**DC WATER HEADQUARTERS**

**FACT SHEET – ENERGY AND WATER**

**ENERGY SAVINGS OF THE HEADQUARTERS BUILDING**

* The new DC Water Headquarters building uses 48% less energy than a typical new, energy-code compliant offices building of this size, from the LEED documentation (pg. 11 of 13).
* DC Water Headquarters is expected to save 838 metric tons of CO2 emissions (greenhouse gas emissions) per year.[[1]](#endnote-1)
* The headquarters building is expected to have a Greenhouse Gas Emissions Intensity of 2.6 kg/sf/yr, placing it in the top 2% of all office buildings in DC.[[2]](#endnote-2)
* The Headquarters building is in the top 2% of the lowest EUIs for offices buildings in DC. Only six office buildings in DC have an Energy Star Rating of 99 or above according to 2017 data available from the District of Columbia’s Energy Benchmarking Tool.[[3]](#endnote-3)
* The headquarters building has a top performing Energy Start Ratings compared to other metropolitan areas in the United States[[4]](#endnote-4):
	+ Top 7% compared to Boston’s office market.
	+ Top 4% compared to Chicago’s office market.
	+ Top 9% compared to Minneapolis’ office market.
	+ Top 6% compared to New York City’s office market.
	+ Top 3% compared to Philadelphia’s office market.
	+ Top 7% compared to San Francisco’s office market.
	+ Top 4% compared to Seattle’s office market.

**WATER SAVINGS OF THE HEADQUARTERS BUILDING**

* The new headquarters building saves 1,217,716 gallons of water annually.
* Rainwater capture is used for mechanical systems (cooling tower), irrigation of landscape and for plumbing fixtures.[[5]](#endnote-5)
	+ 415,800 gallons of city water are saved using rainwater for toilet flushing.
	+ 444,465 gallons of city water are saved using rainwater for irrigation.
	+ 357,451 gallons of city water are saved using rainwater for the cooling tower and by using SWEE technology to condition the building.

**POTENTIAL IMPACT OF SWEE TECHNOLOGY**

* If all 300,000,000 gallons of wastewater flowing through DC Water’s systems daily was leveraged to create energy with SWEE, approximately 50% of the District’s 120,000,000 sf of office space could be heated or cooled.[[6]](#endnote-6)
* Offsetting that much energy with SWEE would save 3,778,058 metric tons of CO2 emissions annually.[[7]](#endnote-7)
* If other major American cities were to leverage their wastewater using SWEE:
	+ Boston could offset 4,410,000 metric tons of CO2 emissions.
	+ Chicago could offset 17,640,000 metric tons of CO2 emissions.
	+ Los Angeles could offset 6,426,000 metric tons of CO2 emissions.
	+ Minneapolis could offset 3,150,000 metric tons of CO2 emissions.
	+ Philadelphia could offset 5,934,600 metric tons of CO2 emissions.
	+ San Jose could offset 1,386,000 metric tons of CO2 emissions.
	+ Seattle could offset 2,482,200 metric tons of CO2 emissions.
	+ New York City could offset 16,380,000 metric tons of CO2 emissions.
1. **CALCULATIONS**

 Using Energy Star’s Statement of Energy Design Intent calculator (via Target Finder for LEED certification), SmithGroup calculates that the DC Water Headquarters building is expected to save 838 metric tons of CO2e (greenhouse gas emissions) per year.

By inputting the fuel type the building uses (Electric – Grid) and our estimated electric usage of 3,645,712.27 kBtu and Energy Rate of $0.04/KBtu, and then inputting the estimated use loads on the building, the Energy Star calculator generates Design Energy and Emission Results.

The calculator then compares our building’s Design Energy and Emission Results against those of actual buildings in the same region to calculate a comparable savings.

|  |
| --- |
| **Estimated Design Energy** |
| **Fuel Type** | **Usage** | **Energy Rate ($/Unit)** |
| Electric – Grid | 3,645,712.27 kBtu (thousand Btu) | $0.04/kBtu (thousand Btu) |

|  |
| --- |
| **Estimated Design Use Details** |
| Weekly Operating Hours | 65 (default) |
| Number of Workers on Main Shift | 328.49 (default) |
| Percent that can be cooled | 50% or more (default) |
| Number of Computers | 285.64 (default) |
| Percent that can be heated | 50% or more (default) |
| Gross Floor Area | 13,268.52 Sq. M. (actual size) |

