UNIVERSITY SUSTAINABILITY COUNCIL

SUSTAINABLE WATER USE AND WATERSHED REPORT

May 2014

sustainableumd

This report was initially prepared by the Sustainable Water Use and Watershed Workgroup and submitted to the University Sustainability Council for review. The final report was revised and approved by the University Sustainability Council in May 2014.

TABLE OF CONTENTS

BACKGROUND ON WORKGROUP 1

WATER CHALLENGES 2

WATER CONSUMPTION AT UMD 3

WASTEWATER SOURCES AT UMD 5

WATER HARVESTING AND REUSE AT UMD 5

STORMWATER MANAGEMENT AT UMD 6

WORKGROUP CONCLUSIONS AND RECOMMENDATIONS 8

Institutional Organization 9

Water Supply 9

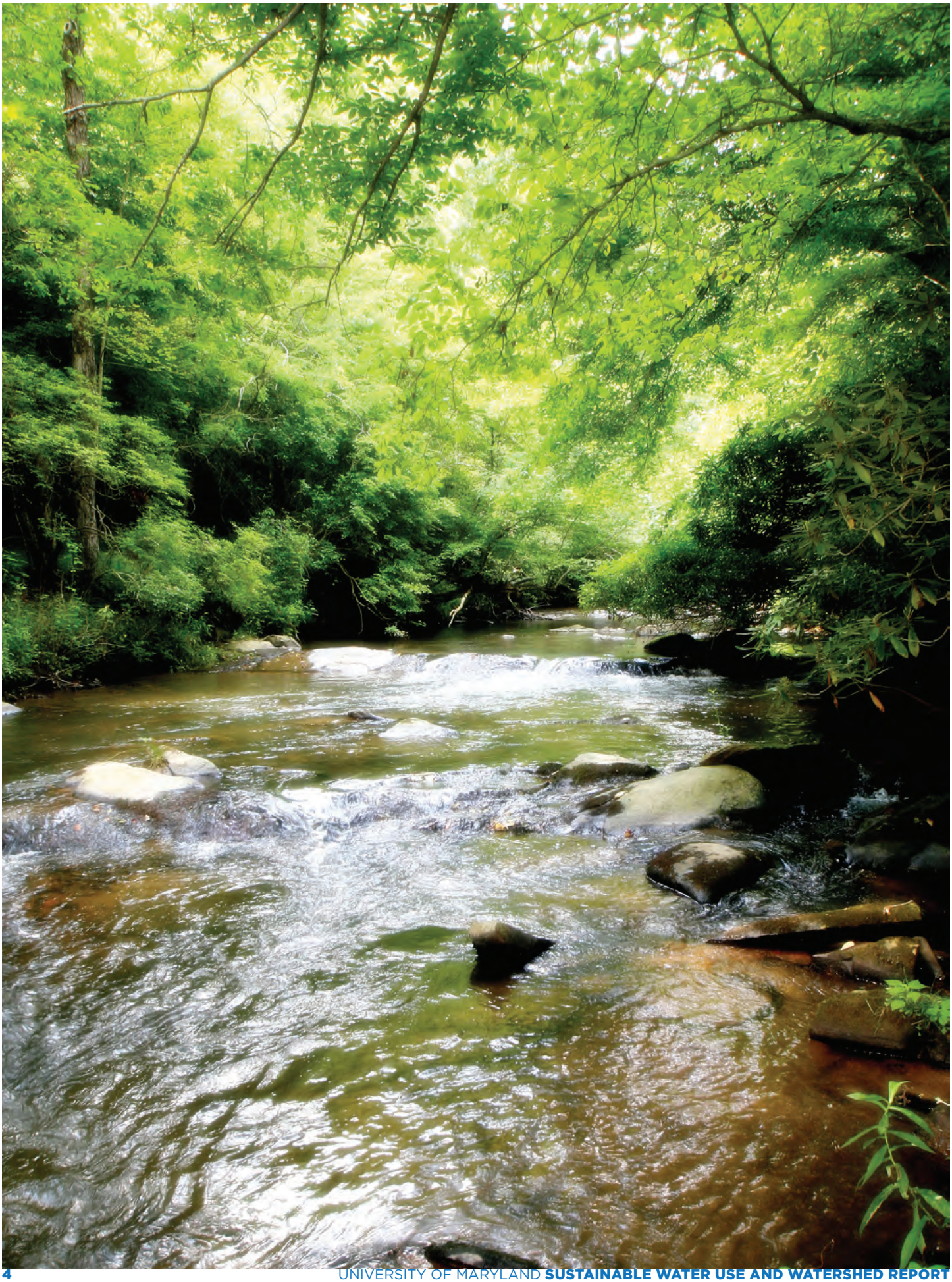
Wastewater and Stormwater 10

Education and Research 14

Measurement and Progress 14

ATTACHMENT 1 15

APPENDICES 18



BACKGROUND ON WORKGROUP

In May 2007, President Mote signed the American College and University Presidents Climate Commitment and established the Office of Sustainability. Since that time, the University adopted a Climate Action Plan (2009) and established the University Sustainability Council (2009). The University Sustainability Council is charged with advising "the President, the Office of Sustainability, and the campus community about issues related to the integration of sustainability into the operations….", and "oversee the University's mission, as stated in the Strategic Plan, to be widely recognized as a national model for a Green University." (p.36)

In 2010-2011, the Office of Sustainability evaluated campus progress under the Campus Climate Action Plan and its performance against the emerging sustainability metrics for higher education produced under the Association for the Advancement of Sustainability in Higher Education's ***Sustainability Tracking and Rating Systems (STARS)***. The results of this review coupled with campus-wide greenhouse gas inventory results were presented to the University Sustainability Council in fall 2011. Ten significant issues were identified and grouped into 4 topical areas. The Council elected to establish a Sustainable Water Use and Watershed Protection Workgroup to further evaluate the University's existing goals, standards and practices relative to water management and to make recommendations for improved performance. This report builds on principles, goals and recommended actions from the 2001-2020 and 2011-2030 Facility Master Plans. The Workgroup, chaired by Russell Furr, Director – Department of Environmental Safety, was formed in September 2012 and met for a year. Workgroup members include:

Russell Furr – Chair	Director	Environmental Safety
Scott Lupin	Associate Director	DES/Office of Sustainability
Ross Salawitch	Professor	Atmospheric and Oceanic Science
Allen Davis	Professor	Civil and Environmental Engineering
Karen Petroff	Assistant Director	Facilities Management
Seth Charde	Project Planner	Facilities Management
Dave Shaughnessy	Manager	Facilities Management
Josh Kaplan	Director	Intercollegiate Athletics
John Follum	Assistant Director	Environmental Safety
Bill Berry	Architect	Residential Facilities
Andrea Thompson	Associate Director	Campus Recreation Services
Jim Hogan	Assistant Director	Facilities Management
John Vucci	Associate Director	Facilities Management
Scott Tjaden	Graduate Student	Environmental Science & Technology

WATER CHALLENGES

Water is a critical resource that may be undervalued in geographic areas that appear to have an abundance. In Maryland, clean water is generally available everywhere in the state either through public or private supply systems. However, in recent years, the public has become increasingly aware of water issues due to prolonged droughts and severe flooding in many parts of the country, infrastructure failures that temporarily limit water availability locally and ongoing media coverage of the region's progress to improve water quality in the Chesapeake Bay.

In general, the university does not "harvest" stormwater, industrial wastewater, graywater or blackwater for reuse… although recent changes in the County appear to improve the outlook for future water harvesting and reuse projects.

The Washington, D.C. region is served by several water suppliers that draw upon both surface and groundwater supplies. Historically, water supplies have been sufficient to meet population demand except for periods of prolonged drought. As of April 2013, little of Maryland was considered to be in a drought condition. In 2000, the region experienced a prolonged drought that resulted in water use curtailments. At that time, Maryland Governor Glendening issued Executive Order 01.01.2001.06 requiring the preparation of Water Conservation Plans by all state agencies that included mandatory water use reductions through 2010; water audits; water conservation education; and annual reporting (see Appendix A). UMD prepared a Water Conservation Plan which included several strategies, (see Appendix B).

