THE UNIVERSITY OF TENNESSEE KNOXVILLE
FACILITIES SERVICES

August 31, 2016

Geoff Klein
Tennessee Department of Environment and Conservation
Knoxville Environmental Field Office
3711 Middlebrook Pike
Knoxville, TN 37921

Dear Mr. Klein,

On behalf of the University of Tennessee, I am pleased to submit the enclosed fourth annual report for the NPDES Permit issued January 16, 2013. Below is a summary of information and accomplishments for the University of Tennessee Stormwater Management Program for the 2016 Fiscal Year.

1.0 Executive Summary

This annual report documents The University of Tennessee's compliance with the Stormwater management program requirements as detailed in the Municipal Separate Storm Sewer System (MS4) National Pollutant Discharge Elimination System (NPDES) permit number TNS076121. This annual report contains program information and accomplishments from July 1, 2015 to June 30, 2016.

1.1 Program Highlights

Program highlights and milestones during the reporting period consist of the following:

- The BMP manual titled University of Tennessee Best Management Practice Manual – A Stormwater Planning and Design Manual for Stormwater Management Practices was updated to include more clarified and descriptive guidelines concerning best management practices.
- Our Public Information and Education (PIE) Plan was updated to reflect the evolution of our Stormwater Management program.
- The collection of Standard Operating Procedures is currently being updated to include highly erodible material storage procedure.
- Conducted over 168 Stormwater Compliance Inspections on active construction projects.
- Update of the Stormwater Management Plan consisting of:
    - UT Best Management Practices Manual
    - Public Information and Education Plan
    - Illicit Discharge Program and Policy
    - Runoff Reduction Policy
    - Stream Monitoring Plan
    - Stormwater Management Standard Operating Procedures

    - Enforcement Response Plan
    - Outfall Monitoring and Dry Weather Screening Report
    - Best Management Practices Inventory
    - Spill Prevention Control and Countermeasures Plan
- The Stormwater Student Assistant received TDEC EPSC Level 1 Certification.

1.2 Program Modifications

Program modifications that occurred during the reporting period consist of the following:

- The Stormwater Pollution Prevention Plan (SWPPP) for the steam plant was modified and updated to reflect the Universities change from coal to natural gas.

- The Universities Spill Prevention, Control & Countermeasures Plan adopted in August of 2009 has been updated.

1.3 Program Advising

The previously established Stormwater Advisory Committee meets quarterly to review Stormwater Management recommendations to be presented to the Vice Chancellor for Finance and Administration. The charge of this committee is to serve as oversight for the development and implementation of the University's Stormwater Master Plan.

2.0 Municipal Separate Storm System Information

2.1 Population Served

Due to the seasonal nature of the University of Tennessee, the population densities vary considerably throughout the year. Special events, contractors, vendors, and normal traffic further contribute to our temporary populations. Based on recent enrollment records, the annual student population is over 27,000. The total University staff consists of over 9,600 full time and part time employees.

2.2 Service Area

The University maintains and operates only those portions of the storm sewer system located within the University property boundaries of Main Campus and the Institute of Agriculture Campus. The University of Tennessee properties specifically addressed in this permit cover an area of approximately 580 acres.

Remote University facilities such as properties south of the Tennessee River are primarily rural with less defined Stormwater conveyances. Stormwater runoff at these sites is managed in compliance with pertinent requirements for those locations. These sites are not included in the NPDES MS4 Stormwater Permit.

Many discharges from University outfalls include run-on contributions from the City of Knoxville storm sewer system, but the primary drainage at the outfalls is conveyed from the University.

2.3 MS4 Conveyance System

The storm sewer system for the University of Tennessee conveys water from approximately 1 square mile of University owned land into several watersheds including Second Creek, Third Creek, East Fork Third Creek, and the Tennessee River. Throughout campus, Stormwater runoff is collected in various BMP devices, curb inlets, area drains, and similar drainage structures that lead to the storm sewer system. The runoff is conveyed primarily through underground piping which eventually discharges into open stream channels before leaving University property.

2.4 Land Use Composition Estimates

The following are estimated land use activities within the University's jurisdictional area.

Estimated Percentages:	
Office and Institutional	15%
Parking	19%
Roads/Sidewalks/Current Construction	30%
Athletics	7%
Green Space	29%

2.5 Receiving Streams

The University of Tennessee contributes runoff into Second Creek, Third Creek, East Fork Third Creek and the Tennessee River/Fort Loudoun Lake. Table 1 below summarizes information provided by the Tennessee Department of Environment and Conservation on the various receiving waters of the State.

Table 1: Receiving Stream Summary

Water Body ID	Water Body Name	Segment/Length	303d Cause	TMDL
TN06010201 087-1000	Second Creek	From Cumberland Avenue to the Tennessee River/ 0.3 Miles	Other Anthropogenic Habitat Alterations, Nitrate, Nitrite, Loss of Biological integrity due to siltation, Escherichia coli	Fecal Coliform Bacteria: April 4, 2003 Siltation/Habitat Alteration: February 1, 2006

Water Body ID	Water Body Name	Segment/Length	303d Cause	TMDL
TN06010201 067-0100	East Fork Third Creek	From Sutherland Avenue extending 0.12 miles to the South / 0.12 miles	Loss of biological integrity due to siltation, Other Anthropogenic Habitat Alterations, Escherichia coli	
TN06010201 067-1000	Third Creek	From Cumberland Avenue to the Tennessee River/ 1.08 miles	Nitrates, Nitrite, Loss of biological integrity due to siltation, Other Anthropogenic Habitat Alterations, Escherichia coli	Fecal Coliform Bacteria: April 4, 2002 Siltation/Habitat Alteration: February 1, 2006
TN06010201	Fort Loudoun Reservoir	From 0.06 miles upstream of Second Creek to 0.16 miles downstream of Alcoa Highway/ 2.25 miles	Mercury, PCBs	PCB's March 3, 2010

3.0 Public Education and Outreach

An integral part of the Stormwater Management program involves the education of the campus community and others about water resources, how we affect water quality, and what we can do to minimize pollution and lessen our impact on the environment. To facilitate this, the University has developed a Public Information and Education (PIE) plan that outlines target pollutants, target groups, programs/events and measurable goals to provide information to the campus community. The campus community (excluding athletic events) includes over 37,000 students, faculty, staff, contractors, vendors and visitors. The Public Education and Outreach program metrics are summarized in Table 2 below.

Table 2: Public Education and Outreach summary

Fiscal Year 2016 Metrics	Quantity	Target Audience	
		Campus Population	Faculty, Staff, Contracted Employees
Stormwater Awareness Info Graphics posted	160	X	X
Stormwater Awareness Training sessions	2		X
Stormwater Awareness Stickers distributed	203	X	X
Stormwater Webpage	1	X	X
Public Meetings held	1	X	X

Fiscal Year 2016 Metrics	Quantity	Target Audience	
		Campus Population	Faculty, Staff, Contracted Employees
Earth Day events	1	X	X
Stormwater Awareness Presentations	2	X	X
Stormwater Display in the University Center	1	X	X

4.0 Public Participation and Involvement

4.1 Public Participation Program

The University provides opportunities for stakeholders and the public to participate in the Stormwater Management Program development and implantation through:

- The Stormwater Advisory Committee, which is a group comprised of University stakeholders who oversee the development and implementation of the permitted Stormwater Management Program.
- The Water Quality Forum, which is comprised of local MS4s that work towards a common goal of increasing water quality in our shared watershed.
- The Tennessee Stormwater Association (TNSA), which is comprised of a statewide MS4s, Consultants and State Regulators that work to help each other build consistent Stormwater management programs and ultimately increase water quality.
- The Environmental Compliance Team which is comprised of various University department representatives who ensure the campus stays within compliance of all environmental programs.
- River Rescue, which is an annual event that the University helps facilitate to clean up our local waterways. We sponsor two locations on campus, had 63 volunteers and were able to collect two dump truck loads of trash.
- The Adopt a Stream program, which provides an opportunity for our faculty, staff and students to take ownership in stream segments that run through campus. These groups focus on invasive vegetation removal and trash pickup.
- Student project assistance and advising, which provides information and project consulting to students working on projects related to Stormwater Management. These student projects range anywhere from Engineering, to Landscape Architecture to Advertising.

Table 3: Public Participation and Involvement Program summary

Fiscal Year 2016 Metrics	Quantity
Stormwater Advisory Committee Meetings	4
Water Quality Forum Meetings	3
TNSA Meetings	4
Environmental Compliance Team Meetings	3
River Rescue Sites	2
Adopt a Stream Sites	1
Student Projects	3

4.2 Public Reporting Program

The University provides an opportunity for the public to participate in the Stormwater Management Program development and implementation through reporting of environmental concerns and illicit discharges. Information on reporting Stormwater related problems have been publicized on the Stormwater awareness info graphics, Stormwater awareness stickers, the Stormwater display in the University Center and on the Stormwater webpage, which has a feature that allows users to submit an electronic form that is sent to the Stormwater Management Coordinator.

Table 4: Public Reporting Program summary

Fiscal Year 2016 Metrics	Quantity
Reported Environmental Concerns	7
Reported Illicit Discharges	3

5.0 Illicit Discharge Detection and Elimination

5.1 Storm Sewer System Inventory

Previously, a consultant was hired by the university to map all of the underground utilities for the UTK campus. The completed mapping is now being field verified and updated.

5.2 Illicit Discharge Program

A standard operating procedure (SOP) for illicit discharge detection and elimination has been developed and is in place. Illicit discharges are identified via submittal of the electronic form located on the website, or via telephone calls of concern placed by the public. There is currently a substantial amount of construction on the Main Campus, which increases the likelihood that construction related illicit discharges may occur. An Illicit Discharge Policy prohibiting this type of activity, and the associated Enforcement Response Plan were being updated at the time of this report.

In addition to the SOP and Policy an Outfall Inventory and Dry Weather Screening is conducted on a semi-annual basis in our 4 receiving streams. A standardized Outfall Inventory data sheet is utilized for collecting all necessary information in the field and documenting illicit discharge inspections at outfall locations. 26 outfalls have been identified and investigated as part of this process and an Outfall inventory and dry weather screening report has been prepared.

Table 5: Illicit Discharge Program summary

Fiscal Year 2016 Metrics	Quantity
Electronic forms received	2
Phone calls received	3
Illicit Discharges detected	5
Illicit Discharges resolved	5
Outfalls Inspected	62

6.0 Construction Site Runoff Control

The University of Tennessee is a state agency and is subject to the State erosion and sediment control regulations as specified in the State of Tennessee general NPDES permit for discharges of Stormwater associated with construction activities. For projects disturbing greater than or equal to 1.0 acres, a Stormwater Pollution Prevention Plan (SWPPP) and associated Erosion and Sediment Control Plan are submitted to the University Stormwater Management Coordinator for review and then submitted to TDEC for review and issuance of a Notice of Coverage prior to commencement of land disturbing activities. For projects disturbing 0.1 to 0.99 acres, the erosion and sediment control plans are submitted to the University Stormwater Management Coordinator for review and approval prior to commencement of land disturbing activities as outlined in the Stormwater Management Standard Operating Procedures.

All projects at the University that have a land disturbance component are required to follow the regulations outlined in the NPDES permit and are subject to enforcement procedures outlined in the Enforcement Response Plan. Unlike other permitted MS4s, the University is typically the owner, developer, and project manager for on-campus projects. Construction requirements and penalties are outlined in the project contract, and typical enforcement is tied to payment and final project acceptance. All approved projects on campus are inspected by the University Stormwater Management staff on at least a monthly basis. All inspections are performed using the TDEC Erosion and Sediment Control Handbook as guidance.

The Construction Site Runoff Control Program is performance based and is quantifiable through the number of plan reviews/approvals, inspections performed, complaints received and enforcement actions issued. These measureable goals are summarized in Table 6 below.

Table 6: Construction Site Runoff Control Program summary

Fiscal Year 2016 Metrics	Quantity
TDEC CGP Permits	12
University Plan Review/Approval	15
Projects Receiving NOVs	1
University Erosion and Sediment Control Inspections	168
Publicly Reported Construction Site Issues	4

7.0 Post Construction Runoff Control

The University has developed and implemented a Runoff Reduction policy. This policy provides guidelines to ensure site design standards for all new and redevelopment projects disturbing greater than 1 acre, require management measures that are designed, built and maintained to infiltrate, evapotranspire, harvest and/or reuse at minimum the first inch of every rainfall event preceded by 72 hours of no measurable precipitation. In addition to this policy the University's post construction Stormwater control program includes post construction runoff inspections, a Best Management Practice Inventory and Maintenance Program, and a Best Management Practices Manual- A Stormwater Planning and Design Manual for Stormwater Management Practices.

8.0 Pollution Prevention and Good Housekeeping

The University's pollution prevention and good housekeeping operations span a collection of multiple individual programs;

1. Stream Monitoring Program
2. NPDES-Regulated Industrial Facilities
3. Stormwater Collection System Operations and Maintenance
4. Permenant Stormwater BMP Operations
5. Landscape Services Operations and Maintenance
6. Snow Removal and Control
7. Recycling and Solid Waste Management
8. Hazardous Waste Management
9. Vehicle Cleaning

These nine programs are described in more detail below.

8.1 Stream Monitoring Program

Stream monitoring of impaired water bodies is required as a component of the MS4 permit to assess the effectiveness of the BMPs in achieving contaminant load allocations. Both analytical monitoring and non-analytical monitoring are required in stream segments listed as impaired. A sampling plan has been developed to satisfy the requirements of the MS4 permit for all 303d listed streams that have the pollutant source identified as discharges from MS4 areas. Implementation of this plan will be used to evaluate the effectiveness of the University's Stormwater Management Program. At minimum these stream segments will be sampled on a 5 year rotation as required. Additional sampling may be conducted as needed. A summary of samples to be collected as part of the stream monitoring program are summarized in table 7 below.