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| **Design Energy and Emission Results** |
| **Metric** | **DC Water Headquarters** | **Median Property** | **Estimated Savings** |
| ENERGY STAR Score (1-100) | 99 | 50 | -- |
| Energy Reduction (from Median) (%) | -67.4 | 0 | -- |
| Source Energy Use Intensity (EUI) (kBtu/ft2/yr) | 80 | 246 | 166 |
| Site Energy Use Intensity (EUI) (kBtu/ft2/yr) | 25 | 78 | 53 |
| Source Energy Use (kBtu/yr) | 11,447,536 | 35,155,343 | 23,707,807 |
| Site Energy Use (kBtu/yr) | 3,645,712 | 11,195,967 | 7,550,255 |
| Energy Costs ($) | 135,255 | 415,370 | 280,115 |
| Total GHG Emissions (Metric Tons CO2e) | 404 | 1,242 | 838 |

 [↑](#endnote-ref-1)
2. The DC Water Headquarters building is expected to have a GHG Emissions Intensity of 2.6 kg/sf/yr (generated from the Energy Star tool) placing it within the top 2% of all office buildings in DC.

Only ten of DC’s 523 office buildings reported greenhouse gas (GHG) emissions intensity of 2.6 kg/sf/year or less according to 2017 data available from District of Columbia’s Energy Benchmarking DC tool: <http://energybenchmarkingdc.org>.

The 2017 energy usage of 1600 buildings in the District are published in this tool: <https://doee.dc.gov/node/572252>. [↑](#endnote-ref-2)
3. The DC Water Headquarters Building is in the top 2% of the lowest Source EUIs for office buildings in DC.

Just six office buildings have an Energy Star Rating of 99 or above according to 2017 data available from District of Columbia’s Energy Benchmarking Tool: <http://energybenchmarkingdc.org>.

The 2017 energy usage of 1600 buildings in the District are published in this tool: <https://doee.dc.gov/node/572252>. [↑](#endnote-ref-3)
4. |  |  |  |  |
| --- | --- | --- | --- |
| **City** | **Total Number of Office Buildings** | **Total with an Energy Start Rating of 99 or Above** | **Percentile** |
| Boston | 370 | 27 | Top 7% |
| Chicago | 358 | 4 | Top 1% |
| Minneapolis | 134 | 12 | Top 9% |
| New York City | 1572 | 95 | Top 6% |
| Philadelphia | 217 | 7 | Top 3% |
| San Francisco | 602 | 45 | Top 7% |
| Seattle | 512 | 21 | Top 4% |

Sources (Pulled in March of 2019):

	* Boston: <https://www.boston.gov/departments/environment/building-energy-reporting-and-disclosure-ordinance>
	* Chicago: <https://data.cityofchicago.org/Environment-Sustainable-Development/Chicago-Energy-Benchmarking/xq83-jr8c>
	* Minneapolis: <http://www.minneapolismn.gov/environment/energy/WCMS1P-116916>
	* New York City: <https://www1.nyc.gov/html/gbee/html/plan/ll84_scores.shtml>
	* Philadelphia: <https://www.opendataphilly.org/dataset/large-commercial-building-energy-benchmarking>
	* San Francisco: <https://data.sfgov.org/Energy-and-Environment/Existing-Commercial-Buildings-Energy-Performance-O/j2j3-acqj>
	* Seattle: <https://data.seattle.gov/dataset/2017-Building-Energy-Benchmarking/qxjw-iwsh/> [↑](#endnote-ref-4)
5. If DC Water Headquarters were not capturing rainwater for irrigation and toilet flushing and was not using SWEE technology to condition the building, it would use an estimated **1,471,276 gallons** of water annually.

Because DC Water Headquarters is capturing rainwater for irrigation and flushing toilets, and is using SWEE technology (thereby saving water from a cooling tower in a typical system), it is estimated to save **1,217,716 gallons** annually, according to totals from LEED documentation and our stormwater management plan (required to be submitted to the District of Columbia).

	* Of that total, using captured rainwater for toilet flushing saves 415,800 gallons annually.
	* Of that total, using captured rainwater for irrigation of landscape saves 444,465 gallons annually.
	* Of that total, eliminating the use of city water in a cooling tower by using SWEE technology and reusing captured rainwater saves 357,451 gallons annually. [↑](#endnote-ref-5)
6. DC Water Innovation Program Manager Saul Kinter (saul.kinter@dcwater.com; 202-787-2259) estimates a daily average of 300,000,000 gallons of wastewater flowing through DC Water’s systems.

