2.1
1959	28.5	29.1	37.8	51.5	63	69.1	73.9	73.7	67.7	56.4	42.7	34.5	52.3	0.7
1960	31	34	30.4	53	59.1	68.2	71	71.5	64	52.6	44.6	25.2	50.4	-1.2
1961	21.8	31.6	38.7	45.8	57	68.6	73.3	71.7	70.3	55.5	44.6	31	50.8	-0.8
1962	28	27.5	38.5	50.1	61.2	69.5	70.3	69.7	60.5	53.5	39.7	27.8	49.7	-1.9
1963	25.3	23.1	39.1	49.7	57.5	67.9	73	69	60	57	47	26.3	49.6	-2
1964	29.9	28.4	39.7	47.1	61.5	66.8	73.2	68.8	64.8	50.6	45.3	32.1	50.7	-0.9
1965	25.3	29.3	36.3	46.4	63.6	67.5	71.1	70.5	65	50.5	41.6	34.2	50.1	-1.5
1966	27.4	29.6	39.2	45.3	55.8	69.5	74.9	72.2	61.7	50.8	44.3	32.1	50.2	-1.4
1967	32.4	25.7	34.3	47.9	51.9	69.8	71.8	69.8	61.7	51.8	38.5	33.7	49.1	-2.5
1968	22.7	26.5	40.5	51.6	56.1	66.4	73.6	71.8	65.5	55.3	42.5	29.3	50.2	-1.4
1969	27.2	29.9	36.3	51.5	60	69.2	70.9	72.3	64.3	52	42	29.4	50.4	-1.2
1970	20.9	29.3	35	48	60.5	66.9	73.5	72.6	65.9	54.5	44.5	31.7	50.3	-1.3
1971	23.9	30.3	37	47	56.3	69.3	72.1	70.3	66.8	58.2	41.5	37	50.8	-0.8
1972	31.1	27.2	36.4	45.8	59.6	64.8	73.8	70.5	65	48.5	40.2	35.2	49.8	-1.8
1973	32.2	29.6	44.2	50.6	56.4	71.2	73.9	73.6	64.9	55.1	44.9	35.6	52.7	1.1
1974	31.3	28.8	39.7	51.8	58.4	65.7	73	71.7	62.9	48.8	43.9	35.2	50.9	-0.7
1975	32.9	32.3	36.8	44.2	62.6	68.3	72.8	71.3	60.2	56.1	48.3	33.1	51.6	0
1976	24.3	35.4	41.7	52	57.9	70.7	70.9	70.3	61.6	48.6	37.4	26.1	49.7	-1.9
1977	18.4	30	43.5	51	61.7	65.9	73.3	70.6	64.3	50.8	44.7	30.3	50.4	-1.2