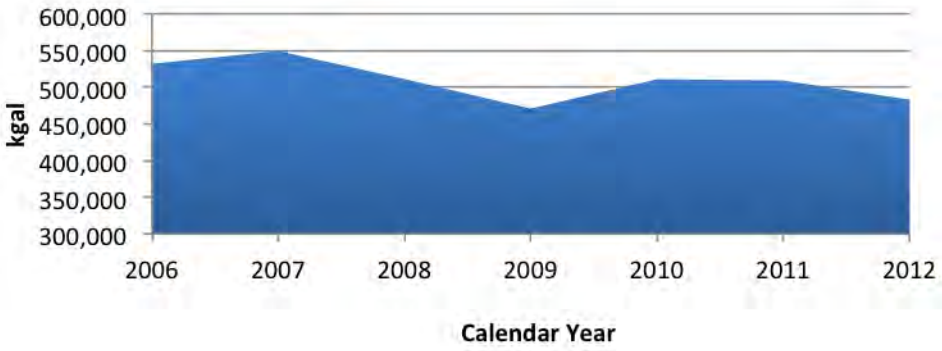
The University of Maryland obtains virtually all of its water for its College Park facilities from the Washington Suburban Sanitation Commission (WSSC) which also provides for the collection and treatment of sanitary waste. Stormwater and wastewater from various types of industrial equipment, is collected through a university-owned separate storm sewer system and discharged into the Paint Branch and tributaries. In general, the University does not "harvest" stormwater, industrial wastewater, graywater or blackwater for reuse. Such activities have not been well-supported by WSSC and Prince Georges County in the past although recent changes in the County appear to improve the outlook for future water harvesting and reuse projects.

The University population and its infrastructure continue to increase as does the overall population of the Washington, D.C. region. According to figures obtained by the University's Office of Sustainability, the campus population grew from 38,972 to 42,729 or 9.6% between 2002 and 2012. Its facilities have also increased from 12.5 million gross square feet to 14.2 million gross square feet or 14% between 2002 and 2012. Similarly, figures released by the Metropolitan Washington Council of Governments (February 13, 2013) reveal that population growth in the Washington, D.C. area is projected to increase by nearly 32% between 2010 and 2040 or to nearly 7 million people. In Montgomery and Prince George's Counties, which are served by the WSSC, the population is projected to increase by almost 400,000 people during the period. Based on past experience, it is anticipated that necessary expansion and upgrades to the area's water and sanitary sewer infrastructure will increase the rates WSSC charges to household and commercial/industrial customers. The availability of water for the region is less clear. The region has had an ample supply of water for many years except for periods of exceptional drought (as was experienced in 2000). The effect of climate change on the regional water supply is not known, but climate change is generally associated with both periods of drought and flooding.

WATER CONSUMPTION AT UMD

UMD is a major WSSC customer. As previously stated, all of the potable water used at UMD is purchased from WSSC which also accepts and treats all of the sanitary wastewater prior to being discharged into the Potomac River at the Blue Plains wastewater treatment plant.

Total Potable Water Consumption



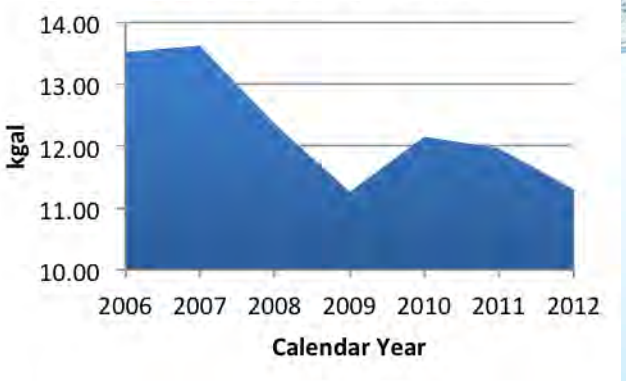
Water supplied by WSSC... is treated to potable standards, but only a small fraction is used for potable purposes.

Water use at UMD has remained rather steady despite campus growth in terms of population and square footage. As seen in the tables to the right and below, UMD's water consumption has remained at approximately 500,000,000 gallons per year while annual per capita consumption and per square foot consumption have been reduced since 2006, largely due to various conservation efforts and equipment changes.

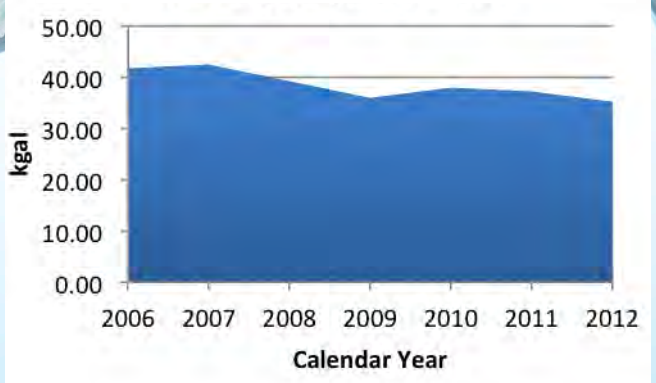
While UMD's total annual water use has remained relatively stable, the cost of water and sewage services provided by WSSC have steadily risen. From FY 2009 through FY 2012, costs have increased from approximately $5.6 million to $7.2 million or over 28%. Given the demand on WSSC's supply, regulatory changes and its aging and at-risk infrastructure, increased costs of this magnitude are expected for the foreseeable future. UMD has no control on WSSC charges. Only through controlling consumption and discharge can the University affect its annual expenditure to WSSC.

Water supplied by WSSC is used for a variety of purposes including human consumption, heating and cooling and irrigation. As shown in the figure on page 4, heating and cooling constitute the majority of UMD's water consumption. It should be noted that all of the water is treated to potable standards, but only a small fraction is used for potable purposes.

Potable Water Usage per Capita

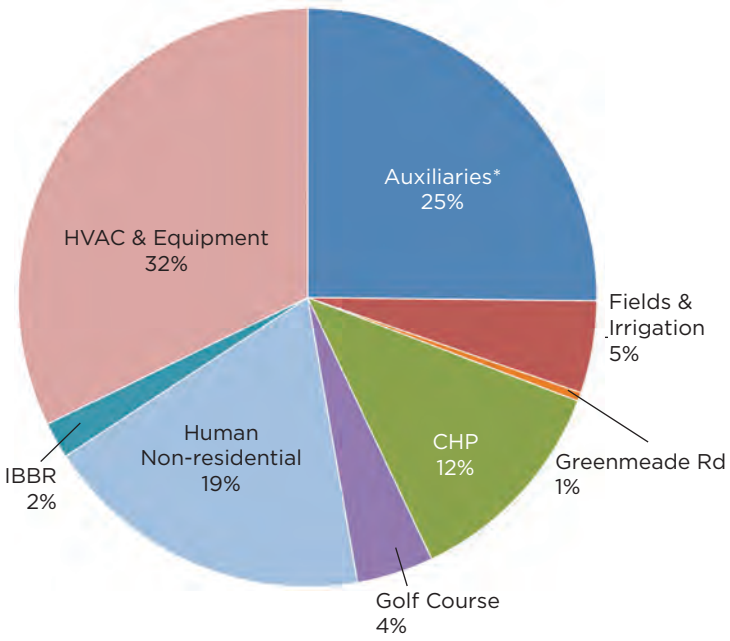


Potable Water per Square Foot



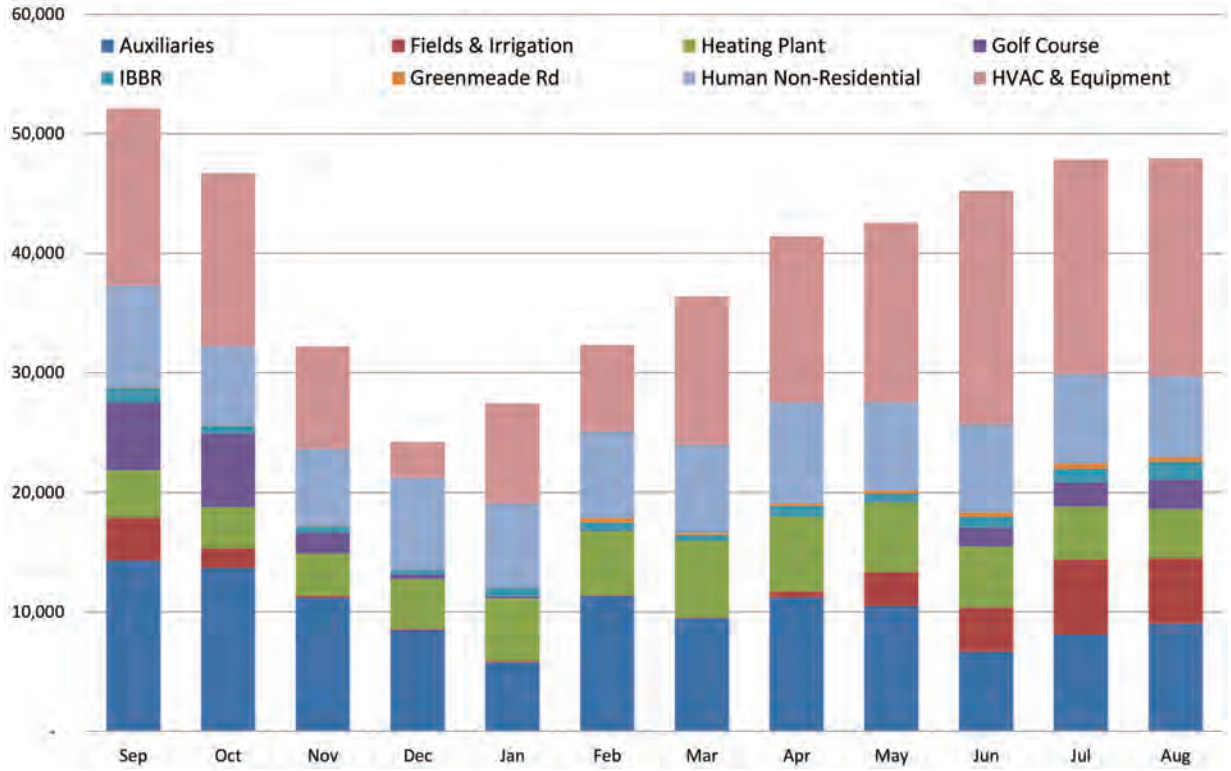
Currently, UMD has not established water conservation goals. Water conservation has resulted from the desire to reduce costs and the need to meet the State mandated LEED Silver rating, which is a set of "green" design standards for new construction and major renovations. In 2011, the State of Maryland also adopted the International Green Construction Code (IGCC) which are sustainable design standards that complement the existing building code. The IGCC includes a chapter governing water conservation among other topics. While LEED establishes a conservation goal to earn available points, the IGCC Water Use chapter specifies water flow rates for a broad array of equipment and specifies allowable water use in greater detail than LEED. The State has not yet required the use of the IGCC on State-funded construction projects, but has established a Workgroup to review the IGCC as an alternative "green" construction practice that may be pursued in lieu of LEED certification on State-funded building construction.

UMD's Potable Water Usage (FY10)
475,000 kg



*Note: Auxiliaries include all reimbursable metered water accounts (i.e., residential facilities, dining services, intercollegiate athletices, etc.)

UMD Potable Water Usage (FY10)
By Month and Category



WASTEWATER SOURCES AT UMD

The University of Maryland's diverse operations produce a wide array of wastewater containing various types and degrees of contamination. From human sanitary waste (referred to as "black water") to tempered hot water, the nature and quantities vary greatly based on the time of year. For the most part, wastewater includes sanitary wastewater that is collected through the sanitary sewer system and treated by WSSC (see Appendix C – UMD/WSSC Sanitary Sewer Connection Map). This includes human and animal waste, wastewater from laboratories as well as other sources. Wastewater is also generated by "industrial equipment" such cooling towers, pumps, heating and ventilation equipment and other mechanical sources. These wastewaters, often referred to as "gray water", may contain low levels of contamination and are currently directed to either the sanitary sewer or to UMD's separate storm sewer system. As may be seen in the previous section, a significant portion of UMD's total annual water use is dedicated to the operation of mechanical, heating and air conditioning equipment. Purchased potable water is also evaporated during cooling and does not enter the sewer system.

WATER HARVESTING AND REUSE AT UMD

The concept of capturing and reusing water ("water harvesting") including stormwater, graywater and blackwater has received significant support around the world. Within the U.S., water-challenged states including Florida and California have developed extensive programs and comprehensive regulations to support such efforts. Water harvesting is not well established in Maryland, but it is an issue receiving greater attention in the Washington, D.C. area, including the WSSC and Prince George's County.

At present, UMD has 3 water harvesting installations located at Washington Quad, Denton Quad and Knight Hall which capture storm water for irrigation use. These locations involve the use of cisterns for stormwater capture. The Washington Quad and Denton installations have worked effectively while the Knight Hall installation had initial operational problems that have been corrected. The most recent water reuse effort involves the new Physical Sciences Building. Due to the depth of the building and presence of groundwater, the Project Team designed a collection system to capture and treat groundwater for use in the building toilets and urinals. This would serve as an innovation point under the LEED rating system, but more importantly, an initial foray into water harvesting for building use purposes. Unfortunately, a regulatory pathway to approve the design did not exist within the Prince George's County government or the WSSC. However, recent changes in Prince George's County and the recent adoption of water reclamation regulations by WSSC appear to favor such innovative uses of water and the project is likely to be approved. Water harvesting and reuse, including stormwater and graywater, hold a significant potential for reducing UMD's water purchases and creating greater resiliency in terms of the campus water supply.

STORMWATER MANAGEMENT AT UMD

Hydrologically, the University of Maryland campus drains to the Paint Branch and Northeast Branch, leading to the Anacostia River and ultimately to the Chesapeake Bay (See Appendix D – Anacostia Watershed Map). The Anacostia is one of the most polluted rivers in the U.S. The Chesapeake Bay is a water body vital to the State of Maryland, but is stressed due to excess sediment and nutrient input.

Stormwater management has been an issue of growing concern since the initial regulations, governing its control, were issued in the mid 1980s. The University, and other contributors within the watershed, are being driven by evolving stormwater regulations to reduce their respective water footprint to improve water quality in the Anacostia River and the Chesapeake Bay. However, most of the University was developed before the 1980s and this development does not have any stormwater management.

Historically, stormwater was controlled via an "end-of-pipe" approach and since 1988 the University has held a National Pollution Discharge Elimination System (NPDES) "Industrial" permit issued under the federal Clean Water Act. The permit regulates discharges from the University's 13 permitted outfalls that are located along the Paint Branch, Campus Creek and Guilford Run. The permit establishes allowable levels of pollutants and requires monthly sampling and quarterly reporting to the Maryland Department of the Environment (MDE). In 2012, the permit was issued, but MDE imposed a new stringent copper standard for University discharges. The standard is below the copper concentrations generally found in the WSSC supplied water. The University faces the challenge of either reducing its copper discharge concentrations or eliminating all mechanical equipment discharges (which currently use potable water) to the storm sewer system by 2018.

The University, and other contributors within the watershed, are being driven by evolving stormwater regulations to reduce their respective water footprint… the thrust of these regulations and the nexus between water supply and stormwater has created the need for a more holistic approach to water and stormwater management.

In the late 1990s, greater regulatory focus was placed on non-point source stormwater pollution. The University was required to obtain a second type of NPDES permit due to UMD's operation of a "municipal" separate storm sewer system (known as an "MS4" permit). It is reissued every 5 years by MDE and is expected to become more stringent over time. The permit required development of Best Management Practices (BMP's) to mitigate stormwater contamination that may result from campus activities. It emphasizes administrative controls over non-point source pollution, and greater campus community education and involvement.

In addition to points of discharge and administrative controls, specific university development and construction projects are also governed by stormwater regulation. Temporary stormwater management is required for construction that disturbsmore than 5,000 square feet of land and/ or 100 cubic yards of excavation. In such cases, an erosion and sediment control (E&S) permit is required by MDE. The E&S permit governs construction site practices as they relate to stormwater controls at the construction site (e.g. silt fencing, erosion control matting, temporary swales, vehicle wash-down areas, and stabilized construction entrances, etc.).

Since 2002, permanent stormwater quality management has been required for redevelopment and new construction activities involving over 5,000 square feet of land disturbance. In 2007, Maryland adopted the Stormwater Management Act, which coupled with the implementing regulations, significantly increased the requirements for new development projects. The thrust of the Act is to allow new development, but in a way that replicates pre-development hydrologic conditions. Pre-development hydrology is the situation in which the stormwater that leaves the new development has characteristics that mimic that which would occur if the site were undeveloped and in its natural state. This is achieved by requiring implementation of Environmental Site Design (ESD) to the maximum extent practicable (MEP). Structural practices (ponds/vaults which were promoted in previous stormwater management requirements) could be used only when ESD options have been exhausted. ESD is defined as "using small-scale stormwater management practices, nonstructural techniques, and better site planning to mimic natural hydrologic runoff characteristics and minimize the impact of land development on water resources." Approved ESD techniques include, rain gardens, bioretention, green roofs, permeable paving, cisterns, and other approaches sometimes referred to as Low Impact Development (LID). All of these techniques fit well within, and are promoted by, the various green building systems such as LEED and IGCC.

Since 2002, the University has been meeting its construction and stormwater requirements through a combination of onsite controls such as stormwater ponds (and now ESD), and a regional "stormwater bank" negotiated with MDE. The "stormwater bank" consists of a sand filter constructed at the base of the President's Residence (now University House) lawn. It was created in conjunction with the University of Maryland University College (UMUC). Approximately 35 construction projects have utilized the bank to date. The original offset acreage available was 10.91 acres, 9.93 of these acres have been used leaving only 0.98 acres of offset available to future projects. It is expected that MDE will allow stormwater "banking" to continue as long as a credit balance is maintained through the new treatment of previously untreated impervious surfaces.

The responsibility and authority for stormwater management at UMD has been largely divided between Facilities Management (FM) and the Department of Environmental Safety (DES). FM's Department of Facilities Planning has served the lead role in stormwater planning and management while FM's Department of Capital Projects has obtained permits related to new construction. DES has obtained permits related to routine discharges (NPDES and MS4) and samples, tests and tracks permit compliance. Therefore, organizational responsibility is fragmented and involves several FM units and DES. The thrust of the regulations and the nexus between water supply and stormwater has created the need for a more holistic campus approach to water and stormwater management.

WORKGROUP CONCLUSIONS AND RECOMMENDATIONS

Watershed restoration is one of the region's most pressing environmental issues, and because watersheds are distinctly local, the University has significant ability to improve the situation for the better. In the Workgroup's opinion, UMD has effectively reduced its water use per capita and per square foot. In addition, it is currently complying with stormwater regulations as they relate to individual outfalls and construction projects. However, UMD's current programs and organization around water, stormwater and watershed management have the following weaknesses:

- The campus is likely facing a growing long-term risk due to regional population growth, climate change and aging infrastructure relative to its water supply.
- All water is provided to campus by the WSSC, a single source.
- The campus does not have a stated policy or goal that targets water use reduction.
- The University is experiencing increasing water and sewer costs and stormwater regulation.
- The campus has not developed a holistic, integrated and long-term approach to water supply and water/stormwater management issues.
- The campus is not organized to place responsibility and authority for water, stormwater and watershed issues on a particular individual or group.

In the Workgroup's opinion, the University should be:

- Pursuing strategies that manage short and long-term risk and promote resiliency as it relates to our water supply.
- Demonstrating the best current practices in the management of water, wastewater and stormwater by adopting established guidelines such as the Federal Water Efficiency Best Management Practices for Water Conservation and Efficiency (http://www1.eere.energy.gov/femp/program/waterefficiency_bmp.html), and design standards set by the State of Maryland for ESD approaches to stormwater management (http://www.mde.state.md.us/programs/Water/StormwaterManagementProgram/MarylandStormwaterDesignManual/Pages/Programs/WaterPrograms/SedimentandStormwater/stormwater_design/index.aspx).
- Training and educating the next generation of policy-makers/engineers/scientists and general citizenry who

will be responsible for managing the watershed and Chesapeake Bay.

- Building strong coalitions with the local and regional community in support of watershed restoration.

Based on these conclusions, the Sustainable Water Use and Watershed Workgroup makes the following recommendations:

Institutional Organization

Recommendation 1: Reorganize Roles, Responsibilities and Authority for Water, Stormwater and Watershed Issues

The responsibility for managing water, stormwater and watershed issues at UMD is not clearly defined and rests with multiple individuals and units. This fragmented approach dilutes responsibility and authority and does not adequately support the growing risks and obligations associated with these critical utilities. UMD should consolidate water, stormwater and watershed management under a single authority having campus-wide responsibility, authority, critical technical capabilities and budget. This authority should be responsible for ensuring holistic planning, design, engineering, inspection, maintenance and communications while serving as a liaison to academic departments and local and regional organizations involved in water management. Centralized services are necessary to coordinate planning, regulatory matters, costs, construction and repair, permitting, billing, reporting and the identification of academic and community opportunities. This authority should also continuously seek Federal, State, local, and non-governmental partners to pursue water management and watershed restoration efforts. This includes organizations such as the U.S. Environmental Protection Agency, the U.S. Army Corps of Engineers, Maryland Department of Environment, the Maryland Department of Natural Resources, Prince George's County, Maryland-National Capital Parks and Planning, the Anacostia Watershed Society, National Fish and Wildlife Foundation, the City of College Park, the Anacostia Watershed Restoration Partnership, and others.

Water Supply

Recommendation 2: Adopt an Initiative to Reduce Purchased Potable Water 20% by 2020

The University requires a water conservation goal that is shared by all campus units and may be achieved through facility design and improvements, sound purchasing, and conservation behaviors. This initiative, and the associated implementation guidelines provided in Attachment 1, would set a standard for water conservation within existing buildings and other campus operations and offers tools for each campus unit to implement water projects to meet the standard. Specifically, the Workgroup recommends reducing the amount of potable water purchased by the University from 500 million gallons per year to 400 million gallons per year by 2020. Water conservation measures may be funded through the Energy Reserve Fund, third-party financing, and the Sustainability Fund.

Recommendation 3: Expand Water Harvesting — "Purple-Pipe System"

Water harvesting, treatment, and re-use should become a widespread practice. The University should develop a system to collect rainwater, mechanical wastewater (i.e. cooling tower blowdown, etc.) and other wastewater, treat it centrally and distribute it through a non-potable "purple-pipe" system to help meet the large demand for non-potable water. Within 18 months, the University should complete a "water audit" to identify available sources and develop a conceptual plan for a centralized non-potable water collection and supply system. It is further recommended that the initial phase of the system be designed, funded and in operation by 2018. The Workgroup envisions the system being built in service districts with the 1st service district designed to collect water from the area roughly bounded north and south by Farm Drive and Campus Drive, and east to west by the Paint Branch and Byrd Stadium. Mechanical and irrigation systems within this district currently use approximately 150 million gallons of potable water per year. In the Workgroup's opinion, the University should commission an engineering and financial analysis to determine the cost and scope for expanding water harvesting. The University should then consider retaining a firm under a long-term contract to carry-out the audit, design, construction and operation of the purple-pipe system.

Wastewater and Stormwater

Recommendation 4: Develop a Stormwater Master Plan for ESD and Rainwater Harvesting

Facilities Management should build on previous planning efforts and develop and formally adopt a Stormwater Master Plan specifically focused on ESD and rainwater harvesting. Plan development should incorporate the proposed reclaimed water/purple-pipe system. The Stormwater Master Plan should serve as an implementation roadmap for meeting future stormwater management initiatives, both required and elected.

Recommendation 5: Beyond Compliance — Demonstrate Leadership in Watershed Restoration by Staying Ahead of NPDES/MS4 Permit Requirements

The University's next NPDES MS4 permit (Draft available here: http://www.mde.state.md.us/programs/Water/StormwaterManagementProgram/Documents/NPDES%20Draft%20Guidance%206_14.pdf page 8) will likely have a 20% treatment requirement for all impervious surface area runoff. Currently it's estimated that 18%-22% of the University's impervious surface runoff is being treated in some form of stormwater treatment facility, but many of these facilities will be considered obsolete under the next permit. The draft permit language indicates that treatment credit will be applied only to facilities constructed after 2002. If this is the case, the University will only receive credit for treating an estimated 6%-10% of its impervious surface runoff. In preparation for the pending NPDES MS4 permit, the University should immediately begin planning for meeting the 20% treatment requirement using ESD to the maximum extent practicable.

As the MS4 permit is renewed every 5 years, it is anticipated that each additional renewal will require greater treatment of impervious surface areas. To stay ahead of the anticipated permit requirements, and to demonstrate leadership in watershed restoration, the University should treat the first 1 inch of rainfall from 50% of all impervious surface area runoff using ESD or rainwater harvesting by 2020. In support of this effort, ESD and rainwater harvesting should be implemented during any project that impacts the campus water and stormwater footprint.

Recommendation 6: Develop Partnership Memorandum of Agreements (MOAs) To Facilitate Regional Stormwater Planning and Campus Projects

Facilities Management should develop and maintain "umbrella" Memoranda of Agreements (MOAs) with selected external agencies and non-governmental organizations that include provisions to facilitate specific collaborations by University departments and sponsored student organizations. MOAs with such partners should be designed to streamline: the receipt of grants; planning and development of demonstration projects; design and construction of stormwater management projects; and the initiation of watershed research and teaching programs.

Recommendation 7: Revise Campus Design Standards — Include Standardized ESD and Rainwater Harvesting Details and Practices

Facilities Management should revise the current Design, Construction and Facility Standards (DCFS) to include best management practices and construction details for ESD. Standardized University practices will result in more efficient maintenance, higher performance, and a greater chance of post installation project success. In addition and where practicable, ESD techniques should be implemented in place of standard renovation approaches. For example, a green roof should be installed, where practicable, as a replacement instead of a standard roof; permeable paving should be used, where practicable, as a replacement for impervious asphalt or concrete. These types of surfaces have stormwater mitigation benefits, typically have longer lifespans, and can be more resilient to renovation and repair (for example: permeable pavers can be removed to fix a subsurface utility, then reinstalled for a seamless repair).

Recommendation 8: ESD Banking — Continue Stormwater Banking for Capital Projects Using ESD

The University should develop an organized, integrated, yet decentralized system to implement ESD ahead of capital projects on a campus sub-watershed or district basis. The current stormwater bank located at the base of the University House can be credited or debited depending on the addition or subtraction of impervious surfaces and the amount of stormwater management provided within specific construction projects. The bank has allowed a high degree of flexibility for managing stormwater requirements. The strategy of providing ESD that treats stormwater in a decentralized sub-watershed basis (local to new construction projects as well as treating existing unmanaged impervious areas) is recommended.

Recommendation 9: Create Internal Funding Mechanism(s) for MS4 Compliance and ESD Banking, Pursue Outside Funding Opportunities

The University should explore various funding strategies for the implementation of ESD and rainwater harvesting. This could include an impervious surface area fee, and/or the development of a stormwater management "connection" fee that would be charged to capital construction projects. These internal funding mechanisms would allow preconstruction of ESD for banking activities, as well as support watershed restoration leadership goals. Outside funding sources available for watershed restoration projects in the form of ESD and rainwater harvesting should be pursued. Billions of dollars are slated for Chesapeake Bay Restoration efforts. As such, significant sources of outside funding may be available via County, State, and Federal sources for Campus stormwater and watershed restoration projects.

Recommendation 10: Expand Inspection and Maintenance of Stormwater Facilities

Stormwater management structures are typically installed as part of capital projects. Historically, these structures have not been routinely inspected and little to no maintenance occurs. Regulations are driving new facility construction, and all treatment facilities need greater maintenance to ensure proper functionality. Within 12 months, UMD should develop and maintain a complete inventory of stormwater facility structures, and implement a routine inspection and maintenance system to ensure these facilities perform as designed. This will require the development and maintenance of an annual budget based on the projected maintenance required as well as a clear assignment of responsibility for conducting the work within Facilities Management.

Recommendation 11: Restore Campus Creek by 2020

The university has been involved in several ongoing watershed restoration studies and efforts in recent history including the Anacostia Watershed Restoration Partnership, the Paint Branch Management Partnership, and Paint Branch restoration efforts with the U.S. Army Corps of Engineers and Maryland National Capital Park and Planning. The University should continue to expand its leadership and participation in these types of local and regional watershed restoration efforts.

The university should develop a proposal by the end of 2015 to restore Campus Creek's stormwater functionality while preserving its aesthetic qualities. Significant matching funding dollars for restoration projects will be available through the State and County during the proposed restoration timeline. In order to meet the State Watershed Implementation Plan (WIP) for Chesapeake Bay restoration by 2025 (the current WIP deadline), the State and County will be actively seeking restoration projects to fund and construct. As a public institution with public lands, the University will be an attractive location for restoration work. The proposal should identify funding, restoration strategy, and restoration schedules.

Education and Research

Recommendation 12: Link Water, Stormwater and Watershed Education and Research to UMD Practices

The University should link its educational and research missions with facilities management practices through synergistic relationships. The campus should approach its water, stormwater and watershed planning and practices as part of a living laboratory. The recommended Energy and Utilities Unit should ensure that signage and documents describing campus water initiatives are prepared and kept up to date. This information will be used for classroom and other educational activities for students (such as the Sustainability Studies Minor) and for campus visitors. FM and OS should also:

- Maintain a list of campus water/stormwater research topics requiring study.
- Identify demonstration sites/projects that are available for external funding or support. These demonstration sites will serve as models for the state and region.
- Seek and support synergistic projects between Facilities Management and the research community that further overall campus water and stormwater management goals (e.g. design, funding and monitoring of an ESD installation).
- FM and OS should seek student groups to implement projects.

Measurement and Progress

Recommendation 13: Annual Progress Report to University Sustainability Council

The University Sustainability Council should serve as the campus body responsible for monitoring campus progress toward UMD's water use, watershed and stormwater goals. Facilities Management with support from the Office of Sustainability, should provide an annual report to the University Sustainability Council each spring (for the proceeding calendar year) outlining campus progress toward each of the goals. The report should be made available through campus websites.

ATTACHMENT 1

Draft Initiative on Reducing Purchased Potable Water 20% by 2020 And Implementation Guidelines

I. Purpose

The University of Maryland strives to reduce its water consumption and sewage disposal costs, reduce its dependence on the regional potable water supply, and create greater resiliency with the advent of climate change. This initiative sets a standard for water performance of existing buildings at the University of Maryland, College Park and offers tools for each campus unit to implement water projects to meet the standard. Successful implementation of this initiative will significantly reduce the University's reliance on the regional potable water supply to meet the needs of campus operations and control costs associated with its purchase.

II. Applicability

This initiative covers every facility and operation at the University of Maryland, College Park and therefore applies to the occupants and operators of every facility on campus including colleges/schools, auxiliary services, and state-support entities ("Units".)

III. Initiative

Reduce purchased potable water use from 500 million gallons per year to 400 million gallons per year (20% reduction) by the end of calendar year 2020.

IV. Effective Date

The effective date of this initiative is July 1, 2014.

Implementation Guidelines:
University of Maryland Initiative on Reducing Purchased Potable Water by 20% by 2020

I. BACKGROUND

A Workgroup of the University Sustainability Council has recommended the University adopt a new initiative to reduce purchased water consumption in existing buildings. While the initiative – Reducing Purchased Potable Water Use by 20% by 2020 (from 500 million gallons per year to 400 million gallons per year) – establishes a goal for water use performance, these Implementation Guidelines provide further guidance to facilities designers and managers who are on the frontline of water conservation work on campus. The Implementation Guidelines are meant to be flexible and can be revised as needed to promote the most efficient methods for achieving the University's goals as established by the initiative.

II. INITIATIVE AND IMPLEMENTATION GUIDELINES

A. Initiative on Reducing Purchased Potable Water by 20% by 2020

I. Purpose

The University of Maryland strives to reduce its purchased potable water consumption and costs, reduce its demand on the regional potable water supply and adapt to the onset of climate change. This initiative sets a standard for water performance of existing buildings and operations at the University of Maryland, College Park and offers tools for each campus unit to implement purchased potable water conservation projects to meet the standard. Successful implementation of this initiative will significantly reduce the purchase of potable water from the regional supplier and facilitate innovation in meeting the water demand of campus operations.

II. Applicability

This initiative covers every facility at the University of Maryland, College Park and therefore applies to the occupants and operators of every facility on campus including colleges/schools, auxiliary services, and state-support entities ("Units".)

III. Initiative

Reduce purchased potable water by 20% by the end of calendar year 2020. The University will reduce its annual purchased potable water from the regional water supply from 500 million gallons per year to 400 million gallons per year (20% reduction).

B. Implementation Guidelines for Initiative on Reducing Purchased Potable Water 20% by 2020

1. **Unit Accountability** – All campus units (i.e. college/school, auxiliary service, OIT, etc.) are responsible for achieving at least a 20% reduction in purchased potable water by 2020. Renovations greater than 25% of gross building space or $1,000,000 must include at least a 20% purchased potable water reduction over existing conditions for the whole facility. (The baseline for purchased potable water consumption is the total used for the whole building the year prior to renovation.) Units may take advantage of loans and grants from the Energy Reserve Fund and/or the University Sustainability Fund to implement projects. Each major campus unit will identify a point-person to notify Facilities Management (FM) of planned projects to ensure adequate measurement and verification, receive annual purchased potable water reports from FM, report annually on other sustainability projects within their unit, and meet at least once annually with point-persons from other units to share ideas for reducing purchased potable water consumption in campus facilities.
2. **Implementation of Water Conservation Measures (WCMs)** – Facilities Management will enhance a minimum of 1,000,000 gross square feet of building space (state and self-supported) every two years with WCMs resulting in average building purchased potable water use reductions of at least 20%. WCMs implemented by Facilities Management can count toward the reductions specified in section II.B.1. of this document.
3. **Water Use Intensity Tracking** – Facilities Management will track the Purchased Potable Water Use Intensity (WUI) of campus facilities to ensure that new and existing buildings maintain or improve their purchased potable water use performance during their lifespan. This process will occur over an implementation period of 5 years from effective date of this initiative and include all buildings exceeding 50,000 GSF.

III. REVISING THE IMPLEMENTATION GUIDELINES

Facilities Management and the Office of Sustainability will update this document annually as needed to incorporate changes in applicable codes and standards, State requirements, technology advancements, and other changes affecting the current guidelines. The University Sustainability Council as well as Campus units will have the opportunity to review and suggest changes prior to the annual updates.

APPENDIX A

GOVERNOR'S 2001 EXECUTIVE ORDER 01.01.2001.06

01.01.2001.06

EXECUTIVE ORDER 01.01.2001.06 Water Conservation by State Agencies

A. Water Conservation Goal.

(1) State agencies, through water conservation measures, shall reduce water consumption by at least seven percent (7%) by the year 2003, at least eight percent (8%) by the year 2005, at least nine percent (9%) by the year 2007, and at least ten percent (10%) by the year 2010, relative to baseline water use in the year 2000.

(2) For the purposes of this Executive Order, water conservation measures will apply to facilities owned, leased or managed by any State agency. This Executive Order does not apply to water production and supply functions.

B. Water Use Audit.

(1) A water use audit, which is a measurement and accounting of the amount of water conveyed through the water distribution system to water users, shall be conducted annually at all State owned or leased facilities by the State agency responsible for the lease or maintenance of the facility. Additionally, the audit will inventory all water fixtures and other water use devices to determine which are inefficient and the results shall be reported to the Maryland Department of the Environment (MDE) by July 1, 2001.

(2) During the water use audit, the State agency shall also identify any water conservation measures for immediate implementation.

C. Water Conservation Plan.

(1) Each State agency responsible for the lease or maintenance of a facility shall immediately designate a water conservation coordinator who is responsible for the annual development and implementation of the agency's water use audit and water conservation plan. An agency coordinator may further designate coordinators for each facility, who will ensure that all aspects of the plan are appropriately implemented. Each responsible State agency will complete and submit to MDE a water conservation plan by October 1, 2001. A water conservation plan shall include the following fundamental elements and explain how each element is to be implemented:

(a) An annual water audit: The use of flow meters or other methods to routinely account for water use shall be used to demonstrate that the water use reduction goals are achieved and that inefficient water fixtures and water use devices are being eliminated; and

(b) Identify and select specific water conservation measures that need to be employed to improve water management and water use efficiency to achieve the water conservation goal of this Executive Order.

(2) Additionally, each responsible State agency shall address the following measures in its water conservation plan:

(a) The purchase of water-efficient plumbing fixtures, appliances and other products when new or replacement products are needed;

(b) The timely detection and repair of leaks in distribution lines and plumbing fixtures;

(c) Wastewater reclamation and recycling of water for nonpotable applications;

(d) Management of system pressure so as to reduce usage;

(e) Retrofit programs and fixture replacement; and

(f) Installation of efficient landscape design and irrigation techniques.

(3) All leases, beginning in FY02, by any State agency shall include water conservation measures as a term of the lease.

D. Water Conservation Education.

In support of the goal to reduce water consumption, all agencies will conduct an information and education program for both public and staff users designed to promote increased efficiency of water use at State facilities to be completed on or before December 1, 2001. The information and education program shall use visual displays, distribution of written material, dissemination of information through existing employee communications and other appropriate mans to raise employee and citizen user awareness of the importance of water conservation.

E. Water Conservation Reporting.

(1) On December 1, 2001, and every year thereafter, each responsible State agency shall report to the Maryland Green Buildings Council and MDE in a format provided by the Department on measures taken to reduce water use at each of its State-owned and State-leased facilities. The reports should include results from the water use audit and steps outlined in the water conservation plan.

(2) The agency reports shall be reviewed to ensure that the most appropriate water conservation measures are implemented. The Green Buildings Council, in consultation with MDE, shall determine and approve appropriate water conservation measures. The Green Buildings Council, in consultation with MDE, will annually reevaluate the water conservation goal contained in Section A above, and may waive water conservation requirements where an agency is able to demonstrate that water conservation has been optimized and further reductions are not structurally feasible.

(3) Each year the Maryland Green Buildings Council and MDE shall submit a report to the Governor regarding the effectiveness of State agencies' water conservation measures in meeting the overall water use reduction goals.

Effective date: May 17, 2001 (28:12 Md. R. 1099)

http://www.dsd.state.md.us/comar/getfile.aspx?file=01.01.2001.06.htm[7/11/2013 9:59:50 A

APPENDIX B

University of Maryland 2001 Water Conservation Plan

UNIVERSITY OF MARYLAND COLLEGE PARK

WATER CONSERVATION PLAN

On May 17, 2001, Governor Glendening signed Executive Order 01.01.2001.06 which establishes water conservation goals by State Agencies. Under the Executive Order, State Agencies must implement a water conservation program that includes an overall goal of reducing water use by 10% by calendar year 2010 over the baseline year of 2000. The Order specifically requires:

- Conduct of a Water Use Audit to determine the various types of water use and an estimate of each use during calendar year 2000.
- Development and implementation of water conservation strategies that will be documented in a facility Water Conservation Plan.
- Conduct of an education program for employees and other users to elevate their awareness of the need to conserve water and how they may contribute to the program goals.
- Annual reporting to document the facility's progress in achieving the reduction goals. For the University of Maryland College Park, these goals are approximately : 39 million gallons (7%) by 2003; 45 million gallons (8%) by 2005; 50 million gallons (9%) by 2007; and 56 million gallons (10%) by 2010.

The University of Maryland College Park is committed to the Governor's water conservation initiative and will implement the requirements of the Executive Order. To facilitate this effort, a broad-based Water Conservation Committee was formed and convened. The Water Conservation Committee is composed of individuals from several key areas of the University including Facilities Management which is responsible for building systems, metering, grounds maintenance and other large water use activities. Also represented are key departments that consume significant quantities of water, including, but not limited to Residential Facilities, Dining Services, Student Affairs, and the College of Engineering. The committee is chaired by a Water Conservation Coordinator from the Department of Environmental Safety as designated by the University's Administration.

The Executive Order directs the preparation of this Water Conservation Plan. It is the Water Conservation Committee's opinion that conservation of this resource is a long term and ongoing activity that requires detailed engineering evaluations to identify efficient and cost effective solutions. It is also the Committee's opinion that attaining the stated reduction goals

pose a unique challenge to the University. UMCP is experiencing significant construction and growth since calendar year 2000 which will require an increased need for water. Actual and near-term campus growth includes the opening of four new dormitories, the Clarice Smith Center for Performing Arts, the Comcast Center, a new research greenhouse complex and several additional buildings currently under design. In addition, research funding increased by approximately 10% or 20 million dollars from FY2000 to FY2001. These factors will increase UMCP's demand for water. Nonetheless, the Committee has identified the following broad strategies to offset this anticipated growth and achieve the goals set forth while realizing that additional strategies will be identified through further review.

Central Steam Plant System

- The Central Heating Plant is undergoing a significant upgrade whereby two existing boilers are being retrofitted and two new combustion turbine engines equipped with heat recovery steam generators are being installed. The upgrade includes three significant improvements that will reduce water consumption. These include the elimination of once through component cooling; the reduction of make-up water through condensate return improvements and water recycling; and in-plant equipment improvements resulting in a water use reduction of 29 million gallons per year.

Water Metering

- UMCP's Facilities Management Department implemented a water metering effort several years ago. The effort provided a means to identify water use by major buildings. The proposed strategy would expand UMCP's existing metering system by adding several submeters to track water usage associated with major equipment. In addition, software enhancements would be made to the campus' automatic meter reading (AMR) system. These enhancements would allow for the establishment of water use norms by building and major systems with computer-based tracking to detect changes in water use that may be attributable to equipment malfunctions. This would allow for more rapid investigation and resolution of problems that lead to excessive water use. This program is anticipated to reduce water use by 10 million gallons per year.

HVAC Equipment

- UMCP has numerous cooling towers, chilled water and hot water piping systems that have been installed over the years. Make-up water for the condenser water loop is required due to the loss of water at the tower and during blow-down cycles. The automatic level detection and actuating valves that mange these systems are vital to avoid the waste of water from overflowing at the tower or excessive and unnecessary blow-down. UMCP proposes to implement standardized controls for level sensing, make-up valves and water treatment. This measure would inventory all make-up water systems and identify the best methods for level and make-up controls. A second component would deal with the chemical treatment strategies and approaches. Cooling tower make-up water would be metered and blow-down operations would be surveyed before and after chemical treatment measures were deployed. The potential water savings is anticipated to be 4.5 million gallons per year.

Restroom Fixtures

- The University is assembling an inventory of restroom fixtures throughout it's buildings. Many restroom fixtures have been upgraded during the past several years with automatic flushing devices and replacement with low capacity units. Similarly, new and renovated restrooms have been equipped with such equipment as required under the University's Design Criteria Facilities Standards. Facilities Management will retain an independent firm to conduct an engineering review of campus restroom fixtures to determine potential water and cost savings. Actual water savings cannot be estimated until an audit is conducted. The potential water savings is anticipated to be 5 million gallons per year.

Laboratory Equipment

- UMCP's research mission requires the use of laboratory equipment throughout hundreds of laboratories. Autoclaves are a significant sources of water consumption and are located in several buildings. The age, make and model of these units are quite varied and some use cooling water when the units are not being used for sterilization. The proposed strategy would involve the installation of submeters on some units to establish baseline water use associated with autoclaves as compared to their operation and maintenance. An inventory of those units using excessive water would be compiled and water control equipment would be installed to limit water use to actual autoclave operation. In addition, Facilities Management would modify the campus design criteria to incorporate measures in all future buildings to achieve water usage at or below the baseline data. The anticipated savings of this strategy is 3 million gallons per year.

3

Residential Facilities

- Residential operations present several reduction opportunities some of which are ongoing projects. These include:

  - Inspecting every faucet with aerators and install missing low-flow disks;
  - Inspecting every 3.5 gpm toilet/urinal flushometer and adjust the flow rate to minimize water use.
  - Obtaining samples, installing and evaluating various mechanical and electromechanical low-flow faucets for future use.
  - Obtaining samples, installing and evaluating various low-flow flushometers and assessing locations to determine where china fixtures may need to be changed to accommodate low-flow toilets/urinals.
  - Obtaining and installing samples of waterless urinals to determine performance factors.
  - Converting top-loading washing machines in one building's laundry room to a water conserving front loading machine and evaluate performance. The results will then be used to revise laundry contract specifications to require the provision of low consumption washing machines in residence halls.
  - Based on equipment evaluation programs, install low-flow faucets, flushometers, and fixtures as well as waterless urinals, as deemed effective and cost efficient.

  These programs are anticipated to reduce water consumption by 1.5 million gallons per year.

Irrigation

- The University Golf Course uses approximately 7 to 10 million gallons per year to maintain fairways and greens. Annual water use is dictated by weather conditions and the facility's operating practices. Golf course maintenance staff will modify their turf watering schedule and vehicle washing equipment to reduce water consumption by slightly less than 1 million gallons per year.

Dining Services

- Dining Services provides restaurant, catering and cafeteria services to the campus community. Several equipment and operational modifications have been or will be implemented including: the installation of air-cooled condensing equipment rather than water-cooled equipment at all new or renovated areas; converting Denton and South Campus locker rooms and the Administration restroom toilets

period; advising customers that water will only be served upon request; and conduct of an engineering evaluation to determine the cost effectiveness of equipping kitchen hand sinks with water spigots having automatic sensors. These alterations are anticipated to reduce water consumption by one quarter to one half million gallons per year.

Wastewater Recycling

The University is currently preparing a new 10 year Master Plan that is designed to address environmental and traffic improvements on the campus as well as potential building locations. As part of this effort, storm water management improvements are being considered in developed areas where storm water controls were not required in the past. UMCP will evaluate the possibility of installing storm water control ponds in these areas with the possibility of using some of the collected water for turf irrigation. To date, no engineering studies have been conducted to determine the technical and cost effectiveness of this approach and therefore a water savings estimate is not available.

The University will monitor and review it's progress toward meeting the objectives of the Executive Order through periodic meetings of the Water Conservation Committee and metering information. As required by the Executive Order, an annual Water Conservation Report will be submitted to the University System of Maryland office by December 1 to report on the progress achieved, new strategies that have been identified and obstacles that may be encountered in carrying out UMCP's water conservation effort.

Charles S Sturtz

Approved By:
Dr. Charles Sturtz
V.P. Administrative Affairs

11/5/01

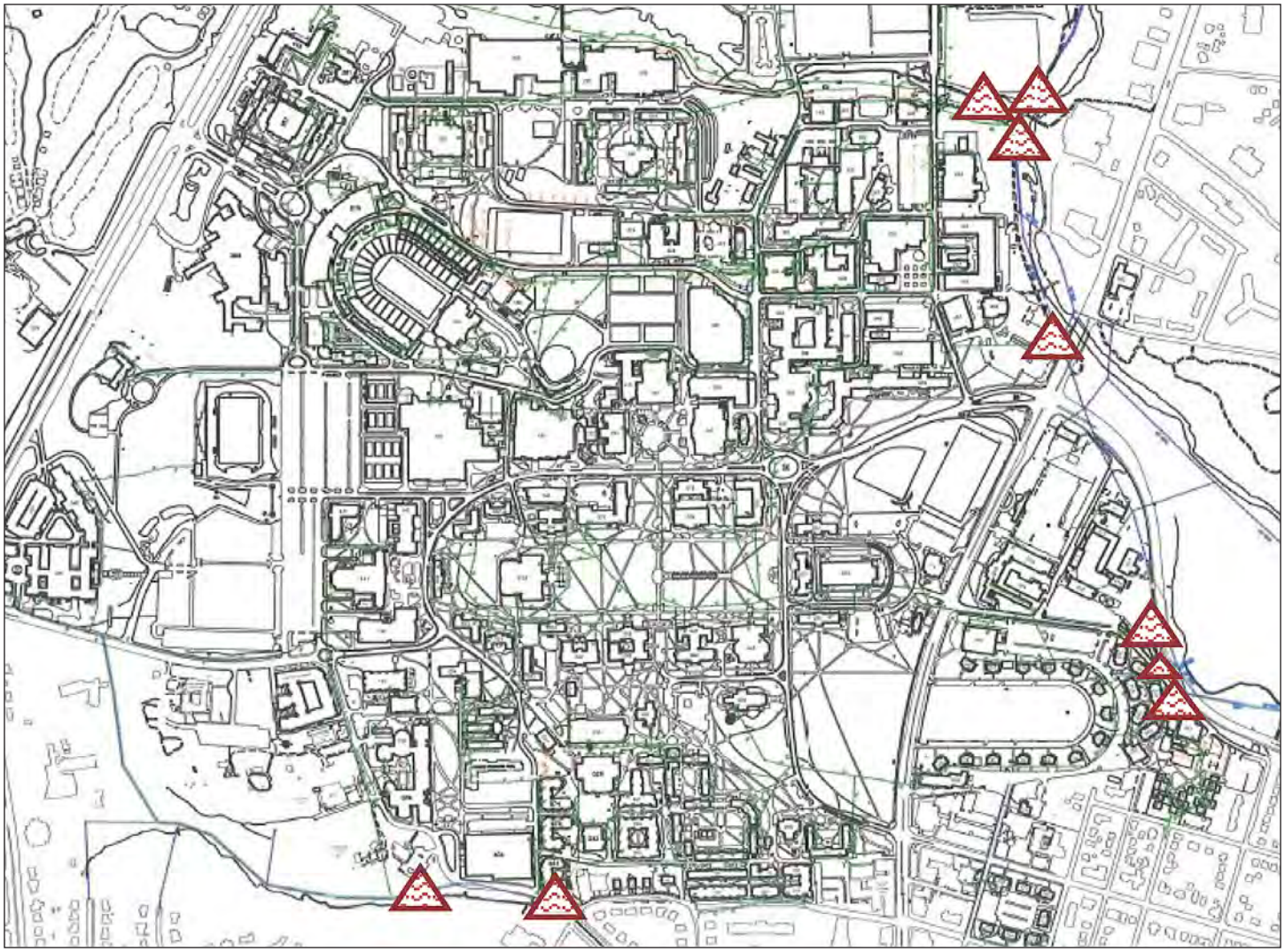
Date

5

APPENDIX C

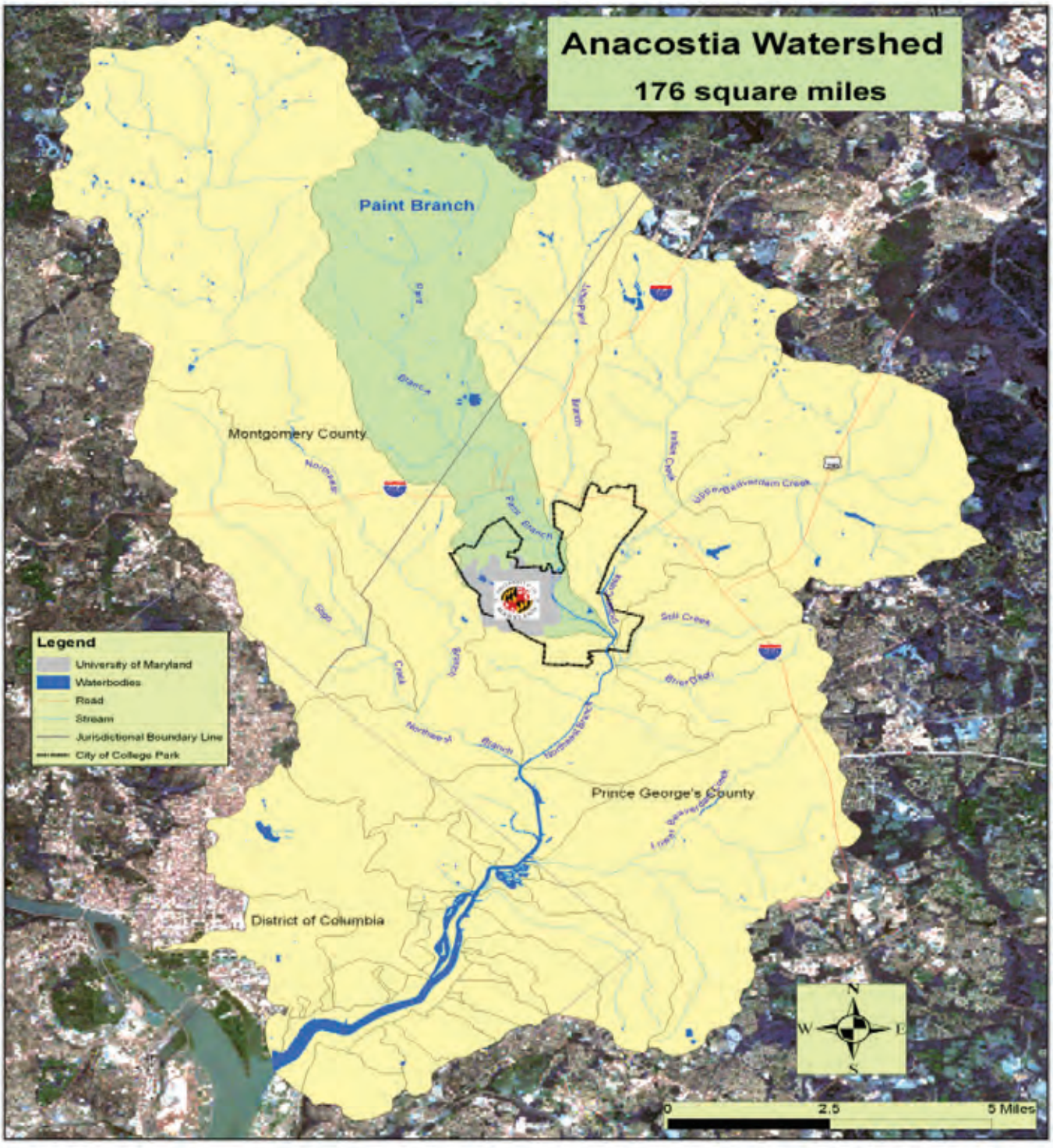
Main Campus Attachment Locations to WSSC Sanitary Sewer

=Owned by WSSC =Owned by UMD



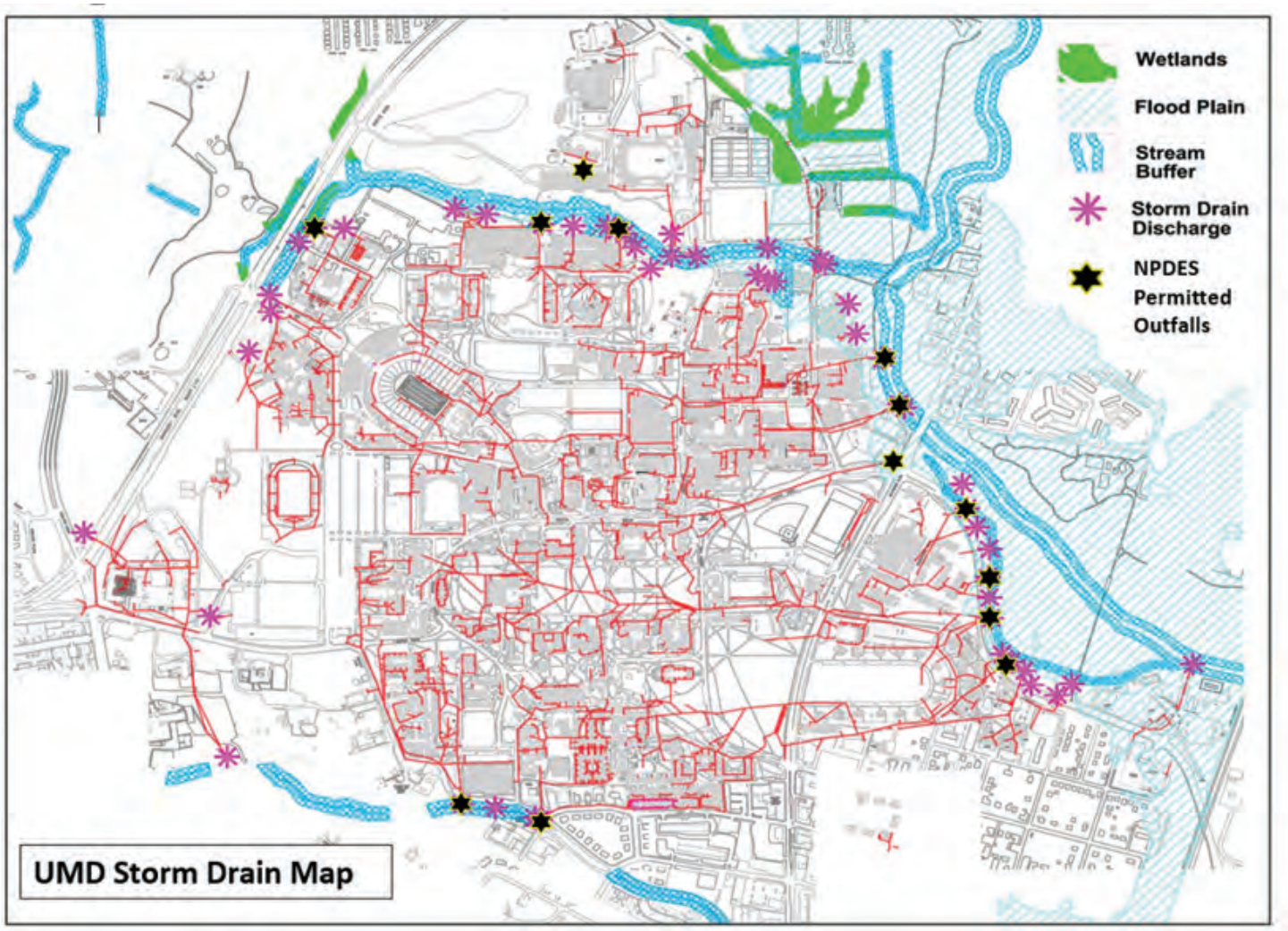
APPENDIX D

ANACOSTIA WATERSHED MAP



APPENDIX E

UMD STORMWATER OUTFALL MAP



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