



FY 2018

Environmental Sustainability

Montgomery County Public Schools, Rockville, Maryland

MANAGEMENT PLAN



2013 U.S. DEPARTMENT OF EDUCATION
GreenRibbonSchools



DISTRICT SUSTAINABILITY
AWARD WINNER



Malcolm Baldrige
National Quality Award
2010 Award Recipient



VISION

We inspire learning by providing the greatest public education to each and every student.

MISSION

Every student will have the academic, creative problem solving, and social emotional skills to be successful in college and career.

CORE PURPOSE

Prepare all students to thrive in their future.

CORE VALUES

*Learning
Relationships
Respect
Excellence
Equity*

Board of Education

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President

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Student Member

School Administration

Jack R. Smith, Ph.D.
Superintendent of Schools

Maria V. Navarro, Ed.D.
Chief Academic Officer

Kimberly A. Statham, Ph.D.
*Deputy Superintendent of
School Support and Improvement*

Andrew M. Zuckerman, Ed.D.
Chief Operating Officer

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A Letter From the Superintendent

Dear Community Members:

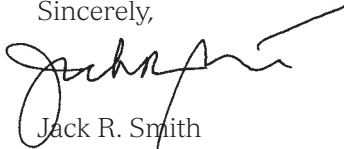
MONTGOMERY COUNTY PUBLIC SCHOOLS (MCPS) has a strong commitment to environmental sustainability that spans nearly 40 years. We have integrated economic, social, and environmental considerations in all our decisions to provide healthy, safe, and sustainable learning and working environments for our students, staff, and communities.

Our unwavering commitment to environmental stewardship makes us a national leader in green and healthy- schools initiatives that include environmental literacy in the curriculum and instructional programs at all grade levels. MCPS was recognized by the U.S. Department of Education and received the 2013 District Sustainability Award for our outstanding environmental sustainability practices and systemwide conservation initiatives. Going forward, we have continued to engage and motivate our students and staff to be responsible stewards.

The Fiscal Year 2018 Environmental Sustainability Management Plan continues to celebrate our past successes and maps the road ahead as we seek to achieve incremental milestones in our journey to ensure that our earth is a better place for future generations. The plan demonstrates how our teachers actively teach environmental education; how we build environmentally friendly and energy-efficient schools; how we utilize technology in our classrooms; how our students and staff are dedicated to conserving energy, reducing waste, and increasing recycling; and how we transport our students using the most efficient routes each day to minimize the number of miles driven by our buses. These actions are helping us to reduce the amount of greenhouse gas emissions from our schools.

It is our hope that, as you review this Environmental Sustainability Management Plan, our bold commitment to environmental sustainability is clearly evident through the goals and strategies we have detailed to achieve future milestones.

Sincerely,



Jack R. Smith
Superintendent of Schools

Our Environmental Sustainability Management Plan is built on a strong foundation and a history of sustained commitment to environmental stewardship and education.

About MCPS	1
About This Document	2
Our Impact on Climate Change	3
Our Vision for Sustainability	5
Student Education, Awareness, and Actions	6
Energy and Natural Resource Conservation.....	12
Materials and Waste Cycles	20
Building Construction, Maintenance, and Operations	22
Transportation	29
Glossary	30
Appendix	31
Acknowledgments	34



2013 U.S. DEPARTMENT OF EDUCATION
GreenRibbonSchools



DISTRICT SUSTAINABILITY
 AWARD WINNER



Montgomery County Public Schools (MCPS) is the recipient of multiple 2012–2018 U.S. Department of Education Green Ribbon School Awards:

- Francis Scott Key Middle School (2012)
- Cedar Grove Elementary School (2013)
- Summit Hall Elementary School (2013)
- District Sustainability Award (2013)
- Travilah Elementary School (2014)
- Northwest High School (2015)
- Sligo Middle School (2016)
- William Tyler Page Elementary School (2017)
- John Poole Middle School (2017)
- Newport Mill Middle School (2018)

MCPS is also the recipient of the Malcolm Baldrige National Quality Award (2010), the nation’s highest Presidential honor for performance excellence, including a focus on organizational sustainability.

About Montgomery County Public Schools

IN THE 2017–2018 SCHOOL YEAR, Montgomery County Public Schools (MCPS), in Maryland, operates 133 elementary schools, 40 middle schools, 25 high schools, 1 career and technology high school, 1 alternative program, and 5 special program centers, for a total of 205 facilities. Since 1983, MCPS has opened 33 elementary schools, 19 middle schools, and 6 high schools (including 13 closed schools that were reopened). During the next six years, additional school capacity will be added through various capital projects, including new schools and additions.

Official MCPS enrollment for the 2017–2018 school year is 161,546 students, a one-year increase of 2,536 students. MCPS has grown by more than 23,801 students since 2007 and expects to add more than 10,000 new students by 2021. The enrollment is now 21.5 percent African American, 14.4 percent Asian, 30.8 percent Hispanic, 28.3 percent White, non-Hispanic, and less than 5 percent two or more races. The Montgomery County Board of Education unanimously approved a \$1.83 billion six-year Capital Improvements Program (CIP) request for MCPS that will help ease overcrowding caused by years of rapid enrollment growth and address aging facilities. MCPS continues to be the largest school district in the State of Maryland and, for the 2017–2018 school year, has become the 14th largest school system in the United States.

MCPS' Environmental Sustainability Management Plan (ESMP) is built on a strong foundation and a history of sustained commitment to environmental stewardship and education. Over the past decade, MCPS has intensified its commitment to sustainability through various energy-efficiency improvements to our facilities and increasing conservation awareness systemwide. The facility assets are approximately 26,763,220 million square feet, spread over 3,677 acres of real property. A committed community of more than 23,347 employees, consisting of teachers, administrators, and supporting service employees spread throughout our schools and facilities to ensure that students receive the best education in a safe and comfortable learning environment. MCPS receives support, advice, and direction from engaged community partners and from intergovernmental agencies.

MCPS is the recipient of numerous awards and recognitions, including the Malcolm Baldrige National Quality Award (2010), the nation's highest Presidential honor for performance excellence through innovation, improvement, and visionary



leadership, including a focus on organizational sustainability. MCPS is only the sixth school system to receive this award and is the largest, by far. In 2006, MCPS won Maryland's most prestigious award for performance excellence—the U.S. Senate Productivity Award for implementation of the Malcolm Baldrige Criteria for Performance Excellence, a management philosophy that focuses on continuous improvement in the constant pursuit of excellence. Thirty-nine MCPS schools are proud recipients of the National Blue Ribbon Award.

The U.S. Department of Education National Green Ribbon Schools (ED-GRS) Award began in the 2011–2012 school year. This award recognizes schools and districts, and institutions of higher-learning education that reduce environmental impact and costs; improve the health and wellness of schools, students, and staff; and provide effective environmental and sustainable education. Since then, nine schools to include, Northwest High School; Francis Scott Key, John Poole, Newport and Sligo middle schools; and Cedar Grove, Summit Hall, Travilah, and William T. Page elementary schools, have been proud recipients of this much-sought-after national recognition. MCPS received the District Sustainability Award from the U.S. Department of Education (2013) for its systemwide efforts in the three areas detailed above. MCPS is among the top 1 percent of school districts in the nation to have received this award.

Additionally, as of 2018, 85 MCPS schools have successfully fulfilled the requirements and have received the Maryland Green School certification (MDGS)—a voluntary certification through the Maryland Association for Environmental and Outdoor Education (MAEOE).

About This Document

THE MCPS ENVIRONMENTAL SUSTAINABILITY MANAGEMENT PLAN (ESMP) is well-aligned with the MCPS Strategic Planning Framework and the Culture of Respect Compact. As part of our emphasis on excellence and organizational effectiveness, based on the core values of the strategic plan, our accomplishments over four decades are a direct result of the school system’s commitment to environmental sustainability and continuous improvement.

The first edition of the ESMP was published in June 2014. The inaugural ESMP celebrated the significant milestones that MCPS has achieved since the beginning of our conservation programs with the adoption of Board Policy ECA, Energy Conservation, in November 1973. Our ESMP is built on five major categories that are most significant in moving forward our environmental sustainability efforts. Those categories are—

1. Student Education, Awareness, and Actions
2. Building Construction, Maintenance, and Operations
3. Energy and Natural Resource Conservation
4. Materials and Waste Cycles
5. Transportation

The FY 2016 ESMP provided our progress, updated the goals set forth in the FY 2014 ESMP, set short-term goals, and adjusted the strategies as necessary to accomplish the established long-term goals.

The FY 2018 ESMP continues to focus on the five major categories, as they are the areas where measurable difference can be made in reducing our carbon footprint and to increase the awareness for responsible stewardship among our students, staff, and community. This edition highlights the incremental milestones of our successes collectively but, more important, since FY 2016, updates short- and long-term goals, revises strategies where necessary, and provides our vision for next chapters of our environmental sustainability management plan. Although much progress had been achieved since the beginning of our conservation programs, we realize that it is a never-ending journey. We will continuously strive to ensure that the actions we choose to take today are environmentally friendly and are sustainable for present and future generations.



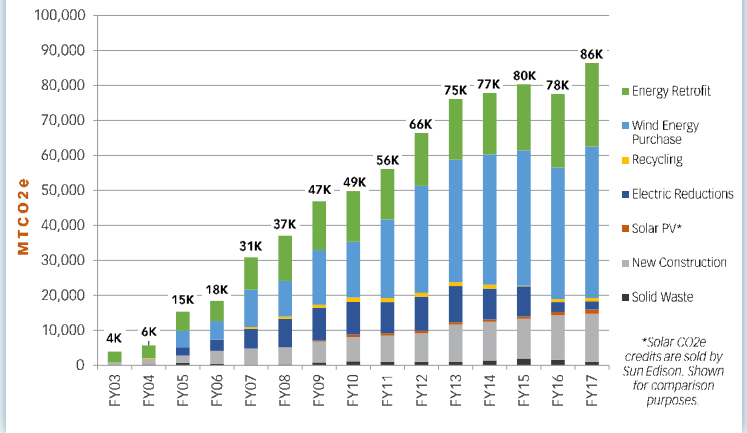
Our Impact on Climate Change

"In the United States, greenhouse gas emissions (GHG) caused by human activities increased by 7 percent from 1990 to 2014. Since 2005, however, total U.S. greenhouse gas emissions have decreased by 7 percent. Carbon dioxide accounts for most of the nation's emissions and most of the increase since 1990. Electricity generation is the largest source of greenhouse gas emissions in the United States, followed by transportation."

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

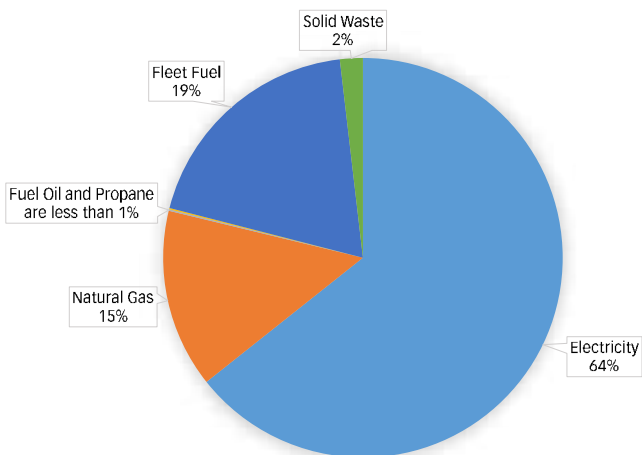
AT MCPS, the largest contributor to GHG emissions is associated with the heating, cooling, and lighting of our schools and facilities. In FY 2017, electricity used in our portfolio of buildings resulted in 64 percent of the total GHG emissions. This was followed by fleet fuel, used by buses that transport our 101,949 students daily to and from school and activities and by the service vehicles driven by our support staff, resulting in 19 percent of the GHG. Natural gas use resulted in 14 percent of the GHG emitted. The use of electricity to power and maintain comfort in our 205 schools and supporting facilities and the use of fleet fuel continues to be the priorities in reducing GHG emissions at MCPS. Building energy efficiency and fleet vehicle efficiency are two targeted areas that provide the greatest opportunities to make an impact to reduce the amount of GHG generated.