Table 7: Stream monitoring summary

Stream Segment	Samples to be conducted				
	Macro Invertebrate Stream Survey	E. Coli	Total Suspended Solids	Nitrate / Nitrite	Visual Habitat Assessment
East Fork Third Creek	0	2	2	0	2
Third Creek	1	2	2	2	2
Second Creek	1	2	2	2	2
Total Samples to be Collected	2	6	6	4	6

Due to the fact that we are still currently in our first 5 year cycle and the new MS4 permit will be issued in the coming months, we will evaluate our sampling plan according to the new permit language prior to conducting the sampling event.

8.2 NPDES regulated Industrial Facilities

The University's Steam Plant located on Lake Loudon Boulevard maintains a Tennessee Multi Sector General Permit (TMSP) for Stormwater discharges associated with industrial activity. This Facility is permitted as a steam electric power generating operation. Historically this facility has been fueled by combustion of coal. The use of coal as a fuel source was discontinued in March 2015, and Natural Gas will be used going forward.

Table 8: NPDES Regulated Industrial Facilities summary

Fiscal Year 2016 Metrics	Quantity
NPDES Stormwater Regulated Industrial Facilities	1
Compliance Audits Performed	1
Audited Facility Not in Compliance	0

8.3 Stormwater Collection System Operations and Maintenance

The Stormwater collection system operations and maintenance is performed both by our in house utilities division and outsourced through task managed contracts. The operations and maintenance work performed consists of storm drain cleaning, removal of blockage, cleaning of catch basins and area drains, the inspection and pump out of proprietary water quality treatment devices. Collected material removed from the Stormwater collection system is hauled off site and disposed of properly.

Table 9: MS4 Operations and Maintenance summary

Fiscal year 2016 Metrics	Quantity
Catch Basins/ Inlets Cleaned	18
Stormwater Collection System Repair Work Orders	3
Water quality units inspected	17
Water quality units pumped out	0

8.4 Permanent Stormwater BMP Operations

The University owns and operates various permanent Stormwater Best Management Practices on Campus. See Table 10 below for a breakdown of BMP type.

Table 10: Stormwater BMP summary

Type of BMP	Total Devices	Quantity	Unit
Stormwater Harvesting and Reuse	2	45,000	Gallons
Water Quality Unit	18	18	Units
Rain Garden	3	6,900	Square Feet

Permeable Pavement System	3	237,408	Square Feet
Dry Detention	3	3	Locations
Green Roof	2	11,311	Square Feet
Silva Cell Bioretention	8 locations	112	Trees
Grassed Swale	1	895	Linear Feet
Vegetated Filter Strip	4	7,670	Linear Feet

Routine monthly BMP inspections, rainfall event triggered inspections (following events exceeding 0.5 inches of rainfall in a 24 hour period), and maintenance are performed under the supervision of staff qualified in Stormwater inspection, operations and maintenances. Standardized maintenance tasks are outlined in the UT BMP Manual and are specific to each type of applicable BMP.

A new Stormwater Management Master Plan is currently under development to reflect the evolution of our Stormwater Management Program.

The University made application for and was awarded the TWRA Riparian Tree Planting Grant valued at $500. As a part of the grant tree planting supplies such as work gloves and dibble bars along with seedlings of various native mixed hardwoods and evergreens were purchased for the watershed. Students, staff and community volunteers assisted in the process of planting the trees.

The University made application for and was awarded the TWRA State Stream Clean-up Grant valued at $800. As a part of the grant clean-up supplies such as work gloves, refreshments for volunteer support and trash pickers. Students, staff and community volunteers assist in the clean-up process.

The Stormwater Management department also received $20,000 to be used for riparian vegetation planting as part of the University's green fee.

8.5 Landscape Services Operations and Maintenance

Landscape Services is responsible for the maintenance and improvement of the campus grounds on the Main and Agricultural campuses. This includes mowing, raking, mulching, fertilizing, weeding, edging, litter pick-up, street and parking lot cleaning, grading, excavating, trenching, demolition, hauling, asphalt preparation, landscape design, planting, transplanting, pruning, tree removal and greenhouse operation.

Two vacuum trailers are dedicated to perform leaf collection during the 3 month long leaf season. Collected leaves are transported to our compost facility to be incorporated into the campus composting operation

Table 11: Landscape Services Operations and Maintenance summary

Fiscal year 2016 Metrics	Quantity
Landscaped Area Maintained (acres)	165 (estimated)
Leaves /Woodchips / Brush Composted (Tons)	755 tons

8.6 Snow and Ice Removal and Control

Landscape Services provides ice and snow removal services for the Main and Agricultural campuses. These services are provided on a priority basis, with safety of the greatest number of individuals being used to determine the order of service. The universities salt and de-icing supply is stored in an enclosed area with no exposure to Stormwater contact

Table 12: Snow and Ice Removal and Control summary

Fiscal year 2016 Metrics	Quantity
Salt Applied	100 tons
Alternative De-icing Product Applied	44 tons

8.7 Recycling and Solid Waste Management

The University maintains a comprehensive recycling and solid waste reduction program including contract dumpsters with plugs and lids, 123 bottle/can recycling stations, 69 paper recycling stations, 80 cardboard recycling stations, 29 compost stations, and one public recycling drop off location. All waste collection areas are picked up 1-5 times per week depending on location and need.

Table 13: Recycling and Solid Waste Management Program summary

Fiscal year 2016 Metrics	Quantity
Compost/Food	383 tons
Green Waste	755 tons
Construction and Demolition (non-landfill/recycled)	122 tons
Scrap Metal	118 tons
Office Paper (mixed)	317 tons
News Print	2 tons
Cardboard	400 tons
Plastic (mixed)	245 tons
Paper Shredding	100 tons
Textiles (mattress, carpet, clothing donations)	27 tons
Pallets	100 tons
Electronics	20 tons
Batteries	3 tons
Used Motor Oil	2 tons
Cooking Oil	16 tons
Printer Cartridges	3 tons
Light bulbs/Ballasts	20 tons
Cinder Blocks	1 ton
Scrap Wood	3 tons
Landfill	7,935 tons
Dumpsters Repaired	13
Dumpsters Replaced	3
Service Requests	1,100

8.8 Hazardous Waste Management

The University's Environmental Health and Safety department provides a collection service for all Hazardous and Acutely Hazardous Waste substances. This service is provided to the University labs, shops and storage facilities that generate these types of waste as well as other types of waste materials that require special disposal or handling procedures such as mercury lamps. Incident response agreements are continuously maintained with the City of Knoxville Fire Department.

8.9 Vehicle Cleaning

The Motor Pool has an engineered wash bay facility on campus for washing vehicles. This facility discharges to the sanitary sewer system. There is no vehicle washing that could cause impacts to the storm sewer system permitted outside of the facility constructed for this purpose.

Please see the attached Small MS4 Annual Report Form CN-1291.

Please call me at (865) 805-4007 if you have any questions concerning this report.

Sincerely,

Garrett Ferry, CPESC
Stormwater Management Coordinator
Facilities Services Department
University of Tennessee

Tennessee Department of Environment and Conservation
Division of Water Resources
William R. Snodgrass Tennessee Tower, 312 Rosa L. Parks Avenue, 11th Floor, Nashville, Tennessee 37243
1-888-891-8332 (TDEC)

Municipal Separate Storm Sewer System (MS4) Annual Report

1. MS4 INFORMATION

The University of Tennessee, Knoxville	TNS076121
Name of MS4	MS4 Permit Number
Garrett Ferry	gferry@utk.edu
Name of Contact Person	Email Address
(865)805-4007	
Telephone (including area code)	
2040 Sutherland Ave.	
Mailing Address	

Knoxville	TN	37921 (physical) 37996(mailing)
City	State	ZIP code

What is the current population of your MS4? 36,280 (2014 data)

What is the reporting period for this annual report? From July 1, 2015 to June 30, 2016

2. WATER QUALITY PRIORITIES (SECTION 3.1)

A. Does your MS4 discharge into waters listed as impaired on TN's most current 303(d) list and/or according to the on-line GIS mapping tool? ☒ Yes ☐ No

B. If yes, please attach a list all impaired waters within your jurisdictional area.

C. Does your MS4's jurisdictional area contain any waterbodies where a TMDL has been approved for parameters other than pathogens, siltation and habitat alterations? If yes, please attach a list.

D. Does your MS4 discharge to any Exceptional TN Waters (ETWs) or Outstanding National Resource Waters (ONRWs)? If yes, please attach a list. ☐ Yes ☒ No

E. Are you implementing additional specific provisions to ensure the continued integrity of ETWs or ONRWS located within your jurisdiction? ☐ Yes ☒ No

3. PROTECTION OF STATE OR FEDERALLY LISTED SPECIES (SECTION 3.2.1 General Permit for Phase II MS4s)

A. Are there any state or federally listed species within the MS4's jurisdiction? ☒ Yes ☐ No

B. Are any of the MS4 discharges or discharge-related activities likely to jeopardize any state or federally listed species? ☐ Yes ☒ No

C. Please attach any authorizations or determinations by U.S. Fish & Wildlife Service on the effect of the MS4 discharges on state or federally listed species.

4. PUBLIC EDUCATION AND PUBLIC PARTICIPATION (SECTION 4.2.1 AND 4.2.2)

A. Have you developed a Public Information and Education plan (PIE)? ☒ Yes ☐ No

B. Is your public education program targeting specific pollutants and sources of those pollutants, such as Hot Spots? ☒ Yes ☐ No

C. If yes, what are the specific causes, sources and/or pollutants addressed by your public education program? Any and all pollutants that have the potential to impact stormwater quality.

D. Note specific successful outcome(s) (NOT tasks, events, publications) fully or partially attributable to your public education program during this reporting period. Two dump truck loads of trash (one from second creek and one from third creek) were removed during April 2nd River Rescue. Three truckloads of invasive plant species was removed from the riparian zone of Third Creek during the December 3rd Adopt a Stream event. Approximately 1,000 saplings were planted at Second creek for Tennessee Arbor Day. 15 students participated in the installation of the Claxton Education Rain Garden. 18 students participated in the installation of liner for the wetland ponds at UT Gardens.

E. Do you have an advisory committee or other body comprised of the public and other stakeholders that provides regular input on your stormwater program? ☒ Yes ☐ No

F. How do you facilitate, advertise, and publicize public involvement and participation opportunities? Publication in The Daily Beacon (University Newspaper), Tennessee Today, Posters, Campus Calendar

G. Do you have a webpage dedicated to your stormwater program? ☒ Yes ☐ No

If so, what is the link/URL: stormwater.utk.edu

H. Are you tracking and maintaining records of public education, outreach, involvement and participation activities? Please attach a summary of these activities. ☒ Yes ☐ No

5. Illicit Discharge Detection and Elimination (Section 4.2.3)

A. Have you completed a map of all outfalls and receiving waters of your storm sewer system? ☒ Yes ☐ No

B. Have you completed a map of all storm drain pipes of storm sewer system? ☐ Yes ☒ No

C. How many outfalls have you identified in your system? 62

D. Have any of these outfalls been screened for dry weather discharges? ☒ Yes ☐ No

F. What is your frequency for screening outfalls for illicit discharges? Semi-Annually

G. Do you have an ordinance that effectively prohibits illicit discharges? ☒ Yes ☐ No

H. During this reporting period, how many illicit discharges/illegal connections have you discovered (or been reported to you)? 4

I. Of those illicit discharges/illegal connections that have been discovered or reported, how many have been eliminated? 4

6. Construction Site Stormwater Runoff (Section 4.2.4)

A. Do you have an ordinance or adopted policies stipulating:

Erosion and sediment control requirements? ☒ Yes ☐ No

Other construction waste control requirements? ☒ Yes ☐ No

Requirement to submit construction plans for review? ☒ Yes ☐ No

MS4 enforcement authority? ☒ Yes ☐ No

B. How many active construction sites disturbing at least one acre were there in your jurisdiction this reporting period? 14

C. How many of these active sites did you inspect this reporting period? 14

D. On average, how many times each, or with what frequency, were these sites inspected (e.g., weekly, monthly, etc.)? Monthly at minimum

E. Do you prioritize certain construction sites for more frequent inspections? ☒ Yes ☐ No

If Yes, based on what criteria? Size of site and contractor performance

7. PERMANENT STORMWATER CONTROLS (SECTION 4.2.5)

A. Do you have an ordinance or other mechanism to require:

Site plan reviews of all new and re-development projects?	☒ Yes	☐ No
Maintenance of stormwater management controls?	☒ Yes	☐ No
Retrofitting of existing BMPs with green infrastructure BMPs?	☐ Yes	☒ No

B What is the threshold for new/redevelopment stormwater plan review? (e.g., all projects, projects disturbing greater than one acre, etc.)All projects

C. Have you implemented and enforced performance standards for permanent stormwater controls? ☒ Yes ☐ No

D. Do these performance standards go beyond the requirements found in Section 4.2.5.2 and require that pre-development hydrology be met for:

Flow volumes	☒ Yes	☐ No
Peak discharge rates	☒ Yes	☐ No
Discharge frequency	☐ Yes	☒ No
Flow duration	☐ Yes	☒ No

E. Please provide the URL/reference where all permanent stormwater management standards can be found.

stormwater.utk.edu

F. How many development and redevelopment project plans were reviewed for this reporting period? 13

G. How many development and redevelopment project plans were approved? 13

H. How many permanent stormwater management practices/facilities were inspected? 49

I. How many were found to have inadequate maintenance? 16

J. Of those, how many were notified and remedied within 30 days? (If window is different than 30 days, please specify) 0. These are all water quality units. We are currently unable to dispose of the waste generated by these units due to restrictions from the City of Knoxville.