DC’s 300,000,000 gallons/day = 12,500,000 gallons/hour = 208,333 gallons/minute.

Convert 208,333 gallons/minute to Megawatts-Hrs of Energy using the common equation (Q = 500 \* ΔT \* GPM):

	* For cooling (20 ΔT): 2,083,333,333 BTU/H = 610 megawatts-hrs = **138,888.90 Tons of Cooling Capacity**
	* For heating (13 ΔT): 1,354,164,500 BTU/H = **396 megawatts-hrs**It is commonly accepted that 450 square feet can be cooled per metric ton in a typical high-performance building like the DC Water Headquarters. 138,888.90 tons then equals 62,500,000 sf of DC office space that could be cooled with SWEE. The District contains 120,000,000 sf of office space in total.

Similarly, heating a high-performance building requires 20 BTU/sf, so the 1,354,164,500 BTUH could heat 67,708,225 sf of office space in DC.

If one megawatt of electricity created from typical fuel types (nuclear, coal) on average produces 0.707 metric tons of CO2 emissions, then the 610 megawatts that the SWEE system can produce in an hour without using those fuel types saves 10,351 metric tons of CO2 emissions. Multiplied to a year, that is a savings of **3,778,089 metric tons of CO2 emissions** saved by using SWEE on all of DC’s wastewater. [↑](#endnote-ref-6)
7. |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **City** | **Average Daily Gallons Wastewater** | **Gallons Wastewater Per Minute** | **Cooling Capacity (20 ΔT)** | **Heating Capacity (13 ΔT)** | **Potential Conditioned Square Footage** | **Potential** **CO2 Savings** |
| Boston*Population 685,094* | 350,000,000 | 243,056 | 162,050 Tons | 462 Megawatt-hrs | 72,905,000 sf | 4,410,000 Metric tons |
| Chicago*Population 2,715,450* | 1,400,000,000 | 972,222 | 648,200 Tons |  1,848 Megawatt-hrs | 291,620,000 sf | 17,640,000 Metric tons |
| Los Angeles*Population 3,999,759* | 510,000,000 | 354,167 | 236,130 Tons | 673 Megawatt-hrs | 106,233,000 sf | 6,426,000 Metric tons |
| Minneapolis*Population 422,331* | 250,000,000 | 173,611 | 115,750 Tons | 330 Megawatt-hrs | 52,075,000 sf | 3,150,000 Metric tons |
| Philadelphia*Population 1,580,863* | 471,000,000 | 327,083 | 218,073 Tons | 622 Megawatt-hrs | 98,109,300 sf | 5,934,600 Metric tons |
| San Jose*Population 1,035,317* | 110,000,000 | 76,389 | 50,930 Tons | 145 Megawatt-hrs | 22,913,000 sf | 1,386,000 Metric tons |
| Seattle*Population 724,745* | 197,000,000 | 136,806 | 91,211 Tons | 260 Megawatt-hrs | 41,035,100 sf | 2,482,200 Metric tons |
| New York City*Population 8,622,698* | 1,300,000,000 | 902,778 | 601,900 Tons | 1,716 Megawatt-hrs | 270,790,000 sf | 16,380,000 Metric tons |

Population are 2017 estimates from the United States Census Bureau:<https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk>

Wastewater Daily Averages Sources:

	* Boston: <http://www.mwra.com/02org/html/whatis.htm>
	* Chicago: <https://www.mwrd.org/irj/portal/anonymous/waterreclamation>
	* Los Angeles: <https://www.lacsd.org/wastewater/wwfacilities/default.asp>
	* Minneapolis: <https://metrocouncil.org/About-Us/Facts/Wastewater-WaterF/FACTS-Wastewater.aspx>
	* Philadelphia: <https://www.phila.gov/water/PublishingImages/WaterDiagramPoster.jpg>
	* San Jose: <http://www.sanjoseca.gov/index.aspx?NID=1663>
	* Seattle: <https://www.kingcounty.gov/depts/dnrp/wtd/system/facts.aspx>
	* New York City: <https://www1.nyc.gov/html/dep/html/wastewater/index.shtml> [↑](#endnote-ref-7)