Avoided Greenhouse Gas Emissions



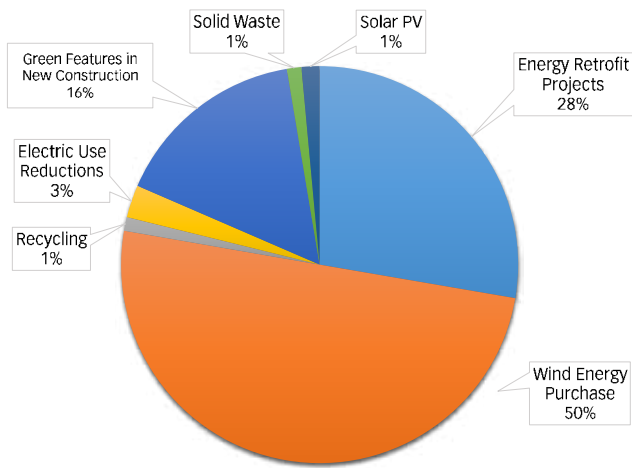
Greenhouse Gas Emissions by Source

FY 2017



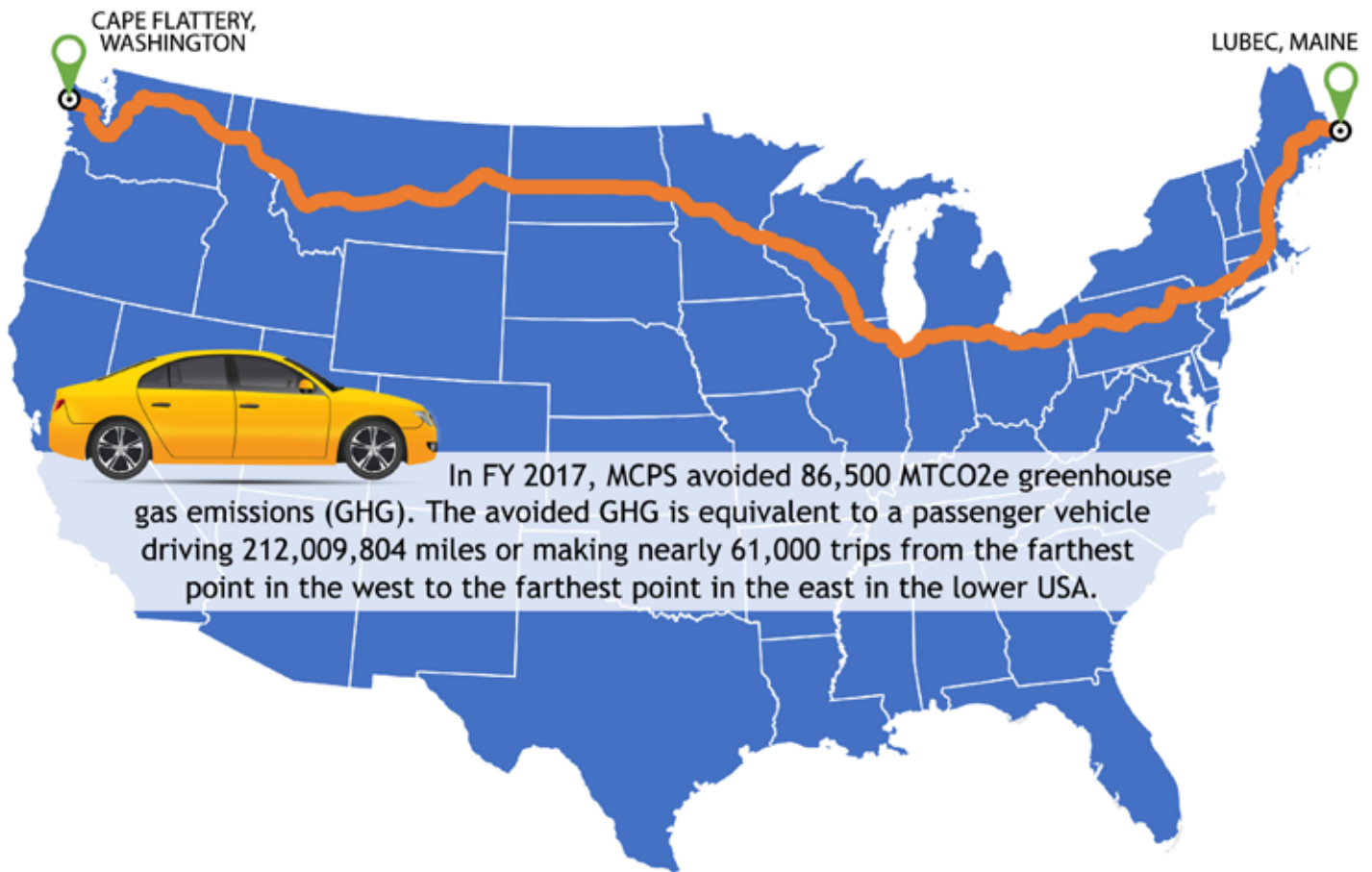
In FY 2017, MCPS avoided greenhouse gas emissions by nearly 86,500 MTCO₂e, through a variety of environmental conservation programs and initiatives, as described in this update. These activities resulted in a carbon footprint avoidance of 31 percent of the total GHG generated in FY 2017. MCPS has been making incremental gains in GHG avoidance over the past several years by focusing on areas that provide us the best opportunities to reduce our emissions. In FY 2007, MCPS avoided nearly 31,000 MTCO₂e in GHG, compared with nearly 86,500 MTCO₂e in FY 2017. The GHG avoidance in FY 2017 has more than doubled compared with the amount of GHG reduced in FY 2007. Since FY 2003, MCPS's environmental sustainability efforts have resulted in a cumulative GHG reduction of nearly 725,000 MTCO₂e.

Greenhouse Gas Reduction by Category FY 2017



The chart on the left shows that the greatest areas of reduction came through the purchase of renewable energy certificates (RECs)—wind energy that accounted for 50 percent of the avoidance, followed by energy retrofit projects that resulted in 28 percent of the avoidance, and green features in new-school construction that resulted in 16 percent of the total GHG avoidance. All other areas of reduction, including hosting of solar photovoltaic (PV), recycling efforts, solid waste reduction, and energy use reductions in schools, accounted for the remainder of the total GHG avoidance in FY 2017.

MCPS continues its comprehensive districtwide programs to incrementally reduce the impact of our environmental footprint through various efforts, including recycling initiatives, energy-conservation efforts, and a commitment to green construction practices in all building projects. We teach our students the value of protecting our natural resources and being good stewards of the environment.



Our Vision for Sustainability

MCPS LEADS AS AN EXCELLENT EXAMPLE of how to collaborate and be environmentally, socially, and financially sustainable across a school system. We have built a world-class education for sustainability into the curriculum and programs in order to equip our students with skills, knowledge, and an ethic of sustainability.

Our commitment to sustainability helps us create healthy learning and living environments for our students, teachers, staff, and community by integrating economic, social, and environmental considerations into all of our decisions. MCPS will continue to partner and collaborate with enthusiastic parents, engaged community partners, and intergovernmental agencies, in addition to working directly with schools to pursue our vision for environmental sustainability. As responsible environmental stewards of the earth, our students and staff conserve natural resources, conduct stream studies, create edible and perennial gardens and small-scale reforestation projects, and participate in community projects, among others, to make our schools and living communities a better place for generations to come.

In December 2017, Montgomery County, Maryland, approved Emergency Climate Mobilization Resolution 18-974 to accelerate the County's greenhouse gas reduction goal to 80 percent by 2027, and to 100 percent by 2035. Montgomery County became one of the first jurisdictions in the nation to declare a "climate emergency." The Montgomery County Council called on the County Executive, MCPS, and Maryland National Capital Park and Planning Commission to advise the Council on specific methods for accelerating the County's greenhouse gas emissions reduction goal. MCPS is collaborating with County government agencies in respect to this resolution.



Student Education, Awareness, and Actions

OUR EFFORTS in this category are focused on making improvements to environmental education, increasing conservation awareness in schools, and ensuring conservation actions and participation.

Environmental Education

MCPS CONTINUES TO BUILD systemic environmental education into the curriculum at every grade level. The MCPS Elementary Integrated Curriculum Team and the Outdoor Environmental Education Programs (OEEP) and their partner, Audubon Naturalist Society, are developing a Grade 2 Meaningful Watershed Educational Experience called Chesapeake Greens. In this unit, students learn about the food they eat and where food comes from as they grow vegetables and care for a pollinator garden.



Students conducting stream studies.

The Department of Facilities Management and OEEP coordinate, manage, and facilitate the visits of the Maryland Agriculture Education Foundation's (MAEF) science mobile to every elementary school in MCPS, using a five-year rotation cycle. By the end of FY 2020, 144,000 MCPS elementary school students will have had an agricultural science experience on the mobile lab.

The project-based curriculum learning (PBL) unit, Our Neighborhood, Our Watershed (ONOW), became the new quarter 2 curriculum for all 12,000 Grade 4 students in fall 2017. A grant from the National Oceanic and Atmospheric Administration (NOAA) enabled MCPS Outdoor Environmental Education Programs to develop and implement this Meaningful Watershed Education Experience curriculum in which students engage in authentic environmental learning. A key ingredient to the success of this unit was the eight hours of professional learning 400 teachers received on the content and pedagogy of ONOW through NOAA funding. In FY 2017, the MCPS Instructional Television and Instructional Technology offices created an innovative, online professional development program to ensure that every year teachers new to Grade 4 will have access to the kind of professional learning that will equip them to lead students through ONOW.

The 50+ year systemic OEEP Grade 6 residential program for outdoor environmental education brings over 10,000 students a year to its sites to use the outdoors as a laboratory for learning watershed science and the impact of humans upon it. Sixty percent of middle schools engage students in environmental student service learning during the students' three-day stay.

Since FY 2015, the "Trout in the Classroom" (TIC) is the unit by which the majority of middle schools integrate a Meaningful Watershed Education Experience into Grade 6 classrooms. In this program, facilitated by OEEP, students assist in raising and observing trout from egg to 2-inch fish, all the while monitoring the aquarium environment to maintain fish health. TIC culminates with students releasing their trout into

identified streams. Currently, 22 middle schools are using TIC as a project-based learning unit, involving approximately 5,000 students.

Since the publication of the FY 2016 Environmental Sustainability Management Plan, the Grade 6–12 Science, Technology, and Engineering (STE) team has produced new curricula aligned to the Next Generation Science Standards (NGSS) and International Technology and Engineering Educators Association Standards, using the Project/Problem-based Learning (PBL) model. Following the mandate that all students have equitable access to a rigorous and relevant education, the new STE curricula integrate “innovative thinking,” in which students apply science and technology content as they complete projects that solve real-world problems or design solutions. In every grade, problems are purposefully linked to issues of environmental sustainability and stewardship.

In the middle schools, Requests for Proposals (RFPs) are the framework for the science PBL experience. Examples of PBLs in the classroom include educating the community on the ecological value of a local ecosystem and promoting public awareness of ways to preserve, maintain and improve its biodiversity and health; evaluating the environmental footprint of their school grounds and proposing an environmentally friendly upgrade to the MCPS facility or grounds; and investigating the role of human activities in climate change and proposing solutions. The technology education curricula include opportunities to create technological solutions to man-made disasters, such as remediating a PCB contamination event. Students also learn to think critically about the balance between the environment and technological development.

In the high schools, the integration of Earth Space Science standards into biology, chemistry, and physics classes gives students rich opportunities to address environmental issues. Biology RFPs include creating a management plan to remediate the impact of an invasive species introduced by human actions and developing a farm-to-table restaurant using urban-farming strategies as a solution to the problems of urbanization such as food deserts and increased carbon footprints. Chemistry RFPs challenge students to design an alternative fuel vehicle and evaluate a region for the risk of sinkhole formation due to climate change. In physics, students design an energy-efficient home using an alternative energy source. The two main sources that are investigated are wind power (with labs using Vernier’s KidWind apparatus) and solar power (with labs using solar cells again with Vernier software).

Through the Foundations of Technology course, students actively engage in studying the impact of advances such as biotechnology on multiple environmental arenas such as food production, environmental contamination, and conservation of natural resources.



Students planting and mulching at school.

In FY 2017, MCPS, with its partners Rock Creek Park and Audubon Naturalist Society, received a \$100,000 grant from the National Park Foundation to develop a “meaningful watershed educational experience” (MWEE) at the high school level, called Chemistry Matters in Rock Creek: Citizen Science in the Rock Creek Watershed. Through participation in this module, students investigate the watershed health of their own schoolyards and nearby Rock Creek as they investigate the impact of gasoline-powered automobiles on the quality of stream and bay health. Through this innovative learning experience, students will participate in citizen science water quality monitoring while learning about careers in the National Park System.

OEEP and the School Energy and Recycling Team (SERT) continue to expand their use of social media platforms to inform, motivate, and reach more students, families, and school communities. Twitter™ has recently become a tool to highlight best practices in sustainability and environmental education. Additional sources for various types of gardens and outdoor learning have been added to the OEEP website, along with several new videos to help teachers engage students in environmental Student Service Learning (SSL) on the school sites.

Increasing Conservation Awareness

The SERT program within the Department of Facilities Management collaborates and provides necessary resources to administrators, staff, and students at all MCPS schools to foster a culture of conservation. The SERT program increases the awareness to conserve by focusing on reducing energy use, increasing recycling participation, and reducing waste in the schools. In addition to regularly scheduled school visits each quarter, the program staff provide individualized classroom activities, energy tool kits to be used in school-based team meetings, and videos and they encourage friendly



Students pledging to recycle.

contests with awards to give our students rich and rewarding experiences in environmental stewardship. The SERT program conducts schoolwide outreach events that include energy and recycling assemblies, Lunch and Learn events, and Read A-louds, when requested by schools.

The SERT program staff continue to visit all schools each quarter to recognize them for exemplary behavior and to identify opportunities to conserve energy and increase recycling. Program staff also routinely conduct random evening school visits to identify additional energy-reducing opportunities after normal school-operating hours. Each year, they conduct more than 800 regular school visits, in addition to providing program outreach and support to school-based green teams.

As a result of these program efforts and energy-efficient improvements made to schools' buildings, MCPS achieved nearly \$600,000 in energy cost avoidance and approximately \$700,000 in Peak Load Management (PLM) avoidance in FY 2017. The energy cost avoidance amount in FY 2017 is lower - the new baseline is an average of the prior five years. Previously, FY 2003 was the baseline year for the majority of schools in the system. Since FY 2003, MCPS has seen a measurable decrease in energy use, largely due to the SERT program efforts, positive behaviors of the building occupants, improvements to energy management systems, energy-efficient improvements to the building, and heating and air-conditioning systems upgrades. As a result, the need has arisen to measure the current performance of schools to a more

relevant baseline. Beginning with the 2015-2016 school year, the new baseline is an average energy use of the prior five school years. Each school's quarterly energy usage is compared with the same period's average of the prior five school years. As each school had an active SERT program during this time, the reported energy use and cost avoidance for each school represents the marginal savings over a baseline that includes the efforts of SERT. The new baseline also compensates for energy use anomalies due to extreme-weather-related temperature fluctuations, energy-use variations related to plant equipment improvements and/or malfunction, and other building conditions.

SERT Spotlight

At the beginning of FY 2017, SERT revitalized its periodic communication to school teams. The previous *SERT Flash* was replaced with *SERT Spotlight*—a monthly newsletter that currently is distributed electronically to more than 2,000 individuals. *SERT Spotlight* contains information on energy-conservation tips, strategies to improve recycling participation, recognition of high-performing schools, and other information and time-sensitive reminders to assist schools to improve their conservation efforts.

Conservation Actions and Participation

Maryland Green Schools Program

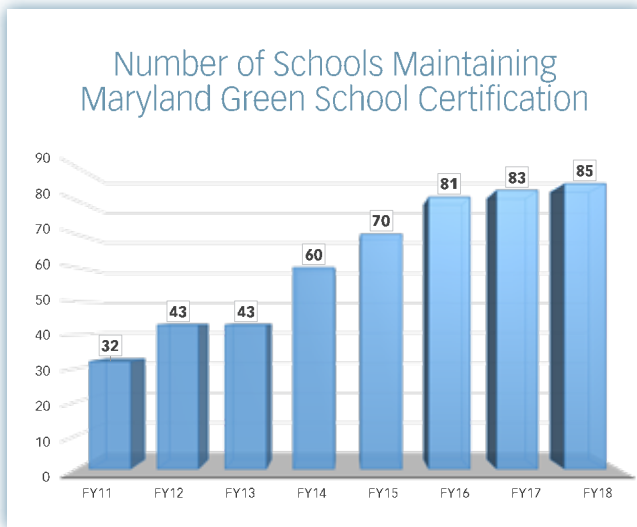
MCPS schools are encouraged to seek the Maryland Green Schools award (MDGS), a voluntary certification through the Maryland Association for Environmental and Outdoor Education (MAEOE). Founded in 1999, MDGS is a sustainable schools program. MDGS is nationally recognized as having significant impact with students and schools. The program provides educational opportunities for pre-K–12 schools that promote responsible environmental stewardship practices and increase awareness of how our relationship with the environment ultimately impacts public health and society. The program is aligned with the Chesapeake Bay Watershed Agreement 2014 goals and supports Maryland State Department of Education graduation requirements and standards. The program's goals are to enrich education by integrating hands-on, inquiry-based instruction, to empower youth to practically apply knowledge at school, home and in their communities that reduce ecological impact and encourage sustainable practices. As schools recertify every four years, they continue to integrate and reinforce the lessons, resulting in progress toward a more sustainable future.

This certification program provides a platform for each school to showcase its great environmental efforts. These efforts are demonstrated through environmental issue instruction, celebration of green practices, community partnerships, and

a variety of student-driven sustainability practices. MCPS has two certified Maryland Green Centers; the SERT program and OEEP. The Maryland Green Center award is given to recognize and honor a facility’s efforts in implementing environmental education, best management practices, and community engagement. Both the SERT program and OEEP work in partnership with the Audubon Naturalist Society (ANS) to provide engaging activities that not only help support schools’ applications for MDGS, but help students and school staff reduce their impact on the environment. MCPS currently has 85 schools that have received the MDGS award, or more than 40 percent of our 205 schools. MCPS has set a goal of 65 percent of our schools to be certified by 2024.