K. How many enforcement actions were taken that address inadequate maintenance?0

L. Do you use an electronic tool (e.g., GIS, database, spreadsheet) to track post-construction BMPs, inspections and maintenance? ☒ Yes ☐ No

M. Do all municipal departments and/or staff (as relevant) have access to this tracking system? ☐ Yes ☒ No

N. Has the MS4 developed a program to allow for incentive standards for redeveloped sites? ☒ Yes ☐ No

O. How many maintenance agreements has the MS4 approved during the reporting period? 0

8. CODES AND ORDINANCES REVIEW AND UPDATE (SECTION 4.2.5.3)

A. Is a completed copy of the EPA Water Quality Scorecard submitted with this report? ☒ Yes ☐ No

B. Include status of implementation of code, ordinance and/or policy revisions associated with permanent stormwater management.No revisions were made. All policies currently in effect.

9. Stormwater Management for Municipal Operations (Section 4.2.6)

A. Have stormwater pollution prevention plans (or an equivalent plan) been developed for:

All parks, ball fields and other recreational facilities	☐ Yes	☒ No
All municipal turf grass/landscape management activities	☐ Yes	☒ No
All municipal vehicle fueling, operation and maintenance activities	☒ Yes	☐ No
All municipal maintenance yards	☒ Yes	☐ No
All municipal waste handling and disposal areas	☐ Yes	☒ No

B. Are stormwater inspections conducted at these facilities? ☒ Yes ☐ No

1. If Yes, at what frequency are inspections conducted? Monthly/Quarterly

C. Have standard operating procedures or BMPs been developed for all MS4 field activities? (e.g., road repairs, catch basin cleaning, landscape management, etc.) ☒ Yes ☐ No

D. Do you have a prioritization system for storm sewer system and permanent BMP inspections? ☐ Yes ☒ No

E. On average, how frequently are catch basins and other inline treatment systems inspected? catch basins - monthly, treatment systems - semi-annually

F. On average, how frequently are catch basins and other inline treatment systems cleaned out/maintained? NAs needed

G. Do municipal employees in all relevant positions and departments receive comprehensive training on stormwater management? ☒ Yes ☐ No

H. If yes, do you also provide regular updates and refreshers? ☒ Yes ☐ No

If so, how frequently and/or under what circumstances? Annually in applicable areas such as the steam plant due to the separate TMSP general permit for industrial activities. Otherwise on an as needed basis.

10. Stormwater Management Program Update (Section 4.4)

A. Describe any changes to the MS4 program during the reporting period including but not limited to:

Changes adding (but not subtracting or replacing) components, controls or other requirements (Section 4.4.2.a). Began development of the Stormwater Master Plan.

Changes to replace an ineffective or unfeasible BMP (Section 4.4.2.b). N/A

Information (e.g. additional acreage, outfalls, BMPs) on program area expansion based on annexation or newly urbanized areas. N/A

Changes to the program as required by the division (Section 4.4.3). N/A

11. Evaluating/Measuring Progress

A. What indicators do you use to evaluate the overall effectiveness of your Stormwater Management Program, how long have you been tracking them, and at what frequency? Note that these are not measurable goals for individual BMPs or tasks, but large-scale or long-term metrics for the overall program, such as in-stream macroinvertebrate community indices, measures of effective impervious cover in the watershed, indicators of in-stream hydrologic stability, etc.

Indicator	Began Tracking (year)	Frequency	Number of Locations
Example: E. coli	*2003*	*Weekly April–September*	*20*
Sediment/Metals	2014	Quarterly (plus storm events of various size)	1
Bacteria/Nutrients	2014	Quarterly (plus storm events of various size)	1

B. Provide a summary of data (e.g., water quality information, performance data, modeling) collected in order to evaluate the performance of permanent stormwater controls installed throughout the system. This evaluation may include a comparison of current and past permanent stormwater control practices. The University previously installed an ISCO brand Signature flow meter in Second Creek, which is equipped with an area velocity meter and is utilized to activate an ISCO Avalanche refrigerated automatic sampler. Our students surveyed the cross section where we are monitoring to convert depth and velocity readings from the area velocity meter into flow readings.

The University is still collecting base flow samples at least once quarterly over our year of sampling (through grab samples), and additionally are targeting storm events. The goal is to characterize pollutant changes during the course of storm events in the watershed and also to get informational data on how and why concentrations change from storm to storm. Samples are collected after each storm event and tested for sediment, bacteria, metals, and some nutrient species. An ongoing program is still under development to quantify various organic pollutants in the stream water as well. A future goal is to have this data available in real time on line via the Stormwater website.

12. Enforcement (Section 4.5)

A. Identify which of the following types of enforcement actions you used during the reporting period, indicate the number of actions, the minimum measure (e.g., construction, illicit discharge, permanent stormwater control) or note those for which you do not have authority:

Action	Construction	Permanent Stormwater Controls	Illicit Discharge	Authority?	
Notice of violation	#1	#N/A	#N/A	☒ Yes	☐ No
Administrative fines	#N/A	#N/A	#N/A	☐ Yes	☒ No
Stop Work Orders	#N/A	#N/A	#N/A	☐ Yes	☒ No
Civil penalties	#N/A	#N/A	#N/A	☐ Yes	☒ No
Criminal actions	#N/A	#N/A	#N/A	☐ Yes	☒ No
Administrative orders	#N/A	#N/A	#N/A	☐ Yes	☒ No
Other _____	#_____	#_____	#_____		

B. Do you use an electronic tool (e.g., GIS, data base, spreadsheet) to track the locations, inspection results, and enforcement actions in your jurisdiction? ☐ Yes ☒ No

C. What are the 3 most common types of violations documented during this reporting period? Sediment leaving the construction site.

13. Program Resources (optional)

A. What was your annual expenditure to implement the requirements of your MS4 NPDES permit and SWMP this past reporting period? $42,900

B. What is next year's budget for implementing the requirements of your MS4 NPDES permit and SWMP? $45,000

C. Do you have an independent financing mechanism for your stormwater program? ☐ Yes ☒ No

D. If so, what is it/are they (e.g., stormwater fees), and what is the annual revenue derived from this mechanism?

Source: Amount $

Source: Amount $

E. How many full time employees does your municipality devote to the stormwater program (specifically for implementing the stormwater program vs. municipal employees with other primary responsibilities that dovetail with stormwater issues)? 1

F. Do you share program implementation responsibilities with any other entities? ☐ Yes ☒ No

Entity	Activity/Task/Responsibility	Your Oversight/Accountability Mechanism

G. Please attach a copy of your Organizational Chart

14. Certification

This report must be signed by a ranking elected official or by a duly authorized representative of that person. See signatory requirements in sub-part 6.7.2 of the permit.

"I certify under penalty of law that this document and all attachments were prepared by me, or under my direction or supervision. The submitted information is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. As specified in Tennessee Code Annotated Section 39-16-702(a)(4), this declaration is made under penalty of perjury."

DAVE IRVIN
ASSOCIATE VICE CHANCELLOR

Printed Name and Title | Signature | Date 8/30/16

Annual reports must be submitted in accordance with the requirements of Section 5.4. (Reporting) of the permit. Annual reports must be submitted to the appropriate Environmental Field Office (EFO) by September 30 of each calendar year, as shown in the table below:

EFO	Street Address	City	Zip Code	Telephone
Chattanooga	1301 Riverfront Pkwy, Suite 206	Chattanooga	37402	(423) 634-5745
Columbia	1421 Hampshire Pike	Columbia	38401	(931) 380-3371
Cookeville	1221 South Willow Ave.	Cookeville	38506	(931) 432-4015
Jackson	1625 Hollywood Drive	Jackson	38305	(731) 512-1300

Johnson City	2305 Silverdale Road	Johnson City	37601	(423) 854-5400
Knoxville	3711 Middlebrook Pike	Knoxville	37921	(865) 594-6035
Memphis	8383 Wolf Lake Drive	Bartlett	38133	(901) 371-3000
Nashville	711 R S Gass Boulevard	Nashville	37216	(615) 687-7000

Municipal Separate Storm Sewer System (MS4) Annual Report

Attachments

Attachment 1:

2. Water Quality Priorities; B. Impaired Waters Within Jurisdictional Area

TN06010201 097- 1000 – Second Creek

TN06010201 067 – 1000 – Third Creek

TN06010201 067 – 0100 – East Fork Third Creek

TN06010201 020 – 2000 – Fort Loudon Reservoir

Attachment 2:

2. Water Quality Priorities; C. Water bodies with TMDL other than pathogens, siltation, or habitat alteration

TN06010201 020 – 2000 – Fort Loudon Reservoir ; Total Maximum Daily Load for Polychlorinated Biphenyls (PCBs), March 3, 2010

Municipal Separate Storm Sewer System (MS4) Annual Report

Attachments

Attachment 3:

3. Protection of State or Federally Listed Species; C. US Fish and Wildlife Service Statement

Mr. Ferry -

Thank you for your e-mail dated July 24, 2015, regarding compliance with the Tennessee Department of Environment and Conservation (TDEC) Notice of Coverage annual reporting requirements for the University of Tennessee's MS4 permit (TNS076121) and stormwater management program in Knox County, Tennessee. U.S. Fish and Wildlife Service (Service) personnel have reviewed your request for technical assistance and offer the following comments.

Review of our endangered species database indicates that no federally listed or proposed endangered or threatened species occur within the jurisdictional boundaries of the University of Tennessee's stormwater management program. In view of this, we believe that adverse effects to federally listed species from activities carried out under that program are not anticipated.

Thank you for the opportunity to comment. If you have any questions, please contact me at 931/528-6481, ext. 210, or via e-mail at steven_alexander@fws.gov.

Municipal Separate Storm Sewer System (MS4) Annual Report

Attachments

Attachment 4:

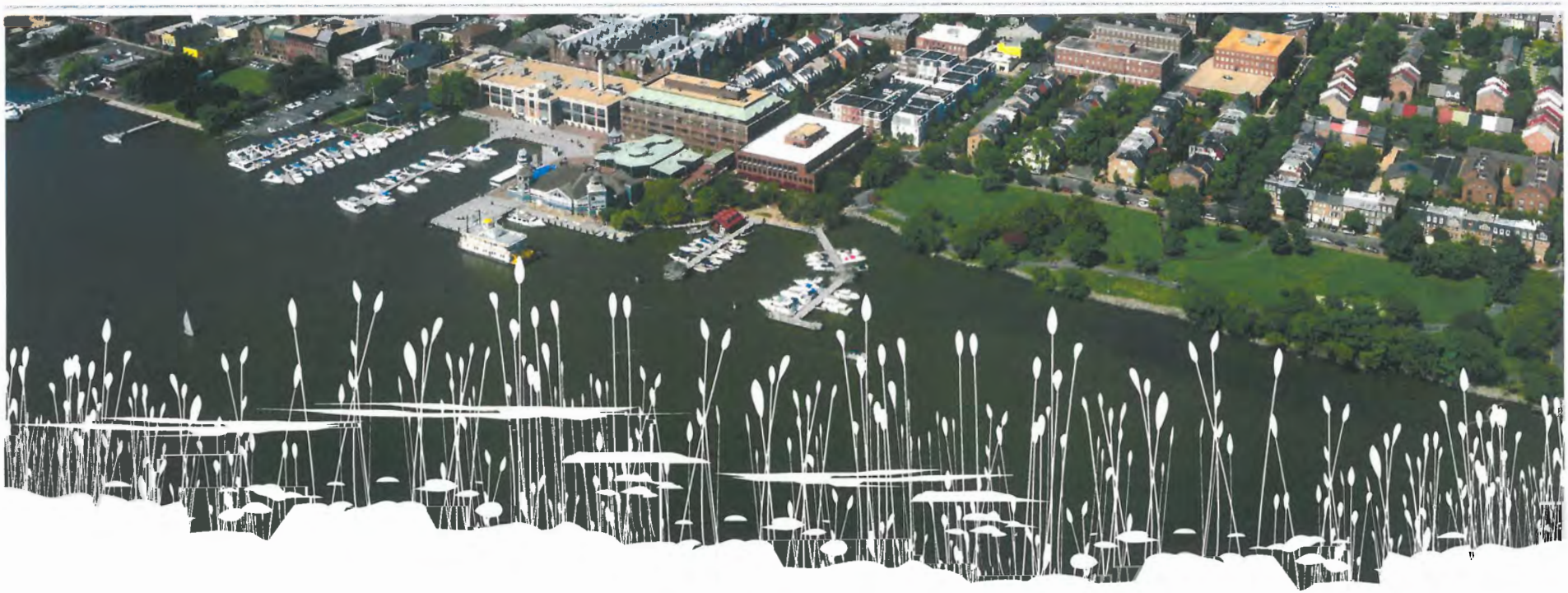
8. Codes and Ordinances Review and Update; A. EPA Water Quality Scorecard

EPA
United States
Environmental Protection
Agency

EPA 231B09001 | October 2009 | http://www.epa.gov

WATERQUALITY SCORECARD

Incorporating Green Infrastructure Practices at the Municipal, Neighborhood, and Site Scales



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1 Executive Summary

Many communities across the United States face the challenge of balancing water quality protection with the desire to accommodate new growth and development. These cities and counties are finding that a review of local ordinances beyond just stormwater regulations is necessary to remove barriers and ensure coordination across all development codes for better stormwater management and watershed protection. Local policies, such as landscaping and parking requirements or street design criteria, should complement strong stormwater standards and make it easier for developers to meet multiple requirements simultaneously.

EPA's Water Quality Scorecard was developed to help local governments identify opportunities to remove barriers, and revise and create codes, ordinances, and incentives for better water quality protection. It guides municipal staff through a review of relevant local codes and ordinances, across multiple municipal departments and at the three scales within the jurisdiction of a local government (municipality, neighborhood, and site),[1] to ensure that these codes work together to protect water quality goals. The two main goals of this tool are to: (1) help communities protect water quality by identifying ways to reduce the amount of stormwater flows in a community and (2) educate stakeholders on the wide range of policies and regulations that have water quality implications.

The scorecard is for municipalities of various sizes in rural, suburban, and urban settings, including those that have combined sewers, municipal separate storm sewers, and those with limited or no existing stormwater infrastructure. It can help municipal staff, stormwater managers, planners, and other stakeholders to understand better where a municipality's[2] land development regulations and other ordinances may present barriers or opportunities to implementing a comprehensive water quality protection approach. The scorecard provides policy options, resources, and case studies to help communities develop a comprehensive water quality program.

1 While the watershed scale is the best scale at which to look regionally at water quality protection strategies, it can be difficult to align policies, incentives, and regulations across political boundaries. For purposes of implementation, the largest scale the scorecard uses is the municipality.

2 The term "municipality" as used by the International City/County Management Association (ICMA) refers to local government at both the city and county levels.

2 Background

Growth and development expand communities' opportunities by bringing in new residents, businesses, and investments. Growth can give a community the resources to revitalize a downtown, refurbish a main street, build new schools, and develop vibrant places to live, work, shop, and play. The environmental impacts of development, however, can make it more difficult for communities to protect their natural resources. The U.S. Census Bureau projects that the U.S. population will reach 400 million people by about 2040, which will add continued development pressure on local communities and the environment. Many communities are asking where and how they can accommodate this growth while maintaining and improving their water resources.

Land development directly affects watershed functions. When development occurs in previously undeveloped areas, the resulting alterations to the land can dramatically change the transportation and storage of water. Residential and commercial development creates impervious surfaces and compacted soils that filter less water, which increases surface runoff and decreases groundwater infiltration. These changes can increase the volume and velocity of runoff, the frequency and severity of flooding, and peak storm flows.

Mixed use developments, like main street in Cedar Falls, Iowa, allow for the co-locating of land uses, which decreases impervious surfaces and stormwater runoff problems.

Many communities are already struggling with degraded water bodies and failing infrastructure. For example, *EPA's National Water Quality Inventory: 1996 Report to Congress* indicated that 36 percent of total river miles assessed were impaired.[3] In EPA's 2004 Report to Congress, that percentage increased to 44 percent.[4] Further, a report by the National Academy of Sciences found urban stormwater is estimated to be the primary source of impairment for 13 percent of assessed rivers, 18 percent of lakes, and 32 percent of estuaries—significant numbers given that urban areas cover only 3 percent of the land mass of the United States.[5]

Urban runoff also affects existing wastewater and drinking water systems. EPA estimates that between 23,000 and 75,000 sanitary sewer overflows occur each year in the United States, releasing between 3 and 10 billion gallons of sewage annually.[6] Many of these overflow problems stem from poor stormwater management. Many municipalities—both large and small—must address the impact of existing impervious areas, such as parking lots, buildings, and streets and roads, that have limited or no stormwater management while at the same time trying to find effective and appropriate solutions for new development.

These water quality impairments exist, in part, because historically stormwater management—and indeed stormwater regulation—has focused primarily at the site level. The reasoning was sound: manage stormwater well at the site, and water bodies in the community will be protected. However, as the findings of EPA's National Water Quality Inventory demonstrated, this strategy has not been effective for two main reasons.

First, the site-level approach does not take into account the amount of off-site impervious surfaces. During the development boom from 1995-2005, rain-absorbing landscapes, such as forests, wetlands, and meadows, were transformed into large areas of houses, roads, office buildings, and retail centers. This development created vast areas of impervious cover, which generated significant increases in stormwater runoff. However, the amount of development in the watershed is not simply the sum of the sites within it. Rather, total impervious area in a watershed is the sum of sites developed plus the impervious surface of associated infrastructure supporting those sites, such as roads and parking lots.

Second, federal stormwater regulations focus on reducing pollutants in the runoff—the sediments from roads, fertilizers from lawns, etc.—and not on the amount of stormwater coming from a site. Nevertheless, the increased volume of runoff coming into a municipality's water bodies scours streams, dumps sediments, and pushes existing infrastructure past its capacity limits. Failure to consider the cumulative impact—this loss of natural land, increased imperviousness, and resulting stormwater runoff volumes— on regional water quality and watershed health has led communities to seek stormwater solutions that look beyond site-level approaches.

Communities are recognizing the importance of managing water quality impacts of development at a variety of scales, including the municipal, the neighborhood, and site levels. A range of planning and development strategies at the municipal and neighborhood scales is necessary to address stormwater management comprehensively and systematically. At the same time that stormwater management is moving beyond the site level, it is also evolving beyond hardscaped, engineered solutions, such as basins and curb-and-gutter conveyance, to an approach that manages stormwater through natural processes.

A green infrastructure approach provides a solution to thinking at all three scales as well as addresses the need to change the specific types of practices used on the site. Green infrastructure is a comprehensive approach to water quality protection defined by a range of natural and built systems that can occur at the regional, community, and site scales. At the larger regional or watershed scale, green infrastructure is the interconnected network of preserved or restored natural lands and waters that provide essential environmental functions. Large-scale green infrastructure may include habitat corridors and water resource protection. At the community and neighborhood scale, green infrastructure incorporates planning and design approaches such as compact, mixed-use development, parking reductions strategies and urban forestry that reduces impervious surfaces and creates walkable, attractive communities. At the site scale, green infrastructure mimics natural systems by absorbing stormwater back into the ground (infiltration), using trees and other natural vegetation to convert it to water vapor (evapotranspiration), and using rain barrels or cisterns to capture and reuse stormwater. These natural processes manage stormwater runoff in a way that maintains or restores the site's natural hydrology.

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3 *U.S. EPA National Water Quality Inventory: 1996 Report to Congress:* ***http://www.epa.gov/305b/96report/index.html***

4 *U.S. EPA National Water Quality Inventory: 2004 Report to Congress:* ***http://www.epa.gov/owow/305b/2004report/***

5 *Urban Stormwater Management in the United States, National Research Council of the National Academy of Sciences, 2008:* ***http://dels.nas.edu/dels/rpt_briefs/stormwater_discharge_final.pdf***

6 *U.S. EPA National Water Quality Inventory: 2004 Report to Congress:* ***http://www.epa.gov/owow/305b/2004report/***

At the municipal scale, decisions about where and how our towns, cities, and regions grow are the first, and perhaps most important, development decisions related to water quality. Preserving and restoring natural landscape features (such as forests, floodplains, and wetlands) are critical components of green infrastructure. By choosing not to develop on and thereby protecting these ecologically sensitive areas, communities can improve water quality while providing wildlife habitat and opportunities for outdoor recreation. In addition, using land more efficiently reduces and better manages stormwater runoff by reducing total impervious areas. Perhaps the single most effective strategy for efficient land use is redevelopment of already degraded sites, such as abandoned shopping centers or underused parking lots, rather than paving greenfield sites.

At the intermediate or neighborhood scale, green infrastructure includes planning and design approaches such as compact, mixed-use development, narrowing streets and roads, parking reduction strategies, and urban forestry that reduce impervious surfaces and better integrate the natural and the built environment.

At the site scale, green infrastructure practices include rain gardens, porous pavements, green roofs, infiltration planters, trees and tree boxes, and rainwater harvesting for non-potable uses such as toilet flushing and landscape irrigation.

Street retrofits can integrate green infrastructure, like this bioswale along Sandy Boulevard in Portland, Oregon, into standard roadway maintenance and upgrades.

These processes represent a new approach to stormwater management that is not only sustainable and environmentally friendly, but cost-effective as well.

Municipalities are realizing that green infrastructure can be a solution to the many and increasing water-related challenges facing municipalities, including flood control, combined sewer overflows, Clean Water Act requirements, and basic asset management of publicly owned treatment systems. Communities need new solutions and strategies to ensure that they can continue to grow while maintaining and improving their water resources. This Water Quality Scorecard seeks to provide the policy tools, resources, and case studies to both accommodate growth and protect water resources.

3 The Water Quality Scorecard

EPA worked with numerous water quality experts, local government staff, developers, urban designers, and others working on land use and water quality issues to develop this Water Quality Scorecard. The purpose of the scorecard is to address water quality protection across multiple scales (municipality, neighborhood, and site) and across multiple municipal departments. This scorecard can help municipal staff, stormwater managers, planners, and other stakeholders to understand better where a municipality's land development regulations and other ordinances may present barriers or opportunities to implementing a comprehensive green infrastructure approach. The tool's two main goals are to: (1) help communities protect water quality by identifying ways to reduce the amount of stormwater flows in a community and (2) educate stakeholders on the wide range of policies and regulations that have water quality implications.

Communities throughout the U.S. are implementing stormwater regulations that require or encourage the use of green infrastructure for managing stormwater on site. These cities and counties are finding that, to better manage stormwater and protect watersheds, green infrastructure policies require a review of many other local ordinances to remove barriers and ensure coordination across all development codes. Local policies, such as landscaping and parking requirements or street design criteria, should complement strong stormwater standards and make it easier for developers to meet multiple requirements simultaneously. At the same time, if these policies support water quality goals, they can independently reduce and better manage stormwater runoff.

How to Use the Scorecard

This scorecard is a locally controlled self-assessment and guide for better incorporating green infrastructure practices at the municipal, neighborhood, and site scales. While one department or agency could complete the tool, the effectiveness of this tool will increase if an interagency process is established to review all local codes and policies that might affect water quality.

Completing the Water Quality Scorecard requires different documents, plans, codes, and guidance manuals. While the legal structure for stormwater management and land development regulation varies among municipalities, the following list contains the most common and relevant documents to complete this scorecard and describes how they can create impervious cover.

- *Zoning ordinances* specify the type and intensity of land uses allowed on a given parcel. A zoning ordinance can dictate single-use low-density zoning, which spreads development throughout the watershed, creating considerable excess impervious surface.

- *Subdivision codes* or ordinances specify development elements for a parcel: housing footprint minimums, distance from the house to the road, the width of the road, street configuration, open space requirements, and lot size—all of which can lead to excess impervious cover.

- *Street standards or road design guidelines* dictate the width of the road, turning radius, street connectivity, and intersection design requirements. Often in new subdivisions, roads tend to be too wide, which creates excess impervious cover.

- *Parking requirements* generally set the minimum, not the maximum, number of parking spaces required for retail and office parking. Setting minimums leads to parking lots designed for peak demand periods, such as the day after Thanksgiving, which can create acres of unused pavement during the rest of the year.

- *Setbacks* define the distance between a building and the right-of-way or lot line and can spread development out by leading to longer driveways and larger lots. Establishing maximum setback lines for residential and retail development will bring buildings closer to the street, reducing impervious cover associated with long driveways, walkways, and parking lots.

- *Height limitations* limit the number of floors in a building. Limiting height can spread development out if square footage is unmet by vertical density.

- *Open space or natural resource plans* detail land parcels that are or will be set aside for recreation, habitat corridors, or preservation. These plans help communities prioritize their conservation, parks, and recreation goals.

- *Comprehensive plans* may be required by state law, and many cities, towns, and counties prepare comprehensive plans to support zoning codes. Most comprehensive plans include elements addressing land use, open space, natural resource protection, transportation, economic development, and housing, all of which are important to watershed protection. Increasingly, local governments are defining existing green infrastructure and outlining opportunities to add new green infrastructure throughout the community.

An initial step in using this tool is to convene appropriate staff to review various sections of the tool and coordinate to both identify opportunities for change and address the potential inconsistencies between policies. The approaches described in this scorecard may be under the control of a number of different local government agencies, including:

- Parks and Recreation
- Public Works
- Planning
- Environmental Protection
- Utilities
- Transportation

The scorecard's review of land use and development policies provides guidance for implementing a range of regulatory and non-regulatory approaches, including land use planning elements, land acquisition efforts, and capital investment policies that can help various municipal agencies integrate green infrastructure into their programs. Internal agency policies and practices, such as maintenance protocols or plan review processes, may be potential barriers as well.

Each policy or approach is described in the context of its potential for providing water quality benefits, although most of the policies have many additional benefits for community livability, human health, air quality, energy use, wildlife habitat, and more. This tool does not provide model ordinance

language. It emphasizes best practices and helps municipalities understand the incremental steps for changing specific policies and internal agency practices. The scorecard divides the tools and policies into four categories:

1. Adopt plans/Educate
2. Remove barriers
3. Adopt incentives
4. Enact regulations

These four categories provide greater structure to the compiled tools by organizing the policies or approaches as incremental changes and updates. These categories may help municipal staff prioritize which tools to work on based on local factors like resources, time, and political support. For example, an appropriate first step in the process of updating local regulations may be to remove a barrier rather than enacting a new regulation. Most policy options avoid specific performance guidance so that the tool is useful to a range of municipalities in different contexts. However, the case studies and resources provide locally appropriate performance measures where possible.

To highlight the diverse nature of green infrastructure approaches, as well as the fact that oversight over these policies resides in various municipal agencies, the scorecard has five sections:

1. Protect Natural Resources (Including Trees) and Open Space
2. Promote Efficient, Compact Development Patterns and Infill
3. Design Complete, Smart Streets that Reduce Overall Imperviousness
4. Encourage Efficient Provision of Parking
5. Adopt Green Infrastructure Stormwater Management Provisions

The five sections organize green infrastructure approaches based on drivers of impervious cover at the municipal, neighborhood, and site scales. Yet all three scales may be in any single section. For example, the parking section will have questions that address the municipal, neighborhood and site level considerations.

The scorecard describes alternative policy or ordinance information that, when implemented, would support a comprehensive green infrastructure approach, and will allow the municipality to determine where, in the broad spectrum of policy implementation, their policies fall.

A Note about the Point System

The tool includes a point system to make it easier to evaluate and improve local programs. The municipality can decide whether to use the point system at all. If the point system is used, municipalities can set locally appropriate thresholds and goals.

Governments could choose to use the point system in many different ways, including:

- State governments could require municipalities to complete the Water Quality Scorecard and establish measures for improvement over different permit cycles. For example, a municipality might have to improve its score by some number of points before the next permit cycle.
- Local governments could determine a score based on existing programs and policies and then set goals from this baseline. Local targets may include incremental yearly improvements or achieving additional points in a particular section, such as "Encourage Efficient Parking Supply" or "Protect Natural Resources and Open Space."
- Stakeholders such as watershed groups or environmental organizations could complete the scorecard and then provide feedback and information assistance to the local government about sections within the scorecard that received few points and might be an area for improvement.
- The total score or scores in certain sections could educate elected officials, decision makers, and others about the importance of these issues and the role of local policies in addressing them.
- A lack of points in one section may alert a municipality that a certain area, such as parking, lacks local ordinances that support green infrastructure and may be ripe for improvement.
- Variation in the number of points achieved across the five sections may help a municipality to better assess local sources of impervious cover and potential for the introduction of green infrastructure.

Because the scorecard is intended for use by a range of community types and sizes in locations throughout the U.S., please note that no single municipality will be able to receive every point. Some questions and points may only be

A green roof located on the Friends Center in downtown Philadelphia, Pennsylvania provides stormwater management capacity and adds aesthetic value to this dense urban environment.

available to urban municipalities while others may only be available to those in a suburban or rural setting.

Tips for Building Relationships Between Stormwater Managers, Land Use Planners, and Other Local Officials

Effective stormwater management requires coordination and collaboration across many different municipal departments and processes. Below are some ideas for incorporating stormwater management in traditional planning processes and programs.

- Include both land use planners and stormwater managers in pre-concept and/or pre-application meetings for potential development projects.
- Use local government sites (e.g., schools, regional parks, office buildings, public works yards) as demonstration projects for innovative land use strategies and stormwater management. Form a team that includes land use planners, stormwater managers, parks and school officials, etc. to work out the details.
- Include stormwater managers in the comprehensive plan process to incorporate overall watershed and stormwater goals.
- Make sure that both land use planners and stormwater managers are involved in utility and transportation master planning.
- Allow stormwater managers to be involved in economic development planning, especially for enterprise zones, Main Street projects, and other projects that involve infill and redevelopment. Encourage stormwater managers to develop efficient watershed-based solutions for these plans.
- Develop cross training and joint activities that allow land use planners, stormwater managers, and transportation, utility, and capital projects planners to explore the improved integration of various land use and stormwater processes.
- Hold staff trainings with speakers that are knowledgeable about smart growth and stormwater management. Alternately, encourage land use planners, stormwater managers, and other local officials to attend trainings on this topic as a team.

Table 1: Water Quality Scorecard Quick Reference Guide

Incorporating Green Infrastructure Practices at the Municipal, Neighborhood, and Site Scales (SUMMARY)

	Policy Question	Goal
PROTECT NATURAL RESOURCES (INCLUDING TREES) AND OPEN SPACE		
1A.	**NATURAL RESOURCE PROTECTION**	
	Are development policies, regulations, and incentives in place to protect natural resource areas and critical habitat?	Protect natural resource areas (e.g., forests, prairies) and critical habitat (e.g., conservation corridors, buffer zones, wildlife preserves) from future development.
	Are no-development buffer zones and other protective tools in place around wetlands, riparian areas, and floodplains to improve/protect water quality?	Protect critical areas such as wetlands, floodplains, lakes, rivers, and estuaries with a mandatory no-development buffer.
	Does the community have protection measures for source water protection areas through land use controls and stewardship activities?	Protect source water areas from current or potential sources of contamination.
1B.	**OPEN SPACE PROTECTION**	
	Does the jurisdiction have adequate open space in both developed and greenfield areas of the community?	Create open networks throughout a community that serve a dual function of providing recreational areas and assisting in management of stormwater runoff.
1C.	**TREE PRESERVATION**	
	Does the local government have a comprehensive public urban forestry program?	Protect and maintain trees on public property and rights-of-way and plant additional trees to enhance the urban tree canopy.
	Has the community taken steps to protect trees on private property?	Preserve trees on private property and require replacement when trees are removed or damaged during development.
	Do local codes encourage or require street trees as part of road and public right-of-way capital improvement projects?	Leverage existing capital funds to plant more street trees and add multiple benefits to the public right-of-way.
PROMOTE EFFICIENT, COMPACT DEVELOPMENT PATTERNS AND INFILL		
2A.	**INFILL AND REDEVELOPMENT**	
	Are policy incentives in place to direct development to previously developed areas?	Municipalities implement a range of policies and tools to direct development to specific areas.
2B.	**DEVELOPMENT IN AREAS WITH EXISTING INFRASTRUCTURE**	
	Is the jurisdiction directing growth to areas with existing infrastructure, such as sewer, water, and roads?	Adopt policies, incentives, and regulations to direct new development to areas that have infrastructure, such as water and sewer.
2C.	**MIXED-USE DEVELOPMENT**	
	Are mixed-use and transit-oriented developments allowed or encouraged?	Revise codes and ordinances to allow for the "by right" building of mixed-use and transit-oriented developments.

Incorporating Green Infrastructure Practices at the Municipal, Neighborhood, and Site Scales (SUMMARY) continued

	Policy Question	Goal
DESIGN COMPLETE, SMART STREETS THAT REDUCE OVERALL IMPERVIOUSNESS		
3A.	**STREET DESIGN**	
	Do local street design standards and engineering practices encourage streets to be no wider than is necessary to move traffic effectively? Do policies allow narrow neighborhood streets designed to slow traffic and create safer conditions for pedestrians and bicyclists?	Appropriate street widths allow narrower lanes for certain street types, thereby reducing overall imperviousness.
	Are shared driveways, reduced driveway widths, two-track driveways, and rear garages and alleys encouraged for all single-family developments?	Encourage alternative forms and decreased dimensions of residential driveways and parking areas.
3B.	**GREEN INFRASTRUCTURE ELEMENTS AND STREET DESIGN**	
	Are major street projects required to integrate green infrastructure practices as a standard part of construction, maintenance, and improvement plans?	Formally integrate green infrastructure into standard roadway construction and retrofit practice.
	Do regulations and policies promote use of pervious materials for all paving areas, including alleys, streets, sidewalks, crosswalks, driveways, and parking lots?	Build and retrofit these surfaces with pervious materials to reduce stormwater runoff and its negative impacts.
ENCOURAGE EFFICIENT PROVISION OF PARKING		
4A.	**REDUCED PARKING REQUIREMENTS**	
	Does your local government provide flexibility regarding alternative parking requirements (e.g., shared parking, off-site parking) and discourage over-parking of developments? Do parking requirements vary by zone to reflect places where more trips are on foot or by transit?	Match parking requirements to the level of demand and allow flexible arrangements to meet parking standards.
4B.	**TRANSPORTATION DEMAND MANAGEMENT ALTERNATIVES**	
	Does the municipality allow developers to use alternative measures such as transportation demand management or in-lieu payments to reduce required parking?	Provide flexibility to reduce parking in exchange for specific actions that reduce parking demands on site.
4C.	**MINIMIZING STORMWATER FROM PARKING LOTS**	
	Are there requirements for landscaping designed to minimize stormwater in parking lots?	Require substantial landscaping to help reduce runoff.
ADOPT GREEN INFRASTRUCTURE STORMWATER MANAGEMENT PROVISIONS		
5A.	**GREEN INFRASTRUCTURE PRACTICES**	
	Are green infrastructure practices encouraged as legal and preferred for managing stormwater runoff?	Make all types of green infrastructure allowed and legal and remove all impediments to using green infrastructure (including for stormwater requirements), such as limits on infiltration in rights-of-way, permit challenges for green roofs, safety issues with permeable pavements, restrictions on the use of cisterns and rain barrels, and other such unnecessary barriers.
	Do stormwater management plan reviews take place early in the development review process?	Incorporate stormwater plan comments and review into the early stages of development review/site plan review and approval, preferably at pre-application meetings with developers.

Incorporating Green Infrastructure Practices at the Municipal, Neighborhood, and Site Scales (SUMMARY) continued

	Policy Question	Goal
	Do local building and plumbing codes allow harvested rainwater use for exterior uses such as irrigation and non-potable interior uses such as toilet flushing?	Ensure that the municipality allows and encourages stormwater reuse for non-potable uses.
	Are provisions available to meet stormwater requirements in other ways, such as off-site management within the same sewershed or "payment in lieu" of programs, to the extent that on-site alternatives are not technically feasible?	Allow off-site management of runoff while still holding developers responsible for meeting stormwater management goals.
5B.	**MAINTENANCE/ENFORCEMENT**	
	Does your stormwater ordinance include monitoring, tracking, and maintenance requirements for stormwater management practices?	Incorporate monitoring, tracking, and maintenance requirements for stormwater management practices into your municipal stormwater ordinance.

GETTING STARTED

Below are suggested steps to help complete the Water Quality Scorecard:

Step 1. Review the scorecard to identify which agencies, departments, or personnel will be required to complete each section.

Step 2. Convene appropriate staff to review various sections of the tool, and work together to ensure that updates and changes to codes, policies, and internal processes align well with other agency changes.

Step 3. Collect existing ordinances and policies that will be necessary references to complete the scorecard.

Step 4. Coordinate between appropriate agencies or departments to complete the scorecard.

Please indicate by your signature that you have reviewed the tool with all co-signees of this document (name, department, and date):

Garrett Ferry, Design (Facilities Services) 8/17/15

Step 5: Identify sections of the scorecard and/or specific policy questions that should be prioritized for immediate revision or update.

Step 6: Identify short-, medium-, and long-term goals and strategies for revising local policies to better support green infrastructure.

1 Protect Natural Resources (Including Trees) and Open Space

Sensitive Natural Lands/Critical Area Protection

QUESTION: Are development policies, regulations, and incentives in place to protect natural resource areas and critical habitat? Yes

GOAL: Protect natural resource areas (e.g., forests, prairies) and critical habitat (e.g., conservation corridors, buffer zones, wildlife preserves) from future development.

WHY: Protection of significant tracts of critical lands and wildlife habitat will aid in protecting and improving water quality by increasing infiltration and groundwater recharge, preventing erosion and contamination of ground water and surface water resources, and protecting sources of drinking water.

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
ADOPT PLANS/EDUCATE:			
Identify and map critical natural resource areas (e.g., steep slopes, wildlife habitat, forests, drinking water source areas).	1	–	
The local comprehensive plan contains a natural resource protection element with goals calling for preservation of identified critical natural resource areas.	1	–	
Identify key natural resource areas for protection in jurisdiction's parks and open space plan.	1	1	
Assist landowners in identifying sensitive natural areas and laying out developments to avoid such areas.	1		
Local plans establish and enforce areas which are available for development and which lands are a priority for preservation.	1	1	
REMOVE BARRIERS:			
Protection of sensitive natural areas and wildlife habitat qualifies for credit towards local open space dedication and set-aside requirements.	1		
ADOPT INCENTIVES:			
Provide financial support to or collaborate with land trusts to acquire critical natural areas.	1		
Establish a dedicated source of funding for open space acquisition and management (e.g., bond proceeds, sales tax).	2		
Adopt a transferable developments rights program to provide an incentive for landowners to preserve sensitive natural lands and wildlife habitat.	1		
		2 PAGE TOTAL	◀ CARRY THIS SUBTOTAL TO NEXT PAGE = 2

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
Land use regulations provide for the creation of cluster and conservation subdivision on the periphery of urban growth areas to encourage preservation of intact blocks of sensitive natural areas.	1		
ENACT REGULATIONS			
Adopt regulations to protect steep slope, hillsides, and other sensitive natural lands (e.g., by limiting development on slopes > 30% or requiring larger lot sizes in sensitive areas).	2		
Adopt wildlife habitat protection regulations aimed at preserving large contiguous blocks of habitat areas.	2		
Create agriculture/natural resource zoning districts (e.g., minimum lot size of 80 acres and larger) to preserve agricultural areas and forests.	2		

0 PAGE TOTAL + SUBTOTAL FROM PREVIOUS PAGE 2 = ▼ CARRY THIS SUBTOTAL TO NEXT PAGE 2

1.A.2a Protection Of Water Bodies/Aquifers

QUESTION: Are no-development buffer zones and other protective tools in place around wetlands, riparian areas, and floodplains that improve/protect water quality? yes

GOAL: Protect critical areas such as wetlands, floodplains, lakes, rivers, and estuaries with a mandatory no-development buffer.

WHY: The use of these practices will reduce pollutant loads and hydrologic alterations to water bodies.

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
ADOPT PLANS/EDUCATE:			
Identify and map critical water resource areas.	1	1	
The local comprehensive plan contains a water quality protection element with goals calling for protection of identified water bodies and other water resource areas such as wetlands.	1	1	
Identify key critical water resource areas for protection in jurisdiction's parks and open space plan.	1	1	
Cooperate in developing regional approaches to watershed protection and stormwater management.	1	1	
REMOVE BARRIERS:			
Wetlands and other water bodies and buffer areas qualify for credit against local open space dedication/set-aside regulations.	1		
ADOPT INCENTIVES:			
Protected water bodies and buffer areas qualify for twice the credit (or more) against open space requirements set by the municipality.	1		
Restoration of degraded riparian/wetland areas qualifies for additional open space credit within the local municipal system.	1		
Transfer of density from protected riparian areas/buffers to upland portions of development sites.	1		
ENACT REGULATIONS:			
Riparian and wetland buffer areas required by local land use regulations · Buffer is at least 50 feet (as measured from the top of bank) = 1 point · Buffer is at least 100 feet (as measured from the top of bank) = 2 points · Buffer is greater than 100 feet (as measured from the top of bank) = 3 points	1 to 3	1	
Critical water resource areas cannot be counted in calculating allowable density on a site (e.g., on a 200-acre site with 50 acres of wetlands, only 150 acres can be used to calculate density under zone district regulations, and only those 150 acres may be developed).	1		

PAGE TOTAL 5 + SUBTOTAL FROM PREVIOUS PAGE 2 = ▼ CARRY THIS SUBTOTAL TO NEXT PAGE 7

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
Development in floodplains is prohibited or must demonstrate no adverse impacts upstream and downstream (See resources below for details on "no adverse impact" approach to floodplain management).	2	2	
Stormwater quality and quantity performance standards exist for development sites (e.g., restrictions on sedimentation levels, pre/post development flows).	1	1	
Local regulations require restoration of degraded riparian/wetland areas on a development site.	1		
Compensation for damage to riparian/wetland areas must be on a minimum 2:1 basis on- or off-site.	1	1	
Performance standards exist and are well enforced for stormwater discharges to wetlands that protect the hydrologic regimes and limit pollutant loads.	1		

4 PAGE TOTAL + SUBTOTAL FROM PREVIOUS PAGE 7 = ▼ CARRY THIS SUBTOTAL TO NEXT PAGE 11

1.A.2b Protection Of Water Bodies/Aquifers

QUESTION: Does the community have protection measures for source water protection areas through land use controls and stewardship activities? Yes

GOAL: Protect source water areas from current or potential sources of contamination.

WHY: These practices will help safeguard community health, reduce the risk of water supply contamination, and potentially reduce water treatment costs.

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
ADOPT PLANS/EDUCATE:			
Local land use plans identify aquifer recharge/source water areas and recommend protective measures.	1		
Require that all stormwater inlets carry a notice regarding discharge to receiving waters.	1	1	
Map and publish wellhead and aquifer recharge areas to alert developers to potential restrictions.	1		
ADOPT INCENTIVES:			
Identification of drinking water source protection and aquifer recharge areas with a dedicated funding source in place to purchase and protect such areas.	1		
Protection of critical water source areas qualifies for additional credit towards local open space requirements.	1		
ENACT REGULATIONS:			
Adopt well-head protection regulations/zones to prevent incompatible development and uses.	1		
Adopt aquifer protection regulations/zones to prevent incompatible development and uses.	2		

1 PAGE TOTAL + 11 SUBTOTAL FROM PREVIOUS PAGE = 12 ▼ CARRY THIS SUBTOTAL TO NEXT PAGE

1.B OPEN SPACE PROTECTION

1.B.1

QUESTION: Does the jurisdiction have adequate open space in both developed and greenfield areas of the community? adequate is subjective

GOAL: Create open space networks throughout a community that serve a dual function of providing recreational areas and assisting in the management of stormwater runoff.

WHY: In addition to providing open space throughout a community as an amenity, such a network can provide large areas that contribute little to stormwater loads and can provide large areas for the infiltration and purification of stormwater.

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
ADOPT PLANS/EDUCATE:			
Adopt a community-wide open space and parks plan.	1		
The local comprehensive plan contains an open space/parks element that recognizes the role of open space in sustainable stormwater management.	1		
REMOVE BARRIERS:			
Green infrastructure practices count towards local open space set aside requirements up to 50% of total.	1		
Allow and encourage retrofits of abandoned or underutilized public lands to serve as permanent or temporary open space and green infrastructure sites.	1		
ADOPT INCENTIVES:			
Additional open space credits are eligible for green stormwater management facilities improved/designed for public recreational purposes.	1		
Provide credit against open space impact fees for green roofs.	1		
ENACT REGULATIONS:			
Adopt neighborhood policies and ordinances that work to create neighborhood—not development site—open space amenities that are within ¼ to ½ mile walking distance from every residence.	1		
Adopt an open space impact fee to purchase passive open space that can assist in stormwater management.	1		
Adopt open space dedication and/or set aside requirements based on the demand generated by the development. As a baseline, use the average open space requirements adopted by the National Recreation and Park Assn. (e.g., 10 acres of community and neighborhood parks for every 1,000 persons in a development or fraction thereof).	1		

PAGE TOTAL: 0 + SUBTOTAL FROM PREVIOUS PAGE: 12 = ▼ CARRY THIS SUBTOTAL TO NEXT PAGE: 12

1.C TREE PROTECTION

1.C.1

QUESTION: Does the local government have a comprehensive public urban forestry program? yes

GOAL: Protect and maintain trees on public property and rights-of-way and plant additional trees to enhance the urban tree canopy.

WHY: Mature trees provide multiple community benefits, reduce overall stormwater runoff, and improve stormwater quality.

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
ADOPT PLANS/EDUCATE:			
Survey and inventory existing trees on public lands and street rights-of-way. Document the characteristics and location of street trees and urban tree canopy to inform public tree planting, adoption, and maintenance programs.	1	1	
Select tree species based on known performance for managing stormwater runoff. Publish list and make widely available for homeowners/others that plant street trees.	1	1	
Conduct education and outreach about tree protection, proper maintenance, and replanting opportunities through printed materials, workshops, events, and signage.	1		
Adopt a policy to protect existing trees on local government development sites (e.g., municipal parking lots, municipal buildings).	1	1	
Maintain an active tree maintenance program for public trees, including pest control, pruning, watering, and similar measures.	1	1	
REMOVE BARRIERS:			
Acknowledge trees as part of community infrastructure and develop a coordinated design for locating public utilities to provide enough space for mature tree canopy and root development.	1	1	
ADOPT INCENTIVES:			
Provide free or reduced-price trees to homeowners to be used as street trees.	1		
ENACT REGULATIONS:			
Require any public trees removed or damaged during construction associated with private development to be replaced on- or off-site with an equivalent amount of tree caliper (e.g., remove a 24-inch diameter tree/replace with 6 four-inch diameter trees).	1		
Adopt construction protection rules for all public trees (e.g., fencing, no storage of hazardous materials, avoid cutting into root zones).	1	1	

PAGE TOTAL 6 + SUBTOTAL FROM PREVIOUS PAGE 12 = ▼ CARRY THIS SUBTOTAL TO NEXT PAGE 18

QUESTION: Has the community taken steps to protect trees on private property? Yes

GOAL: Preserve trees on private property and require replacement when trees are removed or damaged during development.

WHY: Mature trees provide multiple environmental, economic, and community benefits, including improved water and air quality, reduced heat island effects, lowered energy costs, and improved community aesthetics.

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
ADOPT PLANS/EDUCATE:			
Community plans specifically include tree preservation and replacement as community goals.	1	1	
Conduct educational sessions for builders and developers regarding appropriate tree protection techniques and/or publish a technical tree protection manual.	1		
Follow maintenance and inspection timelines and meet canopy goals and milestones by ensuring old trees survive, replacing dead or diseased trees, and planting new trees.	1		
REMOVE BARRIERS			
Set up maintenance and inspection agreements for private properties meeting stormwater requirements or receiving stormwater fee credit for trees.	1		
Set up long-term maintenance and inspection schedules for trees on public lands.	1	1	
ADOPT INCENTIVES:			
Support local non-profits that plant trees and provide educational services.	1		
Provide financial incentives for tree purchases and planting.	1		
A tree fund has been established to receive in-lieu payments when trees must be removed from a development site to accommodate permitted projects.	1		
Trees of a specified minimum size count towards a percentage of stormwater management requirements (e.g., partial credit given for each mature tree exceeding a specified height or canopy size).	1		
Trees over a specified minimum size (e.g., 3-inch caliper) protected during development are credited towards landscaping requirements. · meeting the established landscape requirement = 1 point · exceeding the established landscape requirement = 2 points	1 to 2		

2 PAGE TOTAL + 18 SUBTOTAL FROM PREVIOUS PAGE = 20 ▼ CARRY THIS SUBTOTAL TO NEXT PAGE

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
ENACT REGULATIONS:			
Require permits before removing trees on proposed development or redevelopment sites. Provide fines and/or stop-work authority for permit violations.	1		
Set minimum tree preservation standards for new development sites.	1	1	
Require site plans or stormwater plans to include tree preservation.	1	1	
Require/allow tree replacement off-site for infill sites.	1		

2 PAGE TOTAL + SUBTOTAL FROM PREVIOUS PAGE 20 = ▼ CARRY THIS SUBTOTAL TO NEXT PAGE 22

1.C.3	
QUESTION:	Are street trees encouraged or required as part of road and public right-of-way capital improvement projects? Yes
GOAL:	Leverage existing capital funds to plant more street trees and add multiple benefits to the public right-of-way.
WHY:	Street trees can help manage and reduce stormwater runoff while providing multiple public and environmental benefits.

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
ADOPT PLANS/EDUCATE:			
Local comprehensive and transportation plans support the planting of street trees by all private and public development projects.	1	1	
Capital improvement plans include tree planning as part of project budgets.	1	1	
ADOPT INCENTIVES:			
Offer incentives, such as reduced setbacks or increased building densities, in exchange for additional tree preservation beyond ordinance requirements.	1		
ENACT REGULATIONS:			
All private and public developments are required to plant street trees in accordance with size, spacing, and other local government requirements.	1	1	
New street designs and redesigns of existing streets take into account space for tree development and require necessary surface area and volume of soil dependent on type of tree species selected (this includes lateral root growth as well as direct downward growth to accommodate mature tree canopy and roots without adversely affecting other utilities).	1	1	
Street specifications require permeable paving for sidewalks and other surfaces to reduce stormwater runoff and allow street trees to benefit from the available water.	1	1	SILVA CELLS in Street Tree locations (New)

5 PAGE TOTAL + SUBTOTAL FROM PREVIOUS PAGE 22 = ▼ **Total score for SECTION 1: PROTECT NATURAL RESOURCES (INCLUDING TREES) AND OPEN SPACE** 27 (TOTAL POINTS AVAILABLE: 82)

This section has been reviewed and scored by GARRETT FERRY

Department name Design (Facilities Services) Signee

Resources

- Planner's Guide to Wetland Buffers for Local Governments, Environmental Law Institute: ***http://www.elistore.org/reports_detail.asp?ID=11272***
- Mertes, James D. and James R. Hall. Park, Recreation, Open Space and Greenway Guidelines. National Recreation and Park Association, 1996.
- Center for Watershed Protection guidance on aquatic buffers: ***http://www.cwp.org/Resource_Library/Restoration_and_Watershed_Stewardship/perviousarea.htm***
- "Protecting Stream and River Corridors: Creating Effective Local Riparian Buffer Ordinances," Carl Vinson Institute of Government, The University of Georgia: ***http://www.rivercenter.uga.edu/publications/pdf/riparian_buffer_guidebook.pdf***
- No Adverse Impact Floodplain Management, Association of State Floodplain Managers: ***http://www.floods.org/index.asp?menuID=349&firstlevelmenuID=187&siteID=1***
- Riparian Toolbox: Model Regulations and Legal Issues, Long Island Sound Study: ***http://www.longislandsoundstudy.net/riparian/legal.htm***
- Model Ordinances to Protect Local Resources: Aquatic Buffers, U.S. EPA: ***http://www.epa.gov/owow/nps/ordinance/osm1.htm***
- Duerksen, Christopher and Cara Snyder. Nature-Friendly Communities: Habitat Protection and Land Use Planning. Island Press, 2005.
- City Trees: Sustainability Guidelines and Best Practices: ***http://www.treetrust.org/pdf/community-forestry-city-trees-bonestroo.pdf***
- Guide to Setting Urban Tree Canopy Goals, American Forests: ***http://www.americanforests.org/resources/urbanforests/treedeficit.php***
- Urban Forestry Manual, Center for Watershed Protection: ***http://www.cwp.org/forestry/part3forestrymanual.pdf*** (pg. 69))
- Duerksen, Christopher and Suzanne Richman, "Tree Conservation Ordinances." American Planning Association. 1993: Planning Advisory Service Report No. 446.
- Duerksen, Christopher , Mowery, M. and McGlyn M. "Tree Preservation." Zoning Practice. July 2006: American Planning Association, Volume 23 Number 7.
- "Trees for green streets: An illustrated guide," Portland Metro: ***http://www.metro-region.org/index.cfm/go/by.web/id=26337***
- *Tree Preservation Information Guide, Portland, Oregon:* ***http://www.sustainableportland.org/shared/cfm/image.cfm?id=72545***
- Storm Water Pollution Prevention Plan (SWPPP) Guide, U.S. EPA: ***http://cfpub.epa.gov/npdes/stormwater/swppp.cfm***
- Center for Urban Forest Research, U.S. Forest Service: ***http://www.fs.fed.us/psw/programs/cufr/***
- Urban Forest Policy and Management, U.S. Forest Service: ***http://www.fs.fed.us/psw/programs/cufr/research/studies.php?TopicID=1***
- Plants for Stormwater Design Volume II, Great River Greening: ***http://www.greatrivergreening.org/_downloads/PSD%20II%20Sample.PDF***

Case Studies

- Alachua County, Florida's land conservation and acquisition program, *Alachua County Forever,* has conserved over 17,000 acres of environmentally sensitive land: ***http://www.alachuacounty.us/government/depts/epd/land/filesforms.aspx***
- Baltimore County, Maryland's Master Plan 2010 designates land management areas that include agricultural preservation areas and resource preservation areas: ***http://www.baltimorecountymd.gov/Agencies/planning/masterplanning/smartgrowth.html***
- King County, Washington's Greenprint Project is an open space and resource conservation strategy that focuses on land acquisition, restoration projects, regulatory changes and protection within the urban growth boundary: ***http://dnr.metrokc.gov/wlr/greenprint/about.htm***
- The Pennsylvania Horticultural Society's *Philadelphia Green* program revitalizes and maintains abandoned land and public spaces by partnering with government, businesses and the community: ***http://www.pennsylvaniahorticulturalsociety.org/phlgreen/about.html***
- Chicago, Illinois's Open Space Impact Fee Ordinance charges a fee associated with residential development building permits and spends the funds on acquisition of neighborhood open space in the same area where development occurs: ***http://egov.cityofchicago.org/city/webportal/portalContentItemAction.do?blockName=Buildings%2FContent&deptMainCategoryOID=-536901233&entityName=Buildings&topChannelName=Dept&contentOID=536988877&contenTypeName=COC_EDITORIAL***
- Lenexa, Kansas's Watershed Management Plan includes erosion and sediment control, stream buffers, subwatershed protection and

improvement, and design standards for the city's uniform development code: ***https://www.ci.lenexa.ks.us/Planning/compplan/Overview/***

- The Maryland Cooperative Extension Service provides a fact sheet on how to design, plant and maintain a riparian forest buffer: ***http://www.riparianbuffers.umd.edu/fact/FS725.html***
- Vermont's Department of Environmental Conservation offers grants to conservation organizations to purchase or receive donated river corridor easements on private property within priority stretches of river: ***http://www.anr.state.vt.us/dec/waterq/rivers/docs/rv_RiverCorridorEasementGuide.pdf***
- The U.S. Department of Agriculture's Natural Resources Conservation Service provides guidance on riparian buffers through the Ohio Lake Erie Buffer Program: ***http://www.oh.nrcs.usda.gov/programs/Lake_Erie_Buffer/riparian.html***
- Davidson, North Carolina requires a public park within a five minute walk of all housing units, providing multifunctional neighborhood open space: ***http://www.ci.davidson.nc.us/index.aspx?NID=576***
- San Jose, California gives post-construction stormwater treatment credit for new and existing trees in close proximity to impervious areas: ***http://www.sanjoseca.gov/planning/stormwater/Policy_6-29_Memo_Revisions.pdf***
- Portland, Oregon gives a stormwater fee discount for trees over 15 feet tall: ***http://www.portlandonline.com/bes/index.cfm?c=43444&#types***
- Portland, Oregon also gives a tree credit for meeting local stormwater requirements: ***http://www.portlandonline.com/shared/cfm/image.cfm?id=93075***
- Portland, Oregon Parks and Recreation and Bureau of Development Services regulate tree cutting on private property and public property: ***http://www.portlandonline.com/parks/index.cfm?c=39712***
- New York City requires street tree planting for a range of developments and zoning increases: ***http://www.nyc.gov/html/dcp/html/street_tree_planting/index.shtml***
- Charlottesville, North Carolina has set goals for achieving a 40% minimum urban tree canopy: ***http://www.charlottesville.org/Index.aspx?page=1745*** (Chapter 8, pgs. 184-187)

2 Promote Efficient, Compact Development Patterns and Infill

2.A Support Infill and Redevelopment

2.A.1

QUESTION: Are policy incentives in place to direct development to previously developed areas? Most areas have been previously Developed in some way

GOAL: Municipalities implement a range of policies and tools to direct development to specific areas.

WHY: Municipalities can realize a significant reduction in regional runoff if they take advantage of underused properties, such as infill, brownfield, or greyfield sites. Redeveloping already degraded sites such as abandoned shopping centers or underutilized parking lots rather than paving greenfield sites for new development can dramatically reduce total impervious area while allowing communities to experience the benefits and opportunities associated with growth.

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
ADOPT PLANS/EDUCATE:			
Local plans identify potential brownfield and greyfield sites, and support their redevelopment.	1		
Capital improvement plans include infrastructure improvements (water, sewer, road, sidewalk, etc. upgrades) for identified brownfield and greyfield sites.	1	1	
Educate lending and financial institutions about benefits and local priorities of directing development to existing areas.	1		
Conduct outreach to the community to ensure support for local forms and patterns of development.	1		
REMOVE BARRIERS:			
Establish a brownfields program to remove uncertainty regarding cleanup and liability issues.	1		
ADOPT INCENTIVES:			
Provide incentives such as density bonuses and accelerated permitting for brownfield and greyfield sites.	1		
Adopt funding mechanisms for remediating/redeveloping brownfield and greyfield sites.	1		
Streamline permitting procedures to facilitate infill and brownfield redevelopment plan review.	1		
Establish tax increment financing (TIF) districts to encourage redevelopment.	1		
ENACT REGULATIONS:			
In local codes, ordinances, and policies, the municipality differentiates between greenfield and infill development.	1		
		1 PAGE TOTAL	◀ CARRY THIS SUBTOTAL TO NEXT PAGE ⇒ 1

2.B.1

QUESTION: Does the municipality direct growth to areas with existing infrastructure, such as sewer, water, and roads? Infrastructure Available in Most areas.

GOAL: Adopt policies, incentives, and regulations to direct new development to areas that have infrastructure, such as water and sewer.
However, in situations where development is in areas with no sewer infrastructure, permitting alternative treatment options that can allow for higher density development or clustering of houses will reduce the overall water quality impact.

WHY: Sewer and water authorities can play a major role in directing a region's growth by determining when and where new infrastructure investment will occur. Well-drafted facility planning areas can direct growth by providing sewer service in areas least likely to impact water resources.

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
ADOPT PLANS/EDUCATE			
Local plans recommend/establish urban growth areas and urban growth boundaries. Development is encouraged within urban growth boundaries and discouraged outside of them.	1		
Analyze which areas within the jurisdiction are appropriate for higher density development based on existing infrastructure capacity, cost of providing new services, and access.	2	2	
Capital improvement plans for public infrastructure (roads, water, sewer, etc.) target funding inside urban growth boundary.	2		
Local sewer/water authority capital improvement plans follow development policies established in local comprehensive plans and target areas with existing development/infrastructure.	1		
REMOVE BARRIERS:			
Development standards addressing landscaping, buffering, parking, and open space are tailored for infill areas to avoid creating unnecessary hurdles to development (e.g., imposing suburban parking requirements in high-density infill areas).	2	2	
Remove prohibitions on accessory dwelling units in infill areas to increase density of development.	2		
Off-site, regional water retention/detention encouraged/allowed to avoid costly on-site retention in densely developed infill areas and to provide benefit to priority retrofit sites, such as schools.	2		Currently working to Develop this practice.
Package plants and other wastewater treatment trains are encouraged for development in limited circumstance areas where growth is appropriate but sewers/treatment capacity does not exist.	1		

4 ~~2~~ PAGE TOTAL + 1 SUBTOTAL FROM PREVIOUS PAGE = ~~3~~ 5 ▼ CARRY THIS SUBTOTAL TO NEXT PAGE

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
Technical information and analysis on the effectiveness of various treatment systems are readily available to developers. Local governments have determined which systems work best for their soil conditions and topography and have made this information available to the development community.	1		
Allow a wide variety of housing types and sizes within infill areas and reduced minimum lot sizes.	1		
ADOPT INCENTIVES:			
Increase development densities and allowable height in infill areas.	1	1	
Reduce impact fees for infill development based on less demand for new infrastructure.	1		
Create development incentives for green roofs (e.g., increased floor area ratio [FAR] bonus, additional building height).	1		
Include provision in stormwater management requirement that reduces on-site management requirements for projects that decrease total imperviousness on previously developed sites.	1	1	
ENACT REGULATIONS:			
Zoning and land development regulations implement urban service areas/ urban growth boundary policies by restricting development in outlying areas.	1		
Adopt adequate public facility and concurrency ordinances that require adequate public infrastructure to be available when development comes on line (e.g., water, sewer, roads).	1		
Adopt large-lot/agricultural zoning (e.g., 1 unit/160 acres) on fringe of city to restrict inappropriate greenfield development.	1		
Enact transitional compatibility standards to ensure that new denser infill development is compatible with existing neighborhoods/adjacent development.	1		

PAGE TOTAL 2 + SUBTOTAL FROM PREVIOUS PAGE 5 = ▼ CARRY THIS SUBTOTAL TO NEXT PAGE 7

2.C ENCOURAGE MIXED-USE DEVELOPMENTS

2.C.1

QUESTION: Are mixed-use and transit-oriented developments allowed or encouraged? All of Campus is Transit-oriented

GOAL: Revise codes and ordinances to allow for the "by right" building of mixed-use and transit-oriented developments.

WHY: Mixed-use developments allow for the co-locating of land uses, which decreases impervious surfaces associated with parking and decreases vehicle miles traveled—resulting in a reduction of hydrocarbons left on roadways and reduced air deposition.

Transit-oriented development (TOD) produces water quality benefits by reducing: (1) land consumption due to smaller site footprints; (2) parking spaces and the impervious cover associated with them; and (3) average vehicle miles traveled, which, in turn, reduces deposition of air pollution into water bodies.

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
ADOPT PLANS/EDUCATE:			
Comprehensive plans identify appropriate areas for higher-density mixed-use developments (e.g., at transit stops) and recommend policies to encourage their development.	1	1	
Local capital improvement plans and funding are targeted to areas appropriate for mixed-use development.	2		
REMOVE BARRIERS:			
Zoning ordinances can create by-right mixed-use and transit-oriented development districts or overlays through amendments.	1		
Initiate map amendments to designate mixed-use and transit-oriented development areas, eliminating the need for developers to secure zoning amendments.	1		
ADOPT INCENTIVES:			
Parking requirements are reduced to reflect decreased automobile use.	1	1	
Credit given for adjacent on-street parking, which can count for local parking requirements.	1		
Shared parking and alternative parking arrangements encouraged.	1		
Mixed-use districts/areas feature increased densities and height.	1		
Accessory parking structures are not counted against maximum floor area ratio (FAR) on a site.	1		

PAGE TOTAL 2 + SUBTOTAL FROM PREVIOUS PAGE 7 = ▼ CARRY THIS SUBTOTAL TO NEXT PAGE 9

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
ENACT REGULATIONS:			
Zoning code requires a minimum mix of uses and minimum density in designated mixed-use and transit-oriented development areas.	1		
Auto-oriented uses and drive-throughs are restricted or prohibited in mixed-use and transit-oriented development areas.	1		

0

PAGE TOTAL

SUBTOTAL FROM PREVIOUS PAGE

+ 9

▼ **Total score for SECTION 2: PROMOTE EFFICIENT, COMPACT DEVELOPMENT PATTERNS AND INFILL**

= 9 (TOTAL POINTS AVAILABLE: **45**)

This section has been reviewed and scored by Garrett Ferry

Department name Design (Facilities Services) Signee

Resources

- "Protecting Water Resources with Higher-Density Development," U.S. EPA Development, Community and Environment Division: ***http://www.epa.gov/dced/water_density.htm***
- "Infill Development: Completing the Community Fabric," Municipal Research and Services Center of Washington: ***http://www.mrsc.org/Subjects/Planning/infilldev.aspx***
- Smart Growth Priority Funding Areas Act of 1997, Maryland Department of Planning: ***http://www.mdp.state.md.us/fundingact.htm***
- Metro Regional Government Urban Growth Boundary, Portland Metro: ***http://www.metro-region.org/index.cfm/go/by.web/id/277***
- Smart Growth Toolkit, Smart Growth Leadership Institute: ***http://www.smartgrowthtoolkit.net/main-content/the-smart-growth-implementation-tools.html***
- "Water and Growth: Toward a Stronger Connection Between Water Supply and Land Use in Southeastern Pennsylvania," 10,000 Friends of Pennsylvania: ***http://10000friends.org/water-and-growth***
- "Connecting Smart Growth and Brownfields Redevelopment," Center for Environmental Policy and Management, University of Louisville: ***http://cepm.louisville.edu/publications/PDF_docs/smart%20growth%20and%20brownfields%20for%20website.pdf***
- "Strategies for Successful Infill Development," Northeast Midwest Institute: ***http://www.nemw.org/infillbook.htm***
- "Smart Infill," Greenbelt Alliance: ***http://www.greenbelt.org/resources/reports/smartinfill/index.html***
- Infill Incentives, Policy Link: ***http://www.ci.phoenix.az.us/BUSINESS/infilpgm.html***

Case Studies

- Wisconsin Department of Natural Resources is responsible for helping municipalities establish Sewer Service Area Planning to protect water quality and guide growth within public sewer systems: ***http://dnr.wi.gov/org/water/wm/GLWSP/SSAPlan/***
- Dane County, Wisconsin's BUILD program offers incentives for infill development and removes barriers to redevelopment in order to preserve farmland and prevent greenfield development: ***http://www.countyofdane.com/plandev/Community/build/about.asp***
- U.S. EPA and Land-of-Sky Regional Council in Asheville, North Carolina developed a report outlining market, policy, and regulatory changes that can help overcome the barriers to infill and brownfield redevelopment: ***http://www.epa.gov/dced/pdf/losrc_brownfields.pdf***
- The Oregon Transportation and Growth Management Program prepared a Model Infill Ordinance to clarify legal and policy-related questions about local infill incentives: ***http://www.dca.state.ga.us/intra_nonpub/Toolkit/ModelOrdinances/ModOrdInfl.pdf***
- The City of Sacramento, California's Infill Strategies includes a Water Development Fee Waiver, Reduced Entitlement Fees, and Sewer Facility Fee Reductions: ***http://www.cityofsacramento.org/planning/infill/***
- Phoenix, Arizona's Infill Housing Program provides incentives to encourage single-family housing on vacant and underutilized land and offers high density development standards: ***http://www.ci.phoenix.az.us/BUSINESS/infilpgm.html***
- Portland, Oregon's Infill Design website provides design strategies for integrating infill development into medium-density neighborhoods: ***http://www.portlandonline.com/bps/index.cfm?c=34024***
- Portland, Oregon's Ecoroof Floor Area Ratio (FAR) Bonus allows developers to increase a building's footprint or floor area by adding an ecoroof: ***http://www.portlandonline.com/bes/index.cfm?a=236916&c=48725***
- The Georgia Quality Growth Partnership's Infill Development Program outlines a comprehensive infill strategy that includes incentives, improvements to public facilities, streamlined regulations, and guidelines for the design, density, and location of infill projects: ***http://www.georgiaqualitygrowth.com/ToolDetail.asp?GetTool=32***
- Santa Cruz, California's Accessory Dwelling Unit Development Program encourages well-designed rental housing in the developed core of the City while being careful to discourage poorly-constructed illegal residential additions: ***http://www.ci.santa-cruz.ca.us/pl/hcd/ADU/adu.html***
- Clark County, Washington's Infill Development Incentives include a waiver of all stormwater requirements for infill projects that create less than 5,000 square feet of new impervious surface: ***http://www.clark.wa.gov/commdev/documents/devservices/handouts/46-infill.pdf***
- San Diego, California offers expedited permitting for eligible affordable/infill housing projects: ***http://www.sandiego.gov/development-services/industry/pdf/infobulletin/ib538.pdf***

3 Design Complete, Smart Streets That Reduce Overall Imperviousness

3.A Street Design

3.A.1

QUESTION: Do local street design standards and engineering practices encourage streets to be no wider than necessary to move traffic effectively?

Do street designs vary according to:

- **street type** (arterial streets, collector streets, neighborhood streets) and yes
- **urban context** (urban core, transit station area, suburban center, general suburban, rural)?

Do policies allow narrow neighborhood streets designed to slow traffic and create safer conditions for pedestrians and bicyclists? yes - some have Transitioned to Pedestrian only.

GOAL: Appropriate street widths allow narrower lanes for certain street types, thereby reducing overall imperviousness.

WHY: The width of travel lanes, parking lanes and sidewalks should be tailored to the urban setting. Where appropriate, narrowing travel lane width to 10-11 feet, rather than the standard 12-13 feet, can significantly reduce the total amount of impervious surfaces. Such streets can also substantially improve conditions for walking, biking, and using transit, which reduces automobile use and overall demand for parking spaces.

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
ADOPT PLANS/EDUCATE:			
Comprehensive plan/transportation plan emphasizes alternative modes of transportation (walking, biking, and transit) to reduce vehicle miles traveled and width and prominence of roads/streets.	1	1	
Comprehensive/transportation plan calls for distributing traffic across several parallel streets, reducing the need for high capacity streets with wide rights-of-way.	1	1	
Comprehensive/transportation planning process brings emergency response and other local government departments (e.g., public works, utilities) to the table early in the process to discuss street design.	1		
Adopt formal bicycle/pedestrian master plan.	1	1	component of the campus Master plan
Create "safe routes to school" programs or other pedestrian/bike safety initiatives.	1		
Make consistent improvements to walking/biking conditions or develop a formal bicycle/pedestrian master plan.	1	1	
REMOVE BARRIERS:			
Comprehensive plan endorses context-sensitive street design with narrower streets in appropriate locations.	1		
Improve pedestrian crossing at intersections to encourage walking.	1	1	
Consolidate utilities in street right-of-way to improve sidewalk design and function.	1		
		5 PAGE TOTAL	◄ CARRY THIS SUBTOTAL TO NEXT PAGE = 5

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
Negotiate with state department of transportation or county transportation department to allow different design standards for regional roads passing through downtowns or other key areas.	1		
Promote street standards for fire safety that include attributes of narrow streets (20 feet widths) while identifying factors relevant to local government departments involved with streets such as public works, engineering, and utilities.	2	2	
Take formal control of state or county roads within city boundaries to ensure power over design and operations.	2	2	
ADOPT INCENTIVES			
Developments that provide comprehensive pedestrian/bicycle circulation systems allowed reducing number of vehicle parking spaces. (See parking section below for greater detail.)	1	1	
Developments with approved comprehensive mobility/transportation plans allowed building narrower, less costly streets and alleys.	1		
ENACT REGULATIONS			
Revamp local government technical street specifications to allow context-sensitive, innovative street design with narrower travel lanes, without curb and gutter, etc., in appropriate circumstances (See Institute of Transportation Engineers Recommended Practice document below).	2		
Emergency response professionals and other local government departments involved with streets (e.g. public works, engineering, utilities) have endorsed or adopted design standards for narrower neighborhood streets.	1		
Development review process involves emergency response early on to reach consensus on appropriate project street design and access.	1		
Development review process requires submittal of project pedestrian/bicycle circulation plans with safe street routes and other pedestrian/bicycle-friendly features in addition to traffic circulation plans for larger developments.	1		
Apply formal connectivity index[7] or other measures to ensure adequate internal street and pedestrian/bicycle connections.	2		
Zoning/subdivision regulations require minimum number of connections between new project and surrounding developments and neighborhoods.	2		

5 PAGE TOTAL + SUBTOTAL FROM PREVIOUS PAGE 5 = ▼ CARRY THIS SUBTOTAL TO NEXT PAGE 10

[7] Connectivity index refers to the directness of links and the density of connections in path or road network. A well-connected road or path network has many short links, numerous intersections, and minimal dead-ends (cul-de-sacs). As connectivity increases, travel distances decrease and route options increase, allowing more direct travel between destinations, and creating a more ***Accessible*** and ***Resilient*** system. Source: Online Travel Demand Management Encyclopedia, ***http://www.vtpi.org/tdm/tdm116.htm***

3.A.2	
QUESTION:	Are shared driveways, reduced driveway widths, two-track driveways, and rear garages and alleys encouraged for all single-family developments? NA
GOAL:	Encourage alternative forms and decreased dimensions of residential driveways and parking areas.
WHY:	Off-street parking and driveways contribute significantly to the impervious areas on a residential lot. Reducing such dimensions can minimize the amount of stormwater runoff from a site.

REMOVE BARRIERS			
Allow developments that utilize shared driveways and rear-loaded garages to permit overnight parking in driveways and on-street.	1		
Development code prohibits homeowner covenants forbidding overnight parking in driveways, on-street overnight parking, and shared driveways.	1		
ADOPT INCENTIVES:			
Allow developments with narrow driveways and rear-loaded garages to reduce number of parking spaces for guests.	1		
Zoning/subdivision regulations require minimum number of connections between new project and surrounding developments and neighborhoods.	1		
ENACT REGULATIONS:			
Shared driveways are permitted or required for single-family residential developments.	1		
Minimum widths for single-family driveways reduced to 9 feet.	1		
Two-track driveways are allowed by technical street/subdivision specifications.	1		
Single-family residential developments encouraged/required to be designed with minimum percentage of alley-accessible, rear-loading garages. · Alleys/garages encouraged = 1 points · Alleys/garages required = 2 points	1 to 2		

0 PAGE TOTAL + SUBTOTAL FROM PREVIOUS PAGE 10 = ▼ CARRY THIS SUBTOTAL TO NEXT PAGE 10

Green Infrastructure Elements and Street Design

QUESTION: Are major street projects required to integrate green infrastructure practices as a standard part of construction, maintenance, and improvement plans? yes

GOAL: Formally integrate green infrastructure into standard roadway construction and retrofit practice.

WHY: Consistent projects to improve or repair streets provide opportunities to include green infrastructure retrofits as part of larger project budget, design, and construction.

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
ADOPT PLANS/EDUCATE:			
Comprehensive/transportation plans promote green infrastructure practices in street design.	1	1	
Street project cost estimates include green infrastructure designs and assess cost savings from reduced hard infrastructure.	1	1	
REMOVE BARRIERS:			
Technical street specifications allow/require integration of green infrastructure elements into street project construction.	1	1	
Allow street-side swales to replace conventional curb and gutter for managing stormwater and for separating sidewalks from street traffic in appropriate circumstances.	1	1	currently in development stage
ADOPT INCENTIVES:			
Undertake consistent effort to secure state and federal funds (e.g., transportation enhancements) to pay for green infrastructure elements.	1		
Streets with green infrastructure count towards stormwater requirements.	1	1	
ENACT REGULATIONS:			
Adopt green infrastructure retrofit standards for major street projects.	1		
Adopt technical specifications and design templates for green infrastructure in private and public rights-of-way.	1	1	
All local road projects required to allocate a minimum amount of the total project cost to green infrastructure elements.	1	1	

PAGE TOTAL: 7 + SUBTOTAL FROM PREVIOUS PAGE: 10 = ▼ CARRY THIS SUBTOTAL TO NEXT PAGE: 17

QUESTION: Do regulations and policies promote use of pervious materials for all paving areas, including alleys, streets, sidewalks, crosswalks, driveways, and parking lots? No, Not All

GOAL: Build and retrofit these surfaces with pervious materials to reduce stormwater runoff and its negative impacts.

NOTE: While eliminating sidewalks or placing sidewalks on only one side of the road can reduce impervious cover, this strategy is typically most appropriate for rural areas. However, other effective strategies can achieve the same runoff reductions that will not limit residents' options for recreation and transportation.

WHY: Streets, sidewalks, and other hard surfaces contribute a large portion to a municipality's total imperviousness. Making these impervious surfaces more permeable protects water quality, reduces flooding, and can recharge groundwater.

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
ADOPT PLANS/EDUCATE:			
Sponsor/approve pilot programs to determine appropriate pervious materials for different paving areas (e.g., permeable concrete for sidewalks, permeable pavers for driveways), as well as process for installation and maintenance.	1		
Pilot project results incorporated into standard practice for all new paved areas and retrofits of existing paved surfaces.	1		
Adopt policy to replace impervious materials with pervious materials where practical.	1		
REMOVE BARRIERS:			
Technical street specifications allow pervious paving materials in appropriate circumstances (e.g., not allowed over aquifer recharge areas).	1	1	
ADOPT INCENTIVES:			
Create formal program offering incentives (e.g., cost sharing, reduction in street widths/parking requirements, assistance with maintenance) to property owners who utilize pervious pavement elements.	1		
ENACT REGULATIONS:			
Adopt requirement that some percentage of parking lots, alleys, or roads in a development utilize pervious materials.	1		
Development approvals that allow/require use of pervious materials include requirements for continuing maintenance/cleaning of pervious surfaces.	1	1	

PAGE TOTAL 2

SUBTOTAL FROM PREVIOUS PAGE + 17

▼ **Total score for SECTION 3: DESIGN COMPLETE, SMART STREETS THAT REDUCE OVERALL IMPERVIOUSNESS** = 19 (TOTAL POINTS AVAILABLE: 50)

This section has been reviewed and scored by Garrett Ferry

Department name Design (Facilities Services) Signee

Resources

- Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities, Institute of Transportation Engineers: ***http://www.ite.org/css/*** (Ch. 6, pages. 65-87)
- "Neighborhood Street Design Guidelines: An Oregon Guide for Reducing Street Widths," Oregon Department of Transportation and Department of Land Conservation and Development: ***http://www.oregon.gov/LCD/docs/publications/neighstreet.pdf***
- University of California, Davis Sustainable Transportation Center Sustainable Streets Project: ***http://stc.ucdavis.edu/outreach/ssp.php***
- New York High Performance Infrastructure Guidelines: ***http://www.designtrust.org/pubs/05_HPIG.pdf***
- Stormwater Guidelines for Green, Dense Redevelopment: Stormwater Quality Solutions for the City of Emeryville: ***http://www.ci.emeryville.ca.us/planning/pdf/stormwater_guidelines.pdf***
- "Sustainable Green Streets and Parking Lots Design Guidebook," San Mateo County, California Water Pollution Prevention Program: ***http://www.flowstobay.org/ms_sustainable_streets.php***
- Green Streets: Innovative Solutions for Stormwater and Stream Crossings, Portland Metro: ***http://www.oregonmetro.gov/index.cfm/go/by.web/id=26335***
- Green Highways Partnership between U.S. EPA, U.S. Federal Highway Administration and Maryland State Highway Administration: ***http://www.greenhighways.org/***
- Protecting Water Quality with Smart Growth Strategies and Natural Stormwater Management in Sussex County, Delaware: ***http://www.epa.gov/smartgrowth/pdf/2009_0106_sussex_county.pdf***
- Promoting Sustainable Transportation Through Site Design: An Institute of Transportation Engineers Proposed Recommended Practice: ***http://www.cite7.org/Technical_Projects/Final%20Proposed%20Recommended%20Practice%20RP-035.pdf***
- Transportation is about Places, Project for Public Spaces: ***http://www.pps.org/transportation/***

Case Studies

- The Road Ecology Center at the University of California, Davis conducts research and develops policies to design transportation systems that minimize the impacts of roads on landscapes and communities: ***http://roadecology.ucdavis.edu/***
- Houston, Texas's Urban Corridor Planning changes development regulations and infrastructure standards to support transit ridership and walkability in key corridors: ***http://www.houstontx.gov/planning/Urban/urban_cor.html***
- San Francisco, California's Better Streets Plan created a common set of standards and guidelines for designing, building and maintaining more pedestrian friendly sidewalks, crosswalks, and roadways, including extensive greening: ***http://www.sfbetterstreets.org***
- Portland, Oregon's Green Streets Program includes design specifications for swales, planters and curb extensions, creative funding for projects that treat runoff from public rights-of-way, case studies, tours, and videos of public and private green street projects: ***http://www.portlandonline.com/BES/index.cfm?c=44407***
- Seattle, Washington's Right-of-Way Improvements Manual outlines the requirements and permitting process for right-of-way improvements, as well as provides specific design criteria and model templates for submitting street design concepts: ***http://www.seattle.gov/transportation/rowmanual/***
- Florida Department of Transportation developed Model