1978	25.1	21.8	35.2	47.7	57.1	67.1	70.5	72	61.4	51.1	43.6	33.4	48.8	-2.8
1979	29.1	20.1	41.9	48.4	60.2	65.3	71.6	71	63.2	51.5	46.7	34.6	50.3	-1.3
1980	29.5	26.7	36.4	50.2	61.5	65.6	74.1	74	66.3	50.2	39.6	27.4	50.1	-1.5
1981	20.5	35.1	36.8	51.3	60	68.7	73.9	69.9	62.9	48.8	42.6	30.2	50.1	-1.5
1982	20	31	36.5	46.2	60.8	64.6	72.9	67.9	63.3	52.5	45.6	38.2	50	-1.6
1983	29.6	31.7	41.1	47.7	57.3	68.5	74.9	73.1	65.4	52.6	43.5	30	51.3	-0.3
1984	23.8	36.2	32.9	48	58.1	70.2	71.3	72.5	60.8	56.3	42.3	37.6	50.8	-0.8
1985	23.7	30.7	40.9	51.4	61.8	65	72.3	70.8	65.5	54.8	45.4	29.5	51	-0.6
1986	29.1	27.9	39.9	49.7	62.3	67.4	72.8	69	62.5	53.4	40.1	34.1	50.7	-0.9
1987	27.7	28.9	41.1	50.3	59.3	69.6	74.4	69.3	63.2	48	43.3	35.2	50.9	-0.7
1988	23.3	29.9	39.4	47.5	59.2	67.8	75.8	74.3	61.9	47.5	44.1	31.1	50.2	-1.4
1989	32.2	30.5	38.1	47.2	58.6	69.5	72.3	70.2	64.5	53.6	42	20.9	50	-1.6
1990	36	35.3	41.6	49.5	57.2	68.2	73.3	71.6	63	57.3	45.6	37.8	53	1.4
1991	29.2	35.3	41.8	52.1	65.5	70.4	74.1	73.6	63.9	53.9	43.9	36	53.3	1.7
1992	31.6	33.1	36.7	47.5	57.9	66.3	71.3	68.7	63.7	49.5	42.2	33.4	50.2	-1.4
1993	33.1	25.8	34.9	49.7	61.5	68.9	75.8	73.3	63.7	50.7	42.2	32.4	51	-0.6
1994	20.8	25.8	36.7	52	58.3	71.6	76.2	69.8	63.6	52	47.1	37.4	50.9	-0.7
1995	33.9	26.6	42.3	48.1	57.8	69	74.9	73.6	63.5	56.4	38.7	28	51.1	-0.5
1996	26.4	29.6	35.3	49.8	57.7	69.3	70.9	71.7	64.9	52.9	39.4	36.9	50.4	-1.2
1997	27.9	35.9	39	47.5	56.2	67.7	73.1	69.9	63	52.7	40.3	34.5	50.6	-1
1998	36.5	37.3	41.9	51.5	63.2	67.5	73.7	73.7	66.9	54	43.4	38.8	54	2.4
1999	29.9	33.3	38.4	49.5	59.5	70.2	77.8	72.6	65.9	51.4	46.7	35.7	52.6	1
2000	27.5	32.2	43.6	48.3	60.8	68.7	69.5	69.4	62.8	53.1	41.6	27.3	50.4	-1.2
2001	28	32.1	36.4	50.4	61	69.8	70.4	74.9	64.6	54.5	47.4	39.8	52.4	0.8
2002	35.4	36.9	41.2	53	57.8	69.4	75.5	75.3	67.3	51.6	41.6	31.4	53	1.4
2003	23.9	25.9	39	47.2	56.8	66.1	73.7	74.5	65.3	52.1	46.7	34.2	50.5	-1.1
2004	22.2	30.5	40.9	50.9	64.7	68.6	71.8	71.9	67.3	53	46.1	34.2	51.8	0.2
2005	28	33.4	35.9	52.6	56.5	73.3	76.2	77.4	71.1	55.8	46	31.3	53.1	1.5
2006	37.2	33.1	40.5	52.6	61.3	70.1	77.1	73.8	64	52.9	48.9	41.3	54.4	2.8
2007	35.2	25.4	39.5	47.8	63	70.9	73.3	73.3	67.5	61.3	42.6	33.9	52.8	1.2
2008	33	32.9	40.2	53	57.6	73.1	76.1	71.2	67.6	52.5	43.2	34.8	52.9	1.3
2009	24.8	33.3	39.7	52	60.8	67.1	71.2	74.5	64.2	52.2	48.5	32.8	51.8	0.2
2010	29.9	30.5	45.1	55.2	63.9	73.1	78.2	74.2	68	54.8	43.9	30.1	53.9	2.3
2011	26.1	31.8	39.8	52.7	63.3	71.7	77.6	73.8	68.3	55.6	47.8	39.4	54	2.4
2012	33.2	37.7	48.9	51.9	64.4	69.3	77.2	74.1	66.2	55.4	40.4	38.7	54.8	3.2
2013	32.2	30.7	37.8	50.9	60.3	70.9	77.7	71.1	63.9	56.4	41.8	34	52.3	0.7
2014	24.4	26.6	32.9	49.5	61.7	69.9	74.2	70.9	66.5	56.3	40.5	37.5	50.9	-0.7
2015	25.4	19.2	33.6	50.2	65.6	69.4	75	74.2	70.1	53.6	48	45.4	52.5	0.9
2016	29.2	33.7	45.3	49.9	59.7	69.7								

Year	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	avg	median
05-06	76.2	77.4	71.1	55.8	46.0	31.3	37.2	33.1	40.5	52.6	61.3	70.1	54.4	54.2

06-07	77.1	73.8	64.0	52.9	48.9	41.3	35.2	25.4	39.5	47.8	63.0	70.9	53.3	50.9
07-08	73.3	73.3	67.5	61.3	42.6	33.9	33.0	32.9	40.2	53.0	57.6	73.1	53.5	55.3
08-09	76.1	71.2	67.6	52.5	43.2	34.8	24.8	33.3	39.7	52.0	60.8	67.1	51.9	52.3
09-10	71.2	74.5	64.2	52.2	48.5	32.8	29.9	30.5	45.1	55.2	63.9	73.1	53.4	53.7
10-11	78.2	74.2	68.0	54.8	43.9	30.1	26.1	31.8	39.8	52.7	63.3	71.7	52.9	53.8
11-12	77.6	73.8	68.3	55.6	47.8	39.4	33.2	37.7	48.9	51.9	64.4	69.3	55.7	53.8
12-13	77.2	74.1	66.2	55.4	40.4	38.7	32.2	30.7	37.8	50.9	60.3	70.9	52.9	53.2
13-14	77.7	71.1	63.9	56.4	41.8	34.0	24.4	26.6	32.9	49.5	61.7	69.9	50.8	53.0
14-15	74.2	70.9	66.5	56.3	40.5	37.5	25.4	19.2	33.6	50.2	65.6	69.4	50.8	53.3
15-16	75.0	74.2	70.1	53.6	48.0	45.4	29.2	33.7	45.3	49.9	59.7	69.7	54.5	51.8

Average temperatures were obtained from Rutgers University.