School supplies collected during Drive for Supplies event.



Environmental Service Learning

Grade 6 students participate in environmental service learning, which provides them with 10 hours of Student Service Learning (SSL) toward the Maryland State Department of Education (MSDE) graduation requirement for SSL. OEEP assists science teachers, who are responsible for ensuring that the SSL hours occur, by providing professional learning sessions for teachers to build their capacity to engage students. OEEP also collaborated with MCPS TV to produce professional development videos that present the “whys” and “hows” of specific environmental action projects. The three stewardship actions presented are invasive species removal, habitat construction, and growing perennial plants.

Drive for Supplies

Drive for Supplies is a campaign that teaches students that they can have a direct, positive impact on their communities by donating their reusable school supplies to local, national,

and international schools and organizations. It teaches the importance of recycling and reducing solid waste.

Each year various MCPS schools, along with several MCPS offices, and local businesses, participate in the program by donating their gently used school and office supplies so that others may have what they need for the start of the new school year. Special boxes are distributed to schools and are placed strategically to collect these supplies at the end of the school year as students and teachers clean out their lockers and desks. Each summer, student volunteers collaborate to sort and organize the supplies for the annual celebration, where the collected supplies are distributed to nonprofit agencies and schools with a high number of low-income and needy students and families. Additionally, supplies are available to area nonprofit organizations so that they can distribute these much-needed supplies in their communities.

Since the inception of this program in 2002, it has expanded each year, with the strong support of MCPS schools and local businesses, and has collected over 91.5 tons of school supplies. This program has not only benefited those families that need school supplies but also teaches our students the importance of sharing, promoting recycling, and reducing waste.

Bioretention Gardens

Montgomery County Public Schools, in partnership with the Montgomery County Department of Environmental Protection (DEP), constructed rain gardens (bioretention gardens) on school sites to redirect stormwater runoff from directly entering local streams. These projects are designed to redirect stormwater runoff into rain gardens, where it filters through plants and soil before replenishing the groundwater. In 2017, rain garden projects were completed at four schools—Argyle Middle School, Newport Mill Middle School, Sligo Middle School, and Strathmore Elementary School. DEP collaborated with MCPS to ensure that the new stormwater management



Students at Strathmore Elementary School participating in official completion of Bioretention project.

projects at the four schools achieved maximum environmental benefits and complemented MCPS capital improvement plans. The completed projects are a cost-effective, environmentally efficient way to capture storm and pollutant runoff.

On October 17, 2017, the fifth grade students and school administrators at Strathmore Elementary School joined County Executive Isiah Leggett, MCPS Superintendent Dr. Jack R. Smith, and Department of Environmental Protection (DEP) Director Lisa Feldt at the ribbon-cutting ceremony to mark the official completion of the four MCPS rain garden projects. The fifth graders who participated in this project completed an environmental education curriculum the year before, which emphasized the importance of watershed management on our environment.

“The Strathmore Elementary School children did an excellent job finishing up the planting for this important project,” said Leggett. “This great teamwork between DEP and MCPS not only benefits our schools but provides environmental benefits, such as improved water quality for our county streams and the Chesapeake Bay.” [My Green Montgomery].

“MCPS is taking steps to reduce its impact on the environment,” said Dr. Smith. “These stormwater management projects have been a great way for us to teach our students about the importance of environmental stewardship. We thank DEP for their partnership and commitment to engaging MCPS students in efforts to protect our county’s critical environmental resources.” [My Green Montgomery].

The SERT program within the Department of Facilities Management continues to promote the program through various annual contests, including the following:

Watt’s Up? Poster Contest

Schools look forward to this popular annual contest that encourages students from Grades K through 12 and staff

to create posters to demonstrate their efforts in energy and water conservation and recycling. This contest creates healthy competition among students and staff to produce artwork to increase the conservation awareness among their peers systemwide. Many schools hold schoolwide poster-judging contests and submit their winning entries to the SERT contest. The posters communicate the importance of environmental conservation through the artistic talents of MCPS students and staff. Through art, students and staff show the importance and the need to conserve energy and water use and actively participate in recycling programs to preserve our environment for future generations. The winning posters are printed and distributed systemwide to increase awareness and convey peer-to-peer messages about the need for environmental conservation.



Many MCPS central office staff look forward to the annual poster-judging event. In recent years, more than 70 staff have participated as judges. Due to the overwhelming interest from MCPS staff to be judges, in FY 2017, the SERT program conducted its first online poster-judging, using the Google platform. Central office and school-based staff could either participate in person on the judging day or judge the contest online. The online judging was a huge success—232 people judged online and 52 participated in person. SERT received 128 entries from students and staff in 2016 and 129 in 2017.

Lead by Example Awareness Campaign

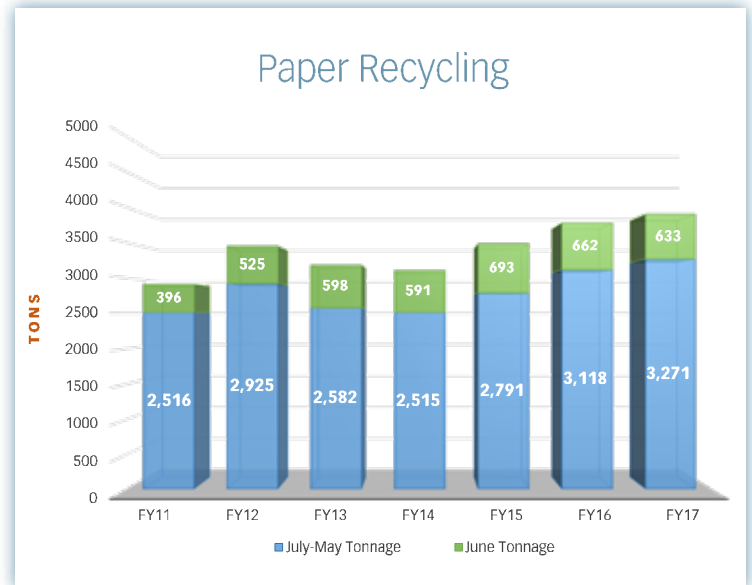
This campaign challenges all secondary schools to create a model resource conservation plan to include energy conservation and responsible recycling projects or initiatives toward a sustainable future. The SERT program encourages all MCPS middle and high schools to participate in the Lead by Example campaign to further reinforce a culture of conservation and sustainability at their schools and in their communities.

Many of the entries include behavioral strategies, energy-efficiency projects, and awareness campaigns that take place in their schools and communities. Often, initiatives such as energy audits with recommended conservation practices, task lamps for staff, computer shutdowns, contests, recycling weight-increase plans, videos, and social media awareness strategies are practiced at the schools as a result of this campaign. These actions promote behaviors among students, staff, and the community to be responsible environmental stewards. The winning entries with proven projects and initiatives are highlighted in SERT Best Management Practices, an online resource for all schools to use as helpful conservation strategies and expectations for efficient building use and operations.

Got Paper? Recycling Contest

This contest is designed to maximize recycling opportunities before the end of the school year. The contest is held in June and provides students with opportunities to recycle as they clean out their lockers and as teachers clean out their classrooms and desks. This contest further helps the school-based building service staff to recycle the majority of the recyclables during the month of June so that they can concentrate on other larger summer projects for the remainder of the summer break. The elementary, middle, and high school with the most paper recycled, by weight, during the month of June will be winners. This contest has proven to not only increase the paper recycling tonnage, but to decrease solid waste. During the FY 2017 contest period, MCPS recycled 633 tons of paper, an increase of nearly 340 tons compared to the same period in FY 2004.

As of 2018, 85 schools are Maryland Green School certified, and nine schools have received the National Green Ribbon Award.



LONG-TERM GOALS

- Increase student knowledge and engagement in environmental sustainability and sustainable practices.
- Use our buildings and grounds as tools to support education for environmental sustainability and outdoor stewardship.
- Make 65 percent of our schools Maryland Green School-certified, by 2024.

SHORT-TERM GOALS

- Increase participation of high school students in meaningful watershed education experiences through the high school chemistry curricula by 10 percent, by FY 2020.
- Continue to create action plans that drive the work forward on the MCPS Environmental Literacy Plan.
- Continue to review and develop environmentally focused problem-based learning units that align to MSDE curricula standards to be completed over the next three years.

STRATEGIES

- Provide ongoing professional learning to build teacher capacity to teach environmental education.
- Partner with various community stakeholders to provide professional learning for teachers around environmental sustainability.
- Identify additional grant sources to provide funding to develop and implement professional learning.
- Continue to use social media to highlight best practices in environmental teaching and learning.

Energy and Natural Resources Conservation

OUR EFFORTS in this category focused on managing energy performance and natural resource conservation. This is accomplished through the following systems and programs:

- Utility Information Management System (UIMS)
- Solar photovoltaic system hosting
- Peak Load Management (PLM) program
- High energy use detection and reduction
- Lighting and energy retrofits
- Water and forest conservation
- Green-power procurement
- School-based conservation programs
- Improving information technology and data center efficiency

EUI of 72 kBTU/SF. As stewards of approximately 26,763,220 square feet of facilities, spread out over 3,677 acres, this is a significant accomplishment in energy-conservation efforts. According to a survey conducted by the U.S. Department of Energy's Energy Information Administration in March 2016, the national median site EUI for K-12 schools is 58.2 kBTUs/SF. When compared to the national median site EUI, the MCPS portfolio of buildings is approximately 7 percent more energy efficient than the median school nationally. The U.S. EPA Energy Star® benchmarking system shows an even higher relative energy performance when relevant factors such as climatic conditions and hours of building use are taken into account.

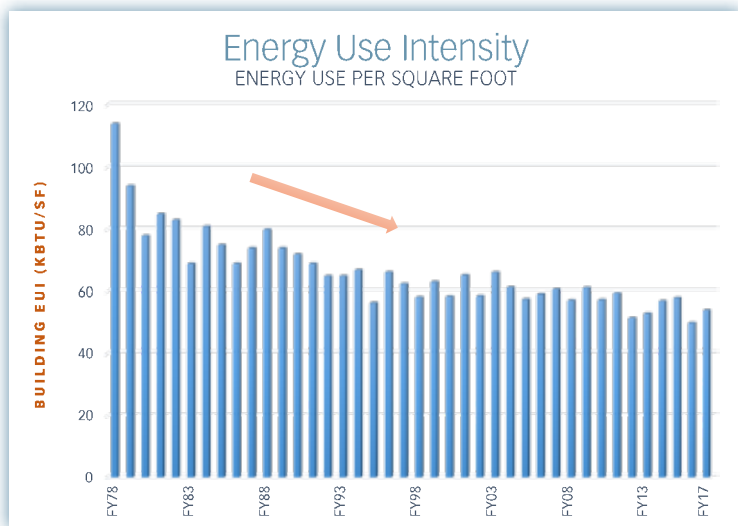
Utilities Information Management System

MCPS manages energy and utilities consumption information through an enterprise utilities information management system (UIMS). This system ensures accurate data processing and analytics of the cost and consumption data from more than 12,000 utility bills per year. This system provides several important tools and reports for reducing energy consumption. Energy-reduction processes and strategies include the following:

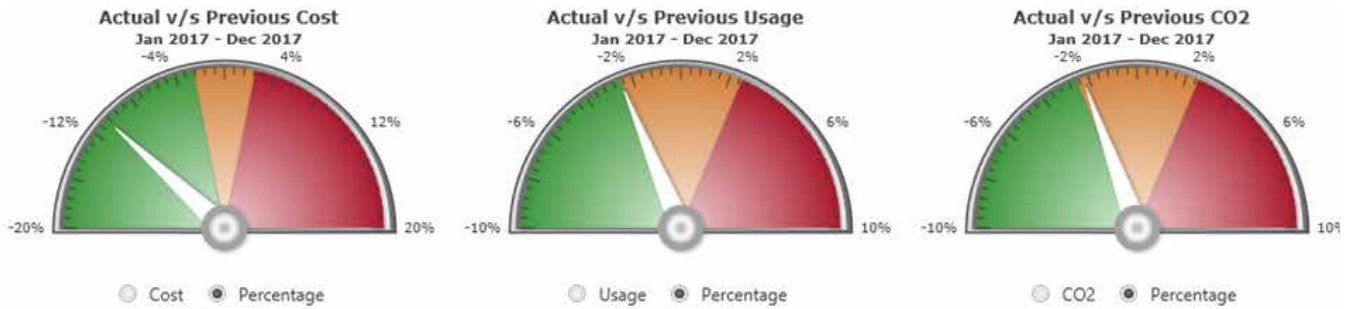
- Identify higher energy use in specific buildings
- Provide energy performance trends
- Provide a basis for evaluating actual energy cost avoidance of retrofit programs
- Communicate with U.S. EPA Energy Portfolio Manager Energy Star® Program
- Provide the data to support the SERT school-based energy incentive program

These information tools and processes provide the measurement capabilities for assessing energy performance at the meter, building, and system levels.

The SERT program regularly uses the UIMS data to analyze current energy use at schools by comparing the consumption to historical energy use. Each school's energy usage is compared against the same period's average of the prior five school years. This tool has proven to be valuable in detecting



The energy performance of MCPS buildings continues to be significantly below national average for educational facilities. The MCPS Energy Use Intensity (EUI) for FY 2017 was 54 kBTU/SF. This is largely due to systemwide efforts of various departments, divisions, students, and school-based staff who ensure that conserving energy remains a major focus. This energy performance is less than half of the FY 1978 MCPS EUI of over 110 kBTU/SF and 25 percent less than the FY 1990



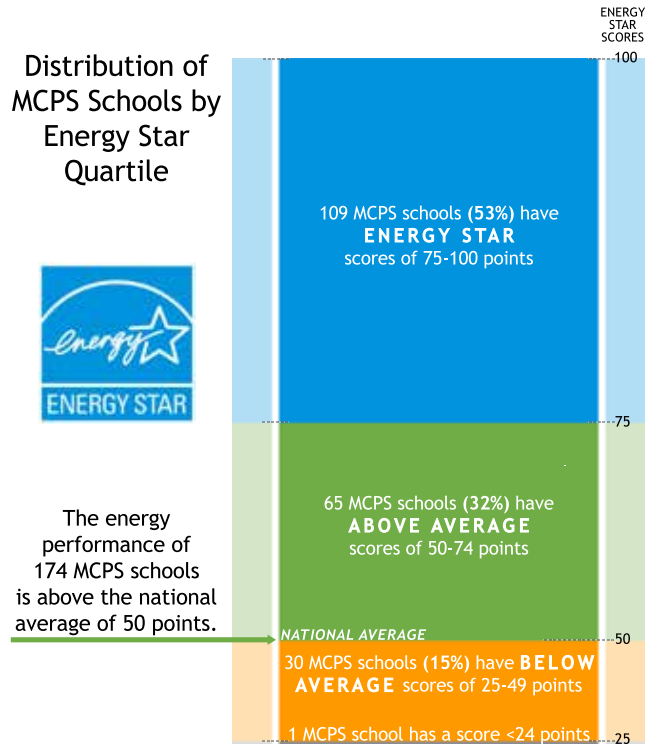
Utilities Information Management System dashboard compares current energy use, cost, and CO2 emissions to prior year.

abnormal energy use at schools early and, as a result, allows the facilities staff to take necessary corrective actions to bring them back to optimal operating conditions.

Energy Performance Benchmarking Using Energy Star® Portfolio Manager

All MCPS schools have their energy performance benchmarked using the EPA Energy Star® Portfolio Manager, a national energy-benchmarking system that ranks the energy performance of buildings. The Energy Star® rating system accounts for building and regional weather characteristics to produce a score using a nationwide database of building energy performance.

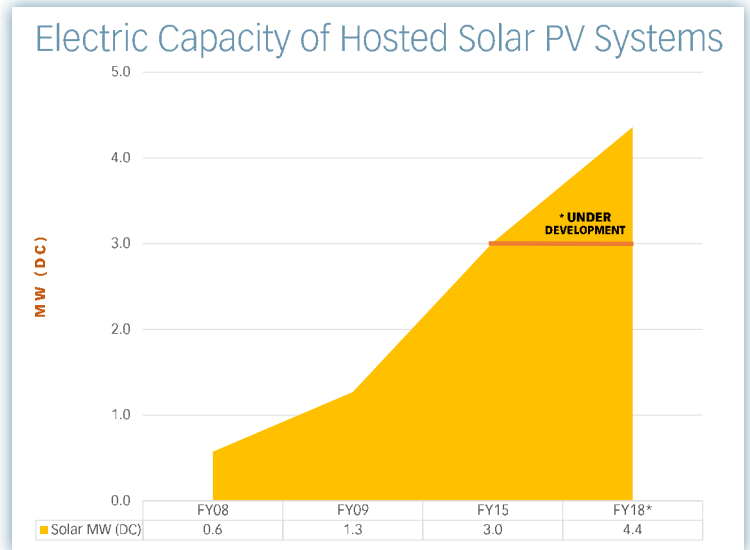
The Energy Star® system is on a 1 to 100 scale, where 50 represents the average energy performance, and scores of 75 or above are in the Energy Star® top quartile. The Energy Star® ranking for the average MCPS schools is 72.



In addition to measuring our energy performance with the EPA Energy Star® Portfolio Manager tool, MCPS participates in the Montgomery County, Maryland, Energy Performance Benchmarking Program.

Solar Power Purchase Agreement

MCPS has continued to develop solar power purchase agreements (PPAs) for on-site renewable energy generation. In 2008 and 2009, MCPS began hosting large-scale rooftop photovoltaic systems at eight schools, with 1.3 megawatts of installed capacity. In 2015, rooftop solar photovoltaic systems were installed at four schools with additional capacity of 1.7 megawatts. MCPS is developing additional solar PPA installations at five more schools, with an added capacity of 1.4 megawatts.



As a result, MCPS is a leader among Maryland school districts in hosting net-metered solar power purchase agreements, with an estimated 4.4 megawatts of installed capacity by the end of 2018. The 17 school sites with photovoltaic systems are projected to produce an annual capacity charge cost avoidance of approximately \$290,000. MCPS is committed to pursuing additional solar PPAs that provide positive financial incentives for the development of local solar PV arrays. MCPS is particularly interested in the potential of aggregate net metering using off-site solar PV systems.



Solar photovoltaic panels installed on the roof of Lakelands Park Middle School.

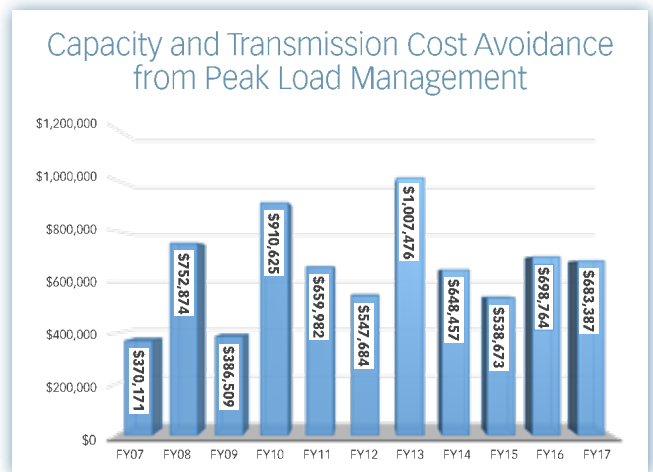
Peak Load Management

MCPS continues to manage its electric capacity charges through its summer Peak Load Management (PLM) program. The energy we use during peak hours in the summer affects MCPS's electricity costs year round. Because these peak demand periods drive our price of electricity for all 12 months of the year, conserving energy is vital. During the summer, the Department of Facilities Management reviews the performance of schools during the critical afternoon hours, on a regular basis, for compliance with PLM strategies. Where compliance is not achieved or other scheduling problems are observed, corrective measures are undertaken and tracked to completion. Cost avoidance for the efforts during the summer of 2017 was \$683,000, and the cumulative cost avoidance since 2007 is more than \$7 million. The graph below shows the historical performance of the impact on kWh usage by shutting down plant equipment during PLM. MCPS keeps track of

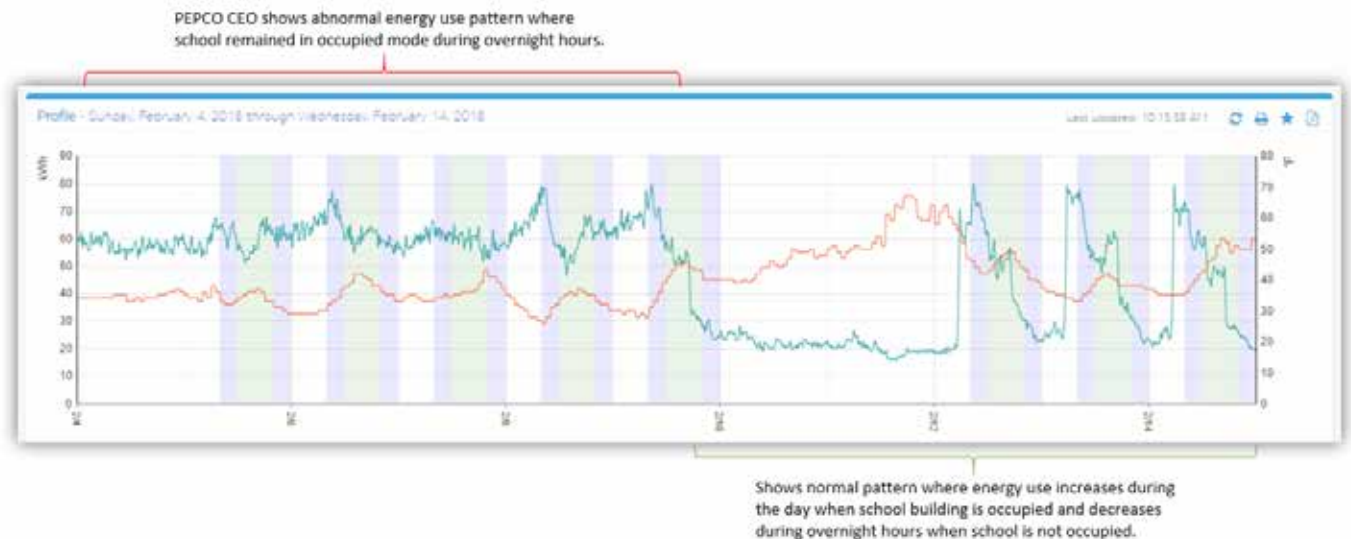
the peak days of the prior years and has identified the hour between 4:00 and 5:00 p.m. as the most optimal time to shut down for PLM.

High Energy Use Reduction Process

MCPS uses a collaborative process, involving multi-functional staff, to investigate, identify, and resolve high energy usage. Analytic tools are used to identify suspected high energy use. Smart meters provide detailed electricity-use profile, from which high energy use can be detected. The PEPCO Chief Energy Officer Online™ (CEO), an energy profiling tool provides access to the near-real-time electric-consumption data.



Unusual consumption patterns are targeted for investigation by the appropriate staff for control and operation problems. Through this process, a number of buildings have been identified to have high energy usage, which, upon investigation,



were found to have control or operational problems that were then corrected. Examples of the typical problems found included faulty sensors that were keeping HVAC systems operating during times when they should have turned off, malfunctioning controls that were causing systems to improperly operate at higher energy consumption than was necessary, and errors in computerized sequence of operation that resulted in equipment operating during unoccupied times, when they were not needed.

Lighting and Energy Retrofits

Light-Emitting Diode (LED) lighting retrofits reduce energy use and maintenance costs, while improving lighting system capabilities. High school auditoriums have been a priority focus for LED lighting retrofits. With the high ceilings in these rooms, and the need for theater-dimming capabilities, the standard legacy house-lighting system used very inefficient incandescent lamps with relatively short lamp life. The maintenance costs were very high, due to the need to use lifts to change the bulbs. Each retrofitted auditorium now is using less energy, greatly reduced maintenance costs due to the long life of LED bulbs, which can now be dimmed. About half of the high school auditoriums have been retrofitted with LED house-lighting systems. Also, MCPS is installing LED lighting in parking lots, exterior building security systems, gymnasiums, and specialty systems.

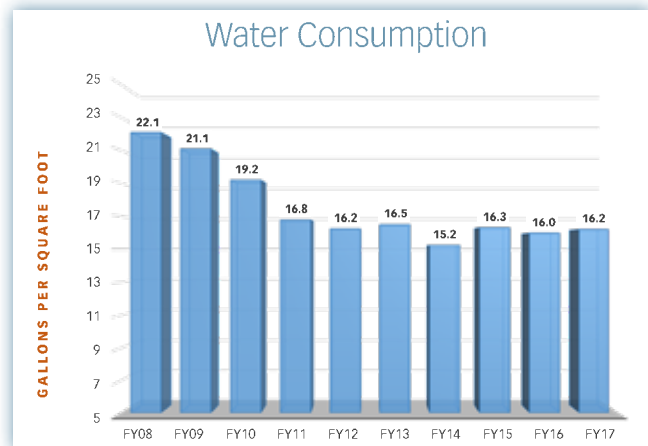
An important energy-performance strategy for exterior lighting is to control the operation time through the use of electronic controls and photocells. Building security lighting is programmed to be on from dusk to dawn daily. Parking lot lights are programmed to be turned off at the close of the regular school day or evening activities (by 12:00 midnight at the latest). They are programmed to be on from 6:00 a.m. to dawn. This process provides exterior lighting for safety when the building may be in use and provides energy savings by turning off when there is no need for lighting during unoccupied hours. The school building service staff actively monitor the exterior lighting for proper operation and submit repair work orders when irregularities are observed.

Building heating, cooling, ventilation, and air conditioning (HVAC) provide essential services to support the educational mission of MCPS. These systems also account for a substantial amount of the building's energy consumption. Energy Management Systems (EMS) control the operation of the HVAC systems to optimize the performance. Upgrading and retrofitting EMS systems with the current technology is a substantial part of the energy retrofit effort. For more information on EMS systems, please see the Building Construction, Maintenance, and Operations section of this report.

Water Conservation

The Department of Facilities Management (DFM) continues to monitor the water consumption at MCPS schools and facilities. SERT staff conducted quarterly school visits to observe water consumption and identify water-conservation opportunities. School administration received feedback regarding issues related to building occupants' use of water. DFM monitors utility bills identify high usage due to leaks or equipment failure, which are followed up with work orders for the Division of Maintenance to perform the necessary repairs. The newly implemented UIMS program also provides routine deviations reports to alert DFM staff when more-than-normal usage of water compared to prior years is detected. This report further enhances our ability to detect water wastage quicker and fix the problems that are causing the increased usage of water.

Water-efficient devices continue to be the standard on all new-construction and restroom-renovation projects. The new buildings are equipped with low-flow water fixtures, dual-



flush valves for toilets, low-flow urinals, and showerheads that require less water than the old fixtures. Dual-flush toilets use 1.1 gallons of water per flush for liquid waste and 1.6 gallons for solid waste, low-flow urinals use 1.28 gallons per flush, and low-flow showerheads use 1.5 gallons of water per minute. In some of the new buildings, waterless urinals are

Many of the new school buildings have native and adapted plants that do not require on-site irrigation.



Water bottle refilling station.

installed to further reduce water usage. In FY 2016 and 2017, 36 restroom renovation projects were completed, for a total of 93 renovation projects since FY 2013.

MCPS also has added water fountains with water-bottle refilling stations in our new and our revitalization/expansion school projects. MCPS Division of Maintenance also has been retrofitting these water fountains in our existing schools to replace the old water fountains. This will help reduce the number of water bottles purchased by students and staff.

MCPS continues to maintain about 16 gallons of water per square feet of building space, thanks to all of the water-conservation strategies taking place at our schools. This is a significant reduction compared to FY 2008, when 22 gallons of water per square feet was used in our schools.

The city of Rockville administers a separate forest-conservation program for properties within its jurisdiction. MCPS is required to comply with forest conservation regulations when a revitalization/expansion and addition project is submitted for development approval. During the development-approval process, MCPS is required to submit a forest-conservation plan for the school project site. Forest-conservation measures for individual projects may include on-site retention in an undisturbed condition (on-site easement), off-site reforestation using a designated forest mitigation bank, or acquisition of an off-site protective easement for existing forested areas not currently protected. Pursuant to these regulations, MCPS currently maintains nearly 111 acres of forest-conservation easements on Board of Education property and has invested in 30.62 acres of off-site forest conservation credits. For example, at Silver Creek Middle School, which opened in 2017, the forest-conservation plan consists of 1.57 acres retained. Additional forest-conservation requirements were met with 3.06 acres of credit from the Bethesda-Chevy Chase Chapter, Izaak Walton League of America forest conservation bank.

Green Power Procurement

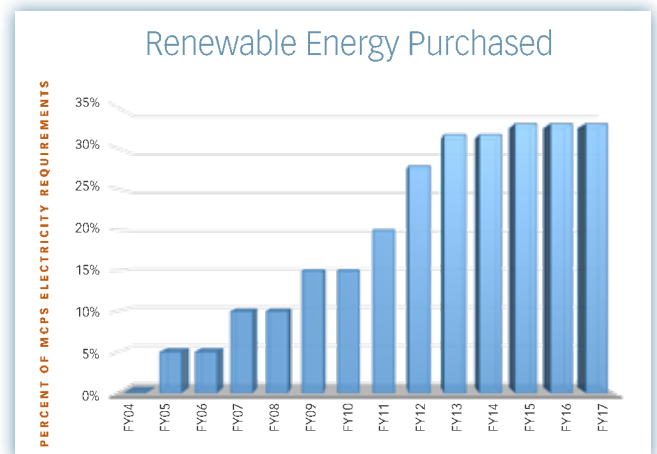
MCPS continues to increase its procurement of electricity and clean or renewable energy through purchase of renewable energy certificates (RECs), now at 33 percent of MCPS electricity requirements. These RECs represent the carbon offsets from clean or renewable energy sources, primarily from wind and solar generators. MCPS purchases wind-energy RECs to offset 20 percent of the carbon from the electricity that the school system consumes, to comply with the Montgomery County Energy Policy. MCPS purchases additional RECs that offset approximately 13 percent of our electric requirements, to comply with the state of Maryland Renewable Portfolio Standards. MCPS began purchasing RECs at 5 percent in FY 2005 and has gradually increased the percentage of procurement. In FY 2017, the school system spent around \$300,000 to purchase RECs.



On-site forest conservation areas at Silver Creek Middle School.

Forest Conservation

The goal of the Montgomery County Forest Conservation Law is to preserve, maintain, and restore forested areas for the benefit of county residents and future generations. Trees and forests filter groundwater, slow stormwater runoff, alleviate flooding, and supply wildlife habitat. Trees cleanse the air, offset the heat generated by development, and reduce energy needs. And, in a less-tangible sense, trees improve the quality of life in a community by providing recreation and visual appeal. [Montgomery County, MD Planning].



Building Occupants

The School Energy and Recycling Team (SERT) program continues to collaborate with school administrators, teachers, staff, and students to provide support to sustain the school's efforts to conserve. The SERT program staff is available to work and assist students and staff in all MCPS schools, as they take active responsibility for reducing energy and water consumption and solid waste. School-based SERT teams are encouraged to engage in an array of activities that provide a means for them to be creative and contribute to reducing environmental impacts. See the Student Education, Awareness, and Action section of this report for more information about the various activities and resources that SERT provides to schools to increase the awareness on environmental conservation.

Many schools have active school-based SERT programs that are led by school staff and students. These teams conduct various activities, including energy audits, recycling inspections, awareness campaigns, and contests to encourage their peers to embrace environmental conservation. Some schools have SERT teams with as many as 40 students who regularly take part in energy-conservation and recycling efforts.

Information Technology

In 2013, the MCPS Strategic Technology Plan provided a roadmap to expanding anywhere-anytime access to people, information, and resources within the district. To actualize this work, MCPS implemented a series of efforts critical to improving efficiencies related to teaching, learning, and system operations.

These efforts included the following:

- Completion of robust wireless infrastructure across all schools to ensure reliable, on-demand access to the Internet.
- Implementation of the myMCPS virtual learning community to connect staff, students, and parents/guardians as well as facilitate online learning opportunities for all stakeholders.
- Integration of self-service portals and the automation of processes previously completed manually.
- Digitization of curriculum and instructional materials to increase the flexibility of teaching and learning in a digital age.

MCPS continues to build on its well-established practices that leverage information technology to improve environmental sustainability. To save and conserve energy, MCPS purchases energy-efficient computers and monitors when new computers are needed. Existing workstations are cleaned, repaired, and refurbished to allow for reuse to substantially



Technology use in schools

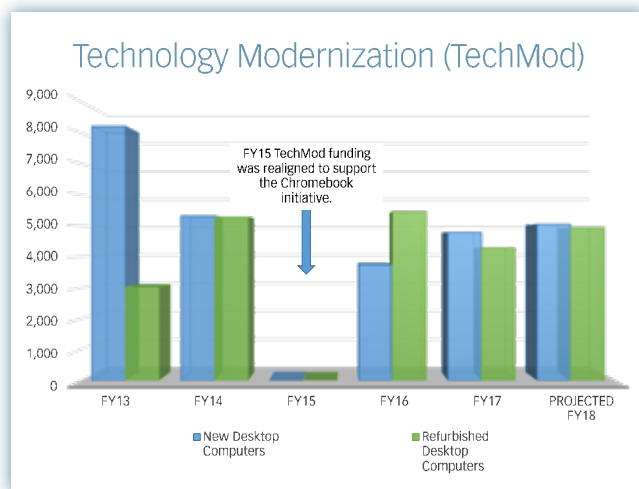
reduce the purchase of new computers. Furthermore, the virtualization of servers reduces both the number of servers and the associated power consumption. As a best practice, computer workstations are scheduled to shut down automatically each night and when not in use. The use of digital curriculum, wireless technology, and electronic devices reduces the amount of paper consumed. To that end, the district's efforts to reimagine teaching and learning in the 21st century maximize the flexibility and efficiency of space in schools, while promoting digital-learning environments that reduce paper consumption.

MCPS has successfully deployed a number of information technology solutions that underscore our focus on environmental sustainability. Below are highlights of these successes:

- Through the Technology Modernization (TechMod) program, MCPS delivers high-quality information-technology tools to support staff and students. Each year, preventive maintenance and refurbishment of devices occurs to maintain the health of the MCPS ecosystem. The chart on page 18 shows the number of new and refurbished computers in MCPS over the past five years.
- In 2015, MCPS funded an initiative that dramatically increased the availability of mobile devices in order to infuse technology into classrooms and reduce the need for print materials. The chart on page 18 shows the number of new and repaired Chromebooks deployed in MCPS over the past five years.
- In 2016, MCPS began a multi-year effort to provide all students with access to mobile computers and a cloud-based learning platform. Through the myMCPS portal, students and staff have 24/7 access to technology-enriched instructional and curricular resources that engage students in more explorative and interactive learning experiences.

Parents have online access to student information and performance data, including report cards, interims, and emergency cards.

- In 2016, MCPS launched Employee Self Service (ESS), an online platform that provides employees and retirees access to benefits enrollment and information. This technology solution reduces a number of manual, paper-dependent processes.
- MCPS expanded initiatives to digitize staff communications previously printed and mailed to schools. Communications such as The Bulletin, MCPS QuickNotes, employee salary notices, network access requests, and all official memoranda are distributed via e-mail.

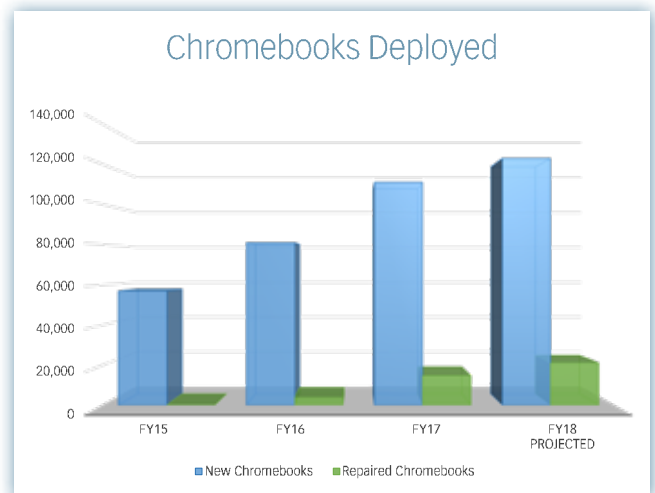


- In FY 2017, MCPS launched an effort to research and implement energy-saving improvements for its data center. Initial actions included increased server virtualization and consolidation of storage area networks (SANs). The migration and consolidation from aging virtualization hosts and SAN devices to newer energy-efficient servers reduces energy consumption. The migration and transition to these technologies began in FY 2018 and staff anticipate completion by end of FY 2019.

These information-technology solutions result in savings in terms of energy, paper, packaging, distribution, and time. There have been noticeable reductions in the overall volume of centrally printed material and need for paper in the last few years.

As technology and business change, the need to conserve energy, collect data, and optimize solutions that best meet business needs continues. MCPS is pursuing a number of new ideas and enterprise systems improvements/upgrades; below are a few highlights.

- One of MCPS’s FY 2018 operating budget strategic priorities focuses on operational excellence. The Enterprise Resource Planning (ERP) Upgrade Project is intended to create efficiencies and ensure effective operations through updating and enhancing MCPS business systems. The roadmap includes recommendations for the Financial Management System (FMS) and Human Resources Information System (HRIS) upgrades, including on-premises vs. cloud technologies, and the replacement of a legacy budget management system. This will be followed by upgrading and/or replacing systems integrated with FMS and HRIS, including the Applicant Tracking System, Human Resources Online, and School Allocation Execution. This effort is a phased rollout, with incremental deliverables, beginning in 2018 and continuing over the next four to five years.
- MCPS is looking at updating current Promethean boards and projectors with interactive touch panels. A key factor in determining our path forward includes assessing the energy savings, replacement cost, and support savings.
- MCPS plans to create and execute an Energy Management Plan to better understand the use of energy in our data center and how we might reduce usage in the future. This plan will address how to collect measurements of system performance, how to manage and interpret the data, and how to identify, fund, and implement energy-efficiency actions. MCPS has conducted an initial energy-usage assessment for our data center, using Data Center Profiler (DC Pro, offered by The Center of Expertise for Energy Efficiency in Data Centers). DC Pro is a web-based “early stage” scoping tool that estimates Power Usage Effectiveness (PUE) and results in a list of suggestions to guide the development of an Energy Management plan for the MCPS Data Center.



Total New Chromebooks To Date: 146,593 (includes centrally purchased devices and those purchased from school funds, PTAs, foundations, etc).

LONG-TERM GOALS

- Maximize building energy efficiency, achieving a systemwide building energy use of 45 kBtu per square foot per year, by 2024.
- Complete installation of building energy management systems in all buildings, by 2024.
- Increase the use of renewable energy sources.
- Achieve a sustained reduction of energy use by computers and other equipment that plug in.
- Reduce greenhouse gas emissions from electricity use by 15 percent, by 2024. Employ energy audits and re-commissioning in the MCPS Data Center to inform ongoing awareness of energy use.
- Reduce print instructional text while expanding the use of digital curriculum and access to technology in schools.
- Reduce water consumption by 20 percent, by 2024.
- Reduce print instructional text by 70 percent, while expanding the use of digital curriculum and access to technology in schools.

SHORT-TERM GOALS

- Increase the capacity of hosted solar photovoltaic systems to 5 MW, by FY 2021.
- Retrofit 15 high school auditoriums and 10 gymnasiums with LED lighting, by FY 2021.
- Pilot LED lighting in other applications, as appropriate.
- Provide anywhere-anytime access to people, information, and resources.
- Develop and expand virtual communities and online learning to connect classrooms and encourage resource-sharing among all stakeholders.
- Implement the processes needed to collect and analyze electrical data in the MCPS Data Center, for use in managing energy-efficient operations.
- Continue the best practice of implementing server virtualization and other emerging technologies to improve the energy efficiency of MCPS data operations.
- Investigate energy-saving measures in our data center such as preparing the Computer Room Air Handler (CRAH) equipment for up-to-date technology and efficiency.

STRATEGIES

- Incorporate LED lighting in areas most appropriate and cost-effective, including auditoriums, parking lots, and emergency and security lighting.
- Collaborate with schools to resolve high energy and water usage.
- Continue support of school-based energy teams by SERT, using school visits, outreach, and performance feedback to minimize energy and water-consumption waste.
- Perform comparative analyses of energy use at schools to identify energy-conserving opportunities.
- Conduct energy audits and recommissioning in buildings that have sustained high levels of energy use.
- Continue to coordinate with the private sector to explore cost-effective power-purchasing agreements and other public-private partnerships that further MCPS's sustainable goals.
- Clean and test out-of-warranty desktop computers at schools.
- Clean/refurbish computers to prolong the life of the machine.
- Use MCPS Self-Warranty team to repair computer hardware.
- Pursue technology solutions for MCPS business, instructional, and information-sharing processes that both encourage and maximize digital delivery and exchange of data over manual and print processes.
- Implement virtualization of servers, as appropriate, to reduce the number of servers and the associated power consumption and infrastructure needs.
- Consolidate servers, as appropriate, to reduce the number of servers and the associated power consumption and infrastructure needs.
- Perform scheduled replacement of technology with more energy-efficient devices.
- Invest in cloud-based technologies for enterprise-system solutions where appropriate and applicable.
- Continue our commitment to cleaning, repairing, and refurbishing desktop workstations to allow for reuse, reducing significantly the number of new computers purchased.
- Employ energy audits and recommissioning in the MCPS Data Center to inform and manage infrastructure energy use.
- Continue our commitment to regularly updating schools scheduled for TechMod services to maintain up-to-date energy-saving computing devices in schools and offices.

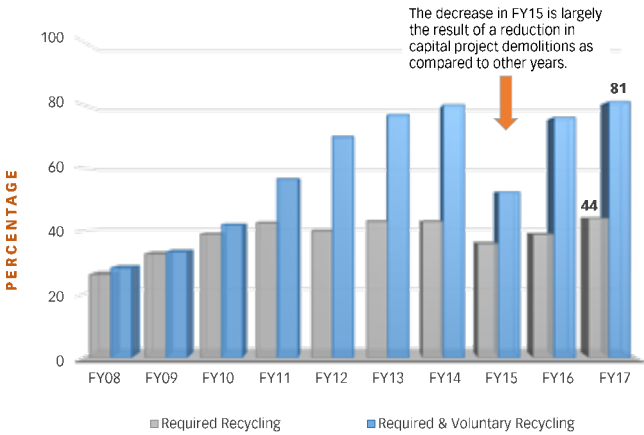
Materials and Waste Cycles

MCPS'S RECYCLING PROGRAM has improved significantly over the years, due to increased awareness and participation from students and staff systemwide. Montgomery County Regulation 1–15 requires all residential dwellings and commercial businesses within the county to recycle four streams of recyclables. The four streams required are paper/cardboard, commingle, yard waste, and scrap metal. In 2017, MCPS achieved a 44 percent recycling rate for these four streams. In addition, MCPS aggressively pursues opportunities to recycle additional material, which are considered voluntary recycling material. The list of materials that are voluntarily recycled has grown to more than 20, and include tires, batteries, various types of construction-demolition debris, automobile windshields, computers, televisions, cell phones, automotive starters, alternators, brake rotors and drums, and others. In FY 2017, MCPS achieved an 81 percent recycling rate in the required and voluntary recycling category. As demonstrated in the chart below. In FY 2017, the required recycling rate doubled, compared to FY 2003, and the voluntary recycling rate increased almost two and a half times.

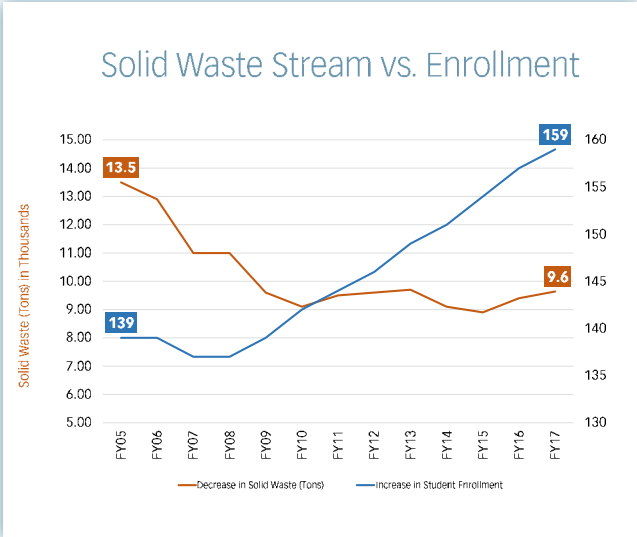
and regionally manufactured. Periodic reports from each of the major construction projects detailing the type, amount, and how it was recycled are submitted to MCPS by the contractors to ensure compliance with this requirement. In 2016 and 2017, five revitalization and expansion projects were completed; the average diversion rate among the five projects was nearly 86 percent.

In addition to recycling, MCPS has sought to change its practices to use more sustainable materials that can be reused or recycled. The implementation of recyclable paperboard lunch trays in all schools during the 2014–2015 school year has proven to be a huge success. The SERT program, in collaboration with school cafeteria staff, school building service teams, school staff, and students, has implemented a successful paperboard lunch tray recycling program. Since the paperboard lunch recycling program began, the SERT program has conducted outreach events at school during lunch time to speak to students about proper recycling practices, and help student identify items that can be recycled and items that cannot be recycled. With the success of the paperboard lunch trays, MCPS is able to eliminate the use of polystyrene products in our school cafeterias. As a result, MCPS is not only able to reduce the amount of solid waste generated by disposing the previous polystyrene trays, but also increase monthly paper/cardboard recycling. Partly due to the recyclability of the paperboard lunch trays, in FY 2017, MCPS recycled 3,779 tons of paper recyclables, an increase of 673 tons compared to FY 2014.

Required and Voluntary Recycling Percentages



MCPS Division of Construction implements guidelines for construction waste management for all of our constructions projects. The goal is to reduce construction and demolition waste on the job site and minimize waste through implementation of a Construction Waste Management Plan by diverting a minimum of 75 percent from waste stream. MCPS also emphasizes using construction materials that are recycled





Students actively participate in recycling commingled recyclables in schools during breakfast and lunch.

MCPS is committed to purchasing more environmentally responsible products. The MCPS Procurement Unit was the recipient of the 2017 Achievement of Excellence in Procurement® (AEP) from the National Procurement Institute, Inc. (NPI). This prestigious award is designed to measure innovation, professionalism, productivity, e-procurement, and leadership attributes of the procurement team. During FY 2016 and FY 2017, the MCPS Print Shop avoided the purchase of 131 new copier machines, and instead purchased refurbished copiers. This significantly reduced costs, along with reducing waste by improving the life-cycle of equipment operated throughout the school system. During the same two-year period, the print shop purchased 44 million sheets of paper made of 30 percent recycled material (post-consumer waste), used for the printing of instructional, operational, and public information material.

Due to an increase in annual student enrollment, in FY 2015, MCPS set a goal for a solid waste limit of 10,000 tons. In FY 2017, the amount of solid waste generated at MCPS was less than 9,600 tons, despite an increase of over 10,200 in student enrollment since FY 2013. MCPS's total recycling that includes required recycling and the voluntary recycling generated in FY 2017 was nearly 2,700 tons more than in FY 2015. This is the perfect scenario, where we maintain the generation of solid waste and, at the same time, increase the amount of recycling that we produce. These recycling and solid-waste-reduction efforts resulted in approximately \$155,000 in cost avoidance in FY 2017, by reducing "tipping" fees, the fee that MCPS pays for the disposal of solid waste.

In FY 2016 and 2017, MCPS began to launch a comprehensive awareness campaign to increase recycling at schools that participate in the Maryland Meals of Achievement (MMFA) Breakfast program. Schools that participate in the MMFA program generate more commingled recyclables than those schools that provide only lunch meals. The SERT program provided the necessary recycling bins to these schools and established best management practices so that the maximum amount of commingled recyclables can be captured after breakfast from the MMFA program. As a result of these school efforts, MCPS's commingled recycling increased to 759 tons in FY 2017, from 530 tons in FY 2015.

LONG-TERM GOALS

- Meet defined sustainable procurement guidelines of at least 50 percent of total goods and services purchased.
- Increase total recycling rates to 80 percent, by 2024.
- Develop protocols for increasing the reuse of materials, including electronics and computers, electronic parts, copiers, furniture, building maintenance parts and equipment, cleaning equipment and parts, and more.

SHORT-TERM GOALS

- Achieve and maintain a minimum 70 percent recycling rate, by 2020.
- Make sure annual solid waste tonnage does not exceed 10,000 tons for FY 2017–FY 2020.
- Continue to educate and deploy an interior centralized recycling station for the expanding number of schools participating in the Maryland Meals for Achievement, After School Snack Program.

STRATEGIES

- Collaborate with the MCPS Procurement Unit to identify recycling opportunities as contracts are awarded for various services and products.
- Continue SERT program school visits to provide outreach and performance feedback to improve school-based conservation efforts.
- Conduct a comparative analysis of recycling participation of elementary schools and deploy exterior centralized recycling collection bins where needed to encourage further participation of students, staff, and community members.
- Keep abreast of changes in local and national markets for opportunities to identify additional volume and types of material that can be recycled.

Building Construction, Maintenance, and Operations

OUR EFFORTS in Building, Construction, Maintenance, and Operations are focused on the following areas:

- Green Buildings
- Geoexchange Systems
- Storm Water Management Program
- Energy Management Systems (EMS)
- Environmental Services and Indoor
- Air Quality
- HVAC Replacement Program
- Green Cleaning
- Fats, Oils, and Grease
- Equipment Repair Program

Green Buildings

In 1993, MCPS developed Facility Design Guidelines that formally standardized processes and design/construction specifications for new and revitalization projects outlined in the Capital Improvements Program. Facility Design Guidelines continues to serve as a vital tool for producing high-quality capital projects in a consistent and timely manner. In 2003, Facility Design Guidelines was updated to incorporate sustainable building design features and practices that are aligned with the various categories in the Leadership in Energy and Environmental Design (LEED). To achieve LEED Gold certification within the LEED for Schools System involves having

significant features for Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, and Innovation and Design Process.

LEED is a set of rating systems for the design, construction, operation, and maintenance of green buildings. Developed by the U.S. Green Building Council (USGBC), LEED is intended to help building owners and operators be environmentally responsible and use resources efficiently. The LEED for Schools rating system was developed to address the design and construction of K–12 schools. The rating system is based on LEED for New Construction, but focuses on classroom acoustics, master planning, mold prevention, environmental site assessment, and other issues important to schools. To achieve LEED Gold within the LEED for Schools system involves having significant features for Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, and Innovation and Design Process.

Using the updated Facility Design Guidelines, MCPS produced Great Seneca Creek Elementary School in August 2006, the first Gold-rated LEED-certified school in Montgomery County and the state of Maryland. Subsequently, in October 2008, Montgomery County and the state of Maryland passed legislation requiring a minimum of Silver rating in LEED certification for new major construction projects. MCPS now has 25 LEED-certified schools of which 23 schools are LEED Gold and two schools are LEED Silver.

Montgomery County adopted the local version of the International Green Construction Code (IgCC) December 2017. Included was a six-month grace period. Projects requesting for permit after June 27, 2018, will be subject to the new rules. LEED is allowed as an alternative compliance path.

Silver Creek Middle School is MCPS's newest LEED Gold-certified school that uses a compact building envelope, providing a space-efficient building. It is designed to reduce the impact on the environment and meet U.S. Green Building Council (USGBC) LEED for schools criteria. The design includes energy savings due to day lighting controls, optimum solar orientation, ground source heat-pump system, increased envelope insulation by using high R-value insulation on the roof and exterior walls, and better-performing



The library at Hallie Wells Middle School.

LEED-CERTIFIED SCHOOLS		
FACILITY	CERTIFICATION LEVEL	YEAR ACHIEVED
Great Seneca Creek Elementary School (new)	Gold	2007
Francis Scott Key Middle School (replacement)	Gold	2009
William B. Gibbs, Jr. Elementary School (new)	Gold	2010
Cashell Elementary School (replacement)	Gold	2010
Carderock Springs Elementary School (replacement)	Gold	2011
Cresthaven Elementary School (replacement)	Gold	2011
Cabin John Middle School (replacement)	Gold	2012
Farmland Elementary School (replacement/renovation)	Gold	2012
Cannon Road Elementary School (replacement)	Gold	2012
Seven Locks Elementary School (replacement)	Gold	2012
Paint Branch High School (replacement)	Gold	2013
Flora M. Singer Elementary School (new)	Gold	2013
Glenallan Elementary School (replacement)	Gold	2014
Garrett Park Elementary School (replacement)	Gold	2014
Beverly Farms Elementary School (replacement)	Gold	2014
Weller Road Elementary School (replacement)	Gold	2014
Herbert Hoover Middle School (replacement)	Gold	2015
Wilson Wirms Elementary School (new)	Gold	2015
Candlewood Elementary School (replacement)	Silver	2015
Bel Pre Elementary School (replacement)	Gold	2015
Gaithersburg High School (replacement)	Gold	2015
Rock Creek Forest Elementary School (replacement)	Gold	2015
Farquhar Middle School (replacement)	Gold	2017
Wheaton High School (replacement)	Silver	2017
Hallie Wells Middle School (new)	Gold	2017

glass than prototype design. LED lights are used in the gymnasium and in outdoor parking and outdoor wall lighting. Compact fluorescent lights are used in other areas of the school. The lights in the building turn on when the room is occupied and it is cloudy or dark outside. The controls turn off lights when the room is vacant or when there is enough natural daylight coming from the windows. The proposed energy use intensity (EUI) is 25.26 kBtu/sf/year.

The school is also equipped with dual flush valves for the toilets that use 1.1/1.6 gallons per flush, low-flow urinals that

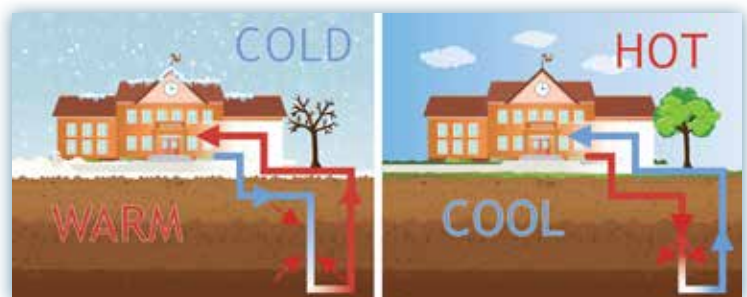
use 1.28 gallons per flush, showerheads that use 1.5 gallons of water per minute, and lavatories to reduce water use. The faucets in the school are metered and will turn off automatically after 10 seconds. This greatly reduces water waste while applying soap to wash hands. MCPS requires that all new-construction projects achieve a minimum of 75 percent waste diversion. At Silver Creek Middle School, 77 percent of waste was diverted and recycled. Additionally, 12 percent of the products used at the school were harvested and manufactured within 500 miles; and 15 percent of the products used in the school had recycled content.

Geoexchange Systems

MCPS piloted the first geoexchange system in 2001. Currently, 29 schools are being heated and cooled with the geoexchange system. Geoexchange, also known as geothermal, heating, and cooling systems, is one of the most energy-efficient and environmentally safe space-conditioning systems available.

While temperatures above ground change a lot from day to day and season to season, the temperature 10 feet below the earth's surface holds nearly constant between 50 and 60 degrees F. For most areas, this means that the soil temperatures are usually warmer than the air in winter and cooler than the air in summer. [USGBC]

The geoexchange system harvests the constant ground temperature and uses the earth's mass to store energy to heat and cool buildings. Energy is transferred through an underground piping system between the building and ground to provide year-round heating and cooling. The system uses conventional heat pumps, similar to units found in homes, but uses the underground piping system in lieu of outdoor condenser fans. At the school sites, hundreds of geothermal wells are installed to harvest the water that is necessary to operate this system. At William H. Farquhar Middle School, which opened in 2016, 192 geothermal wells that are 400 feet deep are installed. At Hallie Wells Middle School, which opened in 2017, there are 273 wells drilled vertically beneath the athletic



The temperature 10 feet below the earth's surface holds nearly constant between 50 and 60 degrees F. For most areas, this means that the soil temperatures are usually warmer than the air in winter and cooler than the air in summer. [USGBC]

fields in a 20' x 20' grid to absorb ground heat in the winter and transfer heat back into the ground in the summer. This scenario enables a building to maintain comfort conditions without using large commercial chillers and boilers. Chillers and boilers require not only annual maintenance, but also significant space within a building. The space and maintenance avoidance tied to the overall energy efficiency results in a return on investment of 7 to 15 years for a given facility.

Green Roofs

A green roof is a layer of vegetation planted over a waterproofing system that is installed on top of a flat or slightly-sloped roof. Green roofs also are known as vegetative or eco-roofs. Although installation of a green roof usually involves higher upfront costs than a traditional roof, there are many economic benefits that can make up for this. Increased R-value (a measure of the resistance of a material to heat flow) of the roofing system, along with reduced temperatures on the roof lessen HVAC loads, resulting in energy cost savings. [National Park Service, U.S. Department of Interior].



Green roof at William H. Farquhar Middle School. [Hord Coplan Macht, architect; photography by Patrick Ross] Inset photo shows types of vegetation used on green roofs.

A green roof also helps control storm water runoff and retention, improves air quality, insulates the building, improves the efficiency of the building's mechanical equipment, reduces GHG, and extends the life of the roof. MCPS's green-roof projects began in 2005 with the installation of 900 square feet at Northwood High School and has since grown to include close to 1 million square feet. Gaithersburg High School, built in 2013, is the largest single site in MCPS's portfolio of buildings to host a green roof, with 126,252 square feet. As of FY 2017, green roofs have been installed at 34 schools, while two other construction projects are under way that will also host green roofs.



The Bioretention area at Hallie Wells Middle School.

Stormwater Management Program

Montgomery County is made up of 8 major and more than 150 smaller watersheds. Stormwater runoff from MCPS schools effects all of these watersheds. These watersheds are tributaries to the Chesapeake Bay and its numerous estuaries. A significant component of the county's stormwater program is its Municipal Separate Storm Sewer System (MS4) permit, a 5-year permit issued by the Maryland Department of Environment (MDE). MCPS is a co-permittee with the county under the state's MS4 permit and works collaboratively with the county's Department of Environmental Protection to identify school-site opportunities to facilitate the installation of environmental site design (ESD) stormwater management measures to improve water quality by reducing the county's overall untreated impervious surfaces.

MCPS implements on-site stormwater management facilities that meet or exceed the latest federal, state, and local requirements, using ESD techniques. Among the ESD stormwater management measures and facilities that MCPS incorporates are impervious area reduction via installation of vegetated roof areas, the use of alternative porous pavements to promote groundwater recharge, bio-retention facilities, infiltration practices, and vegetated bio-swales. In FY 2016 and FY 2017, the program performed maintenance on 427 stormwater facilities and incorporated 127 ESD techniques into 16 new capital projects. In FY 2017, the county reported to MDE that it has completed restoration of 2,927 (77%) of the required acres. As a co-permittee, MCPS's storm management measures and facilities are included in the reported data.

There are 22 bio-retention areas around Silver Creek Middle School, MCPS's newest LEED Gold school. These areas are planted with native shrubs, wildflowers, and grasses that do not require a lot of watering or irrigation. Because they are native, they can survive when there is little rain, and even in a drought. Under the plants are layers of permeable soil, fine aggregate sand, and watershed gravel. After these layers clean the water, it drains through a perforated pipe into the ground below. [USGBC]

Energy Management Program

MCPS has installed energy management systems, also known as building automation systems in most of its facilities to regulate the heating, ventilation, and air conditioning (HVAC) of the building. These systems maximize energy savings by controlling when and how the HVAC system operates. Utilizing this technology, the Energy Management Program staff are able to remotely control the HVAC equipment operation while schools are in session and minimize usage when schools are not in session. For special events and community use, schedules are consolidated and only specific areas (zones) and associated equipment are turned on, as needed.

The energy management system is equipped with features to increase operating efficiency. The system monitors space temperature regularly. In the “unoccupied mode,” it determines the optimal time to turn the system on and off in order to achieve or maintain the desired temperature set point. In many large gathering spaces, such as lunchrooms, gymnasiums, and auditoriums, the systems are equipped with Demand Controlled Ventilation (DCV), which allows the system to detect occupants based on carbon dioxide (CO₂) levels. Ventilation (the provision of fresh air) can then be modulated to respond to the demand and reduce energy consumption. Older energy management systems are being converted to web-based systems with improved graphical user interfaces (GUI) that allow for better control at the school level. The upgrades to energy management systems result in improved quality of maintenance and allow for faster response times to HVAC-related needs.

Progress in the Energy Management Program since the publication of the FY 2016 Environmental Sustainability Management Plan has focused on continuous upgrades of the energy management systems throughout the school system. Previously, the Energy Management Program staff supported hardware and software for nine different types of systems. Older systems with outdated technology have been eliminated; others have been upgraded to current standards. As a result, the Energy Management Program staff now maintains five types of systems, resulting in improved operational efficiency.

Since FY 2016, MCPS Energy Management Program has implemented programming to improve performance and scheduling for the summer Peak Load Management (PLM) program. As energy management systems continue to receive upgrades, the scheduling for PLM shutdown is being added as a feature to efficiently program plant equipment to shut down between the hours of 4:00 and 5:00 p.m. during the summer break. This allows a much faster implementation of the PLM program when schools are not in session for the summer break. Additional information on the PLM program is available on page 14. Since FY 2016, 21 schools have received



WiFi-capable thermostats will be installed in relocatable classrooms in Summer 2018.

energy management system upgrades, including graphics upgrades, to allow for web-based access, to full replacement of the energy management systems, to take advantage of new technologies and improve performance.

The MCPS Energy Management Program is also implementing programming and scheduling improvements to systems to streamline and efficiently complete seasonal changeovers in MCPS’s portfolio of facilities from heating to cooling and from cooling to heating. The MCPS Energy Management Program is also in the developmental phase of creating a dashboard that will allow staff to monitor heating and cooling systems’ loop water temperatures. By monitoring the loop temperatures, any necessary maintenance or repairs can be made sooner before potential issues become major and cause the breakdown of plant equipment.

The Department of Facilities Management continues to research and evaluate new technologies in energy management to maintain comfort, and increase the efficiency of plant equipment operation and maintenance. A significant opportunity to reduce energy consumption remains in controlling space temperatures in the relocatable classrooms system-wide. Currently, MCPS operates close to 500 relocatable classrooms that tend to use more energy per square foot than a regular classroom in a school building. In 2017, MCPS began using WiFi-capable thermostats, a pilot program in a few relocatable classrooms. Due to the success of the pilot program, this technology will be implemented in a majority of relocatable classrooms systemwide during the summer of 2018.

Building Maintenance Plans

As stewards of over 26,763,220 square feet in more than 220 facilities, MCPS strives to maintain the indoor environments in an environmentally, socially, and economically responsible manner. With a proactive Indoor Air Quality (IAQ) program, focusing on preventive maintenance and customer service, the MCPS IAQ Team has continuously improved indoor air quality since it was formed in 2000. The IAQ Team developed its

own program—the Building Maintenance Plan (BMP), which provides relatively low-cost vital preventive maintenance and uses environmentally friendly products during the process. Similar to an owner’s manual for the building’s HVAC system, the BMP is used by school-based staff to maintain the school’s ventilation equipment in optimum condition. The IAQ Team has developed and delivered BMPs to 114 schools. As a result of preventive maintenance activities, the IAQ Team has met performance measures for temperature and ventilation since the program started. The BMP also brings awareness to the importance of using products that have been reviewed for safety and environmental impact. Only “approved” products are permitted in schools.

Environmental Services and Indoor Air Quality

The sustainability initiative to improve and maintain good indoor air quality has been achieved through implementation of a comprehensive indoor air quality program. Through the implementation of building-specific BMPs, MCPS has earned the EPA’s Tools for Schools Excellence Award and, more important, improved the learning environments for students and staff. To avoid air quality issues in relocatable buildings, the IAQ unit proactively inspects all relocatable classrooms on an annual basis, using a written assessment checklist. As a proactive measure, building service staff have begun to use a modified version of this assessment checklist to inspect relocatable classrooms on a weekly basis during the summer break. During 2017, MCPS inspected 490 relocatable buildings. From the inspections, any needed repair work orders are generated to upgrade the units into good condition.

While our primary goal is to address IAQ proactively, the IAQ program also implements a formal IAQ Complaint Response Program, which addresses complaints in an effective and efficient manner. Over the past 10 years, the IAQ unit has responded to an average of 294 complaints per year. In FY 2017, the Indoor Air Quality Special Projects Team was formed to respond to indoor air quality-related complaints and special requests. Since its formation, the IAQ Special Projects Team has completed 316 IAQ-related work orders. Other components of the MCPS IAQ sustainable framework include an Environmentally Preferred Purchasing Program and a staff of environmental professionals and technicians who respond to a wide variety of unforeseen environmental challenges and requests for assistance, including identification and management of a variety of hazardous materials.

Since publication of the FY 2014 Environmental Sustainability Management Plan, the Indoor Air Quality and Environmental Services teams have initiated a Mold Prevention Task Force that meets biweekly during the cooling season to proactively prevent mold outbreaks. As part of the mold-prevention effort,

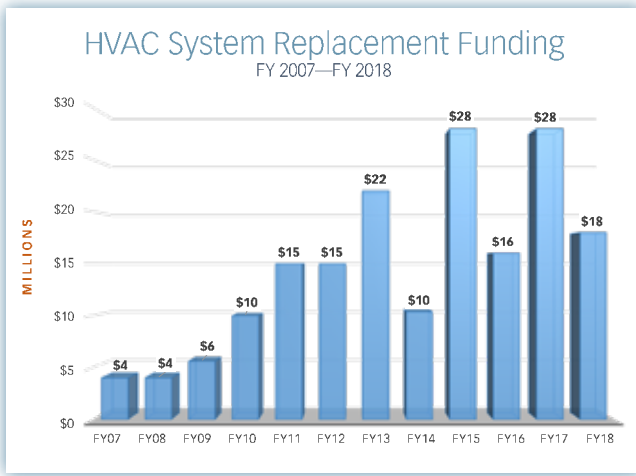
the IAQ Team placed 166 WiFi temperature/humidity sensors in 24 targeted schools in the summer of 2017. WiFi monitors allow for remote viewing of real-time indoor environmental data and gives the IAQ Team the ability to implement corrective actions in a timely manner. Where monitoring has identified humidity concerns, the IAQ Team has placed more than 400 portable dehumidifiers in select locations to reduce humidity levels. In addition, when hot and humid days are forecasted, the IAQ team issues a systemwide e-mail alert to school-based staff instructing them on steps to take to maintain good indoor air quality.

In 2016, MCPS enhanced the radon prevention program to include periodic radon testing. The testing was conducted in all facilities systemwide. To verify that radon levels stay low, MCPS conducts radon testing, based on U.S. Environmental Protection Agency (EPA) guidelines and industry best practices. For schools with an active radon mitigation system, re-testing occurs every two years. For facilities that showed no elevated radon levels, re-testing occurs every five years.

In May 2017, Maryland Governor Larry Hogan signed legislation requiring public and private schools to conduct periodic testing for the presence of lead in drinking water outlets. In response, MCPS has begun the process of proactively testing the drinking water fixtures in all 205 schools in February, 2018 and is scheduled to be completed by June 30, 2018. If water from a fixture is above 20 ppb (parts per billion), the action level designated by both the U.S. Environmental Protection Agency (EPA) and the Maryland Department of the Environment (MDE), MCPS will remove the fixture from use and implement a remediation strategy. The remediation efforts may include removal and replacement of the water outlets or installation of a water filtration system. To further ensure safe drinking water at all our schools, the EPA recommended flushing protocols will continue. All drinking water outlets would be tested on a three-year cycle as required by MDE.

HVAC Replacement Program

The HVAC replacement program implements the systematic replacement of HVAC equipment to maximize indoor environmental quality (IEQ) and energy performance, while reducing a significant equipment backlog. The replacement process involves a full building analysis to ensure that energy efficiency and IEQ are optimized for each facility. MCPS has consistently highlighted the need to increase capital funding for HVAC system replacement. During FY 2016 and FY 2017, 29 HVAC projects were completed. MCPS is on target to complete 17 HVAC projects during FY 2018 with the approved budget of \$18 million. The requested budget for the FY 2019 HVAC replacement project is \$30 million.



Green Cleaning

MCPS is committed to providing a healthy facility environment that is conducive to student learning and employee productivity. MCPS also recognizes its social responsibility to preserve natural resources for future generations. As a result of this commitment to students, staff, and the environment, the Department of Facilities Management continues to update and follow a Healthy, High-Performance Green Cleaning Plan. The Green Cleaning Plan serves to inform facility managers and educate the building service staff at schools on how to fulfill “green housekeeping” requirements.

The plan documents MCPS’s commitment to purchasing and using cleaning and grounds-care products, equipment, and methods that reduce adverse impacts on public health and the environment. Cleaning methods specified in the plan emphasize the removal of indoor pollutants, including soils, particulates, microbes, and the like, while maintaining a safe and healthy environment for all students, staff, and other building occupants.

The Green Cleaning Plan also includes details on how to implement the program, including cleaning practices, how to store cleaning products and requirements for disposal, specific methods for cleaning, custodial equipment standards, purchasing criteria, and recycling. Requirements for grounds care and the effective operation of mechanical systems also



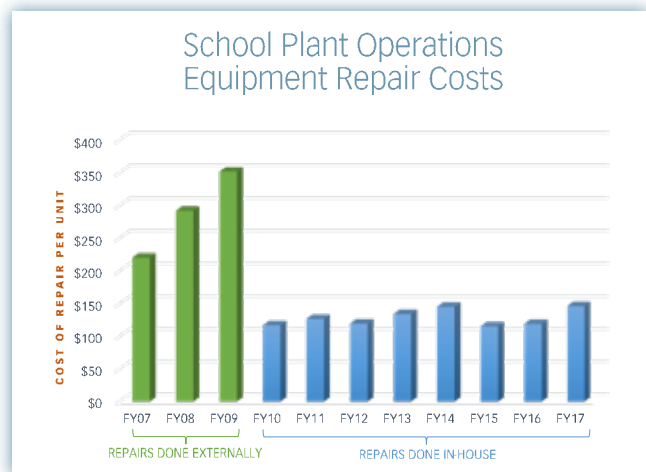
More than 93 percent of the products and materials used to clean MCPS schools are certified as being sustainable.

are identified. Training, involvement, and close collaboration with students, staff, and the community are key components of the program—promoting environmental principles beyond the school walls.

In 2017, more than 93 percent of cleaning products, janitorial paper, and trash bags purchased were certified as sustainable cleaning products and materials. MCPS was one of two school districts in Maryland that were recognized with the School Environmental Health Champion Award by the U.S. Environmental Protection Agency and the Maryland Environmental Health Network.

Fats, Oils, and Grease (FOG) Abatement Program

This program provides the installation and maintenance of grease interceptors. Since the initial Environmental Sustainability Management Plan was published, MCPS has installed 58 additional grease-abatement systems, as part of the Washington Suburban Sanitary Commission (WSSC) fats, oils, and grease (FOG) compliance program. MCPS has installed approximately 400 grease-abatement systems. Properly maintained interceptors protect the environment by preventing sanitary sewer overflows that could contaminate local water bodies and damage property. MCPS spent more than \$550,000 in FY 2016 and \$450,000 in FY 2017 on maintenance of grease-abatement systems. In addition, school staff is educated on best practices to minimize FOG through awareness training. The FOG best management practices are incorporated into the Family and Consumer Sciences (FACS) curriculum, promoting environmental stewardship community-wide.



Equipment Repair Program

The custodial equipment repair program performs repairs on a variety of building service equipment annually. In FY 2016 and FY 2017, the in-house repair program completed more than 2,700 work orders. Equipment repair technicians work

closely with school-based staff to identify equipment that need repair, to reduce and avoid costly equipment repair if detected too late. This program includes salvaging/reuse of parts from unrepairable equipment; and preventive maintenance on equipment currently in service to extend the life cycle of the equipment. All other equipment and parts that cannot be used are properly recycled or disposed of. These and other strategies allow the repair program and preventive maintenance to remain.

Product Evaluation Team

MCPS continues to pursue the use of innovative products and equipment that contain environmentally sustainable features to be used in school cleaning. The Product Evaluation Team (PET) is a collaborative group of staff that assess and evaluate new building services equipment and supplies. Assessment of the environmental impact of new products is an important function of this team.

Three new products have been evaluated by the team—battery pack vacuums, window-washing kits, and gym-floor finish. Low-decibel battery-powered vacuums are less disruptive to the school environment, eliminate the hazard of staff or students tripping over cords and reduce the use of electricity. With five layers of filtration, including a HEPA filter, this vacuum effectively removes dust and other harmful particles from the indoor environment and improves indoor air quality. A new window-washing kit uses the power and effectiveness of long-lasting microfiber pads. This reduces waste from use of paper products. The kits also are designed with an enclosed nozzle to keep cleaning chemicals from escaping into the air. The new water-based gym-floor finish has low odor and reduced cure time, allowing gymnasiums to be available for safe use sooner. The product also reduces cost significantly and has a higher anti-slip value, for improved safety.

MCPS will transition to use these new products in FY 2019.

LONG-TERM GOALS

- Implement life-cycle-assessment procedures that follow International Organization for Standardization (ISO) 14040 standards.
- Continue to refine school-facility-planning standards by implementing urban design concepts in suburban environments.
- Develop and implement Building Maintenance Plans for all schools, by 2024.
- Explore full building integration design concepts that focus on energy management, security, building and classroom controls, etc.

- Develop school-facility-planning standards that target compact core design and open-space preservation for each project.
- Continue to design and construct new school buildings to achieve the evolving and increasingly difficult LEED Gold standards.
- Explore technological needs to achieve full mobile access and control of EMSs.
- Explore automation of inspection programs to expedite work-order completion, by 2020.

SHORT-TERM GOALS

- Replace the centralized HVAC scheduling system for relocatable classrooms.
- Streamline the energy management system (EMS) seasonal changeover process to increase efficiency.
- Develop dashboard to monitor heating and cooling equipment loop temperatures.
- Enable full web-based access and controls of EMSs, by 2020.
- Implement technology to efficiently control groups of relocatable classrooms at multiple school locations.
- Perform continuous nonstructural maintenance to storm water facilities, including bio-retention facilities, ponds, swales, and green roofs at the intervals required by the Montgomery County Department of Environmental Protection.
- Explore full building integration design concepts that focus on energy management, security, and building and classroom controls.

STRATEGIES

- Continue to work closely with county planners to develop projects consistent with the visions of community master plan goals.
- Continue to upgrade EMSs.
- Provide FOG training for school-based building service staff.
- Provide Spill Prevention training to Department of Transportation and Division of Maintenance staff.
- Pump out grease-abatement systems on a quarterly basis.
- Integrate systems with smart-meter technology, as provided by the local utility companies.
- Employ the best operational practices for indoor environmental quality and develop a measurement and verification process.

Transportation

THE DEPARTMENT OF TRANSPORTATION continue its focus in the areas of reducing carbon emissions, and reducing operational costs.

Reducing Carbon Emissions

Currently, MCPS operates more than 1,300 buses, traveling more than 100,000 miles each day to transport our students. The Department of Transportation (DOT) continues to focus its efforts on reducing carbon emissions; environmental impacts, including air pollution; and operating costs, while promoting walking or riding bicycles to schools.

The DOT is required by law to rotate its buses out every 12 years and has been renovating about 12 percent of its fleet every year. As of 2015, 80 percent of the bus fleet meets or exceeds EPA 2008 Emission mandates. Continued progress is being made in preventing the release of diesel particulates into the atmosphere by installing diesel particulate filters on school buses. Based on federal regulations in 2007 and 2010 that will reduce emissions by at least 90 percent, all new buses have diesel particulate filters, which are the most effective technology to control diesel particulate emissions. In FY 2017, 88 percent of the buses were successfully equipped with this system to stop a significant amount of soot from being emitted and to reduce carbon emissions. In FY 2014, only 78 percent of the school buses were equipped with the diesel particulate filters. MCPS is on target to complete the installation of the diesel particulate filters by 2022.

Reducing Operational Costs

The DOT has a yearly review program of all bus routes. During the review program, every single route is analyzed to identify opportunities to improve efficiency, to avoid having several buses serving the same area. These review processes have allowed DOT to absorb the annual growth in student population while reducing the amount of buses. This results in lower operating cost, reduced environmental impacts, and benefits to the health and well-being of our local and global community.

During the 2016–2017 school year, MCPS school buses transported 102,875 students, with a total of 19,492,764 miles driven. Although there were 255,408 more annual miles driven in the 2016–2017 school year, compared with 2015–2016, the annual number of miles driven for each transported



student increased by only one mile, to 189 miles. The increase in the 2016–2017 school year for annual number of miles transported per student is largely due to growth in population that require transportation. DOT is continuing to achieve success by routing its buses efficiently, in order to maximize the number of students transported.

LONG-TERM GOALS

- Achieve an overall bus fleet efficiency higher than eight miles per gallon (mpg), by 2025.
- Increase the efficiency (mpg/use) of the auxiliary non-bus fleet by 20 percent, by 2024.
- Reduce transportation greenhouse gas emissions by 20 percent, by 2025.

SHORT-TERM GOALS

- Install diesel particulate filters on all school buses, by 2022.

STRATEGIES

- Collaborate with the county to increase the connectivity of sidewalks and bike paths to our schools and offices.
- Seek new technologies to incorporate school buses, to reduce our carbon footprint.
- Purchase most-fuel-efficient buses and vehicles, including partial zero emissions, hybrids, and flex-fuel vehicles, based on emerging markets of the latest fuel-efficient vehicle technology and its affordability.

Glossary

Bioretention—The process by which contaminants and sedimentation are removed from stormwater runoff. Stormwater is collected in the treatment area, which consists of a grass buffer strip, sand bed, ponding area, organic or mulch layer, planting soil, and plants.

Building automation—Centralized, interlinked networks of digital hardware and software that monitor and control building environments.

Climate—A measurement in patterns of weather over long periods of time.

EUI—Energy use intensity expresses a building’s energy use as a function of its size or other characteristics.

Forest conservation—The practice of planning and maintaining forested areas for the benefit and sustainability of future generations.

Fossil fuels—Fuels that come from nonrenewable energy sources, such as gasoline and oil.

Geothermal energy—The heat from the earth.

Green cleaning—Using chemicals and products with environmentally friendly ingredients and procedures that are designed to preserve human health and environmental quality.

Greenhouse gases—Gases such as carbon dioxide that trap the earth’s heat, contributing to climate change (usually measured in tons).

Green procurement—Purchasing products and services that cause minimal adverse environmental impacts.

Green Roof—Roof of a building that is partially or completely covered with vegetation and a growing medium, planted over a waterproofing membrane.

kBTU—A measurement of heat created by burning any material, with one BTU being the amount of heat necessary to raise the temperature of one pound of water by one degree Fahrenheit.

LEED—Acronym for Leadership in Energy and Environmental Design, a green-building certification program that recognizes best-in-class building strategies and practices.

Low-E—Low thermal emissivity refers to a surface condition that emits low levels of radiant thermal (heat) energy.

MTC02e—Equivalent metric tons of carbon dioxide, a standard measure for greenhouse gases.

Renewable energy—Energy that comes from non-fossil-fuel-based sources that do not run out, such as wind and solar.

VOC—Organic chemicals that have a high vapor pressure at ordinary room temperature.



Appendix

Information courtesy of Grimm and Parker

Hallie Wells Middle School is a green school

Check out all of the sustainable features and more around your school and campus!

recycle

- Construction materials include approximately 20% recycled content
- Construction Waste Management diverted over 75% from landfills
- Glass never wears out. It can be recycled forever.
- Energy saved from recycling one aluminum can could operate a TV for 3 hours.

save energy

- Approximately 34% energy cost savings is expected
- A compact fluorescent light bulb uses 75% less energy than a regular bulb and it lasts up to 4 years!
- Schools spend more than an energy from computers and textbooks combined.
- While only 5% of the world's population, Americans consume 25% of the world's energy.

save water

- Approximately 35% water savings is expected
- The average family of 4 in the United States uses 400 gallons of water every day.
- A hot water faucet that leaks 1 drop per second can add up to 165 gallons a month. That's more than 1 person uses in 2 weeks!
- A hot water faucet that leaks 1 drop per second can add up to 165 gallons a month. That's more than 1 person uses in 2 weeks!

ENERGY EFFICIENT

This school has energy-efficient features such as:

- Direct/Indirect Lighting Fixtures
- Compact fluorescent and LED lighting
- Daylight harvesting controls
- 100% outside air energy recovery units
- Thermal comfort and lighting controls
- Ground source wellhead HVAC
- Optimum solar orientation
- Building commissioned systems
- Compact building footprint
- High R-value exterior envelope (roof/walls)
- Energy Star compliant roof

who says our school is green?

This school was designed to reduce its impact on the environment and meet the U.S. Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED) for Schools criteria. The green building rating system measures how well the site, water, energy, materials, indoor environmental quality, and operations processes. The school will earn a certification once completed and a plaque representing its level of certification (Certified Silver, Gold, or Platinum) will be hung in the school.

USGBC and LEED

What other LEED certified buildings have you visited? How about LEED-Homes?

WATER EFFICIENT

This school has water-efficient plumbing fixtures such as:

- Dual-flush toilets (1.1/1.6 gpf)
- Low-flow urinals (1.28 gpf)
- Low-flow showerheads (1.5 gpm)
- Metered faucets (This means that the faucet will turn off after 10 seconds, so you don't waste water while you're putting soap on your hands!) Native and drought-resistant plants

ENERGY EFFICIENT

This school has energy-efficient lighting features such as:

- Compact fluorescent and LED lighting
- 100% outside air energy recovery units
- Thermal comfort and lighting controls
- Ground source wellhead HVAC
- Optimum solar orientation
- Building commissioned systems
- Compact building footprint
- High R-value exterior envelope (roof/walls)
- Energy Star compliant roof

GLASS

Bottles & jugs of any color

PLASTIC

Milk jugs
Laundry detergent bottles
Soap bottles
Soda & Juice bottles
Applesauce cups
Yogurt cups
Pudding cups
Plastic food jats

PAPER

Milk Cartons
Newspapers
Magazines
Paperboard food boxes
Paper & Envelopes
Pamphlets & Handbooks
Telephone books
Shredded paper

CANS

Aluminum cans
Steel food/beverage cans
Aerosol can (empty)
Aluminum foil
Aluminum pie pans

Want to learn more?

www.usgbc.org
www.centerforgreenschools.org
www.epa.gov

WATER EFFICIENT

Reducing the amount of potable (or drinkable) water used in this building helps the building be more efficient.

ENERGY EFFICIENT

Lighting system is used in your classrooms. Think about this when you go home and ask yourself if you need to turn on the lights. Make a smart decision and save energy for your home too.

controls turn on lights when room is occupied and it's cloudy or dark outside

controls turn off lights when room is vacant or there's enough natural daylight coming from the windows

Logo courtesy of htmw.org

Diagrams courtesy of Grimm + Parker Architects

Appendix

Information courtesy of Grimm and Parker

LEARN how your rain goes a long way!

Stormwater Management

what is a biofilter (or raingarden)?

These planted areas collect and store (or retain) the water that drains off the impervious surfaces at your school. The plants, along the edges, help slow down the water and filter out pollution before the water continues to drain back into local waterways.

what is an impervious surface?

These areas include parking lots, sidewalks, and basketball courts. Unlike grass, which absorbs rainwater, paved areas produce rainwater runoff. The water has to go somewhere, so at your school it is directed into bioretention areas such as biofilters in the parking lots, near the ballfields, and around the school.

To learn more about pervious paving, check out this website: www.perviouspavement.org

Watershed Basics

what is a watershed?

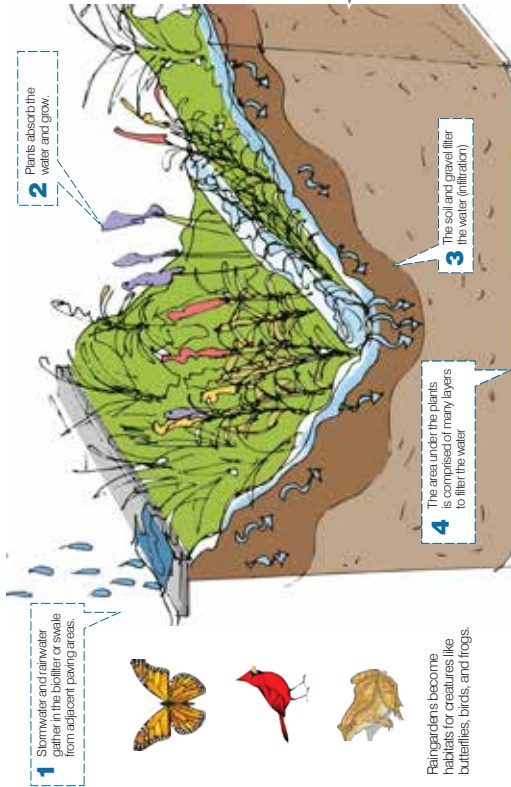
A watershed is an area of land that drains to a particular stream, river, lake, bay, or other body of water. More than 100,000 streams, creeks, and rivers thread through the Chesapeake Bay watershed. Watersheds are sometimes called "basins" or "drainage basins."

what is a tributary?

A tributary is a stream or river that eventually flows into a larger body of water, like a river or a lake. A tributary does not flow directly into a sea or ocean. Tributaries and the main stem river serve to obtain the surrounding area of its surface water and groundwater by leading the water out into an ocean or sea. This area drains to Chesapeake Bay. So, the Chesapeake Bay watershed is the area that drains to Chesapeake Bay. The Chesapeake River and the Chesapeake Bay.

why raingardens are great

They help stop rainstorm runoff from carrying pollutants into streams and the rivers and the bay. Stormwater is polluted by picking up debris, dirt and litter off paved surfaces and carry it toward where we get our drinking water and swim.



to learn more, visit www.123000.org/parkingsolutions/

section diagram through a typical biofilter (or raingarden)

how they work
There are 22 bioretention areas around your school to treat the water before it recharges the groundwater table below ground.

These areas are planted with native shrubs, wildflowers, grasses, and sometimes trees that don't require a lot of watering or irrigation. Since they are native (local to this area), they can survive when there isn't a lot of rain and even in droughts.

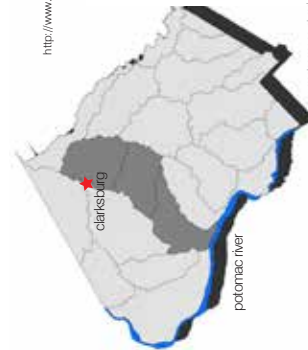
Under the plants are layers of permeable soil, fine aggregate sand, and washed gravel. After these layers are the perforated pipe through a perforated pipe into the ground below.

- Mulch
- Soil Filter Planting Media
- Concrete Sand
- Washed Stone with PVC pipe underdrain system
- Concrete Sand
- Uncompacted Subgrade

section through planting media

How can you get involved at home or in your community? Volunteer as a Stream Steward, plant native plants in the gardens, or follow the Rain Geocache Trail.

Find more information at this website:
<http://www.montgomerycountymd.gov/CEEP/raider/what-you-can-do.html>



map of montgomery county
great seneca subwatershed



chesapeake bay watershed



LEARN

what heats and cools your classrooms



Diagram from www.earth.gov

understanding your system

how does geothermal heating work?

While temperatures above ground change a lot from day to day and season to season, temperatures 10 feet below the Earth's surface hold nearly constant (between 50 degrees and 60 degrees F). For most areas, this means that soil temperatures are usually warmer than the air in winter and cooler than the air in summer. Geothermal heat pumps use the earth's constant temperatures to heat and cool the building. They transfer heat from the ground into the building in winter and reverse the process in summer.

what is a geothermal heat pump?

A geothermal heat pump is an electrically-powered device that uses the natural heat from the earth to help heat and cool your school.

what is your geothermal heating system doing?

The school's mechanical system has many names: geothermal heat pump and ground source heat pump (GSHP) are just two of them. Simply, it's a central heating and cooling system that pumps heat to and from the ground and uses stable ground temperatures near the Earth's surface to control building temperatures above ground. Many wells were drilled deep under the ballfield. The closed loop piping from the ballfield is connected to heat pumps in the building for every classroom and other instructional spaces. Teachers can control the temperature in their classrooms and every room saves energy.

want to learn more?

Check out these websites for more information:

- www.geoexchange.org
- www.aiaa.gov/kids/energy

- the wellfield**
273 wells are drilled 400 feet vertically beneath the athletic fields in a 20x20' grid to absorb ground heat in the winter and transfer heat back into the ground in the summer
- the main**
underground circuit piping is collected in a group horizontally (called a "main") and enters the building underground at the pump room
- the pump room**
the circuit main from the wellfield enters the building and the piping headers are organized for heat pump supply and return.

Like any type of heat pump, it simply moves heat energy from one place to another all year round.

One of the things that makes a heat pump so versatile is its ability to be a heating and cooling system in one. In the winter, the system takes heat from the ground (wellfield) to circulate indoors. In the summer, it takes heat from the indoor air and circulates it into the ground (wellfield). The heating or cooling mode changes based on your classroom temperature.

how does a heat pump work?



Diagram courtesy of Grimm + Parker Architects

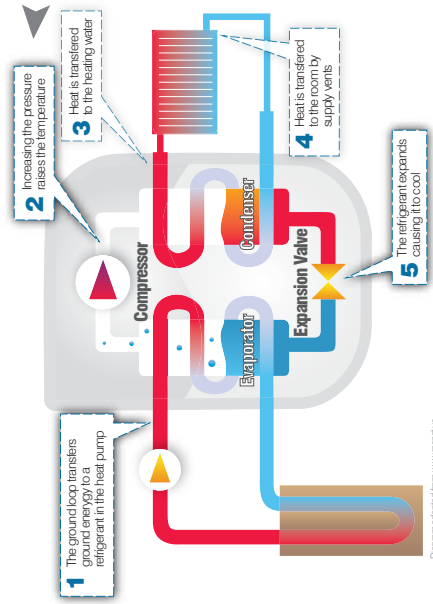


Diagram adapted from www.earth.gov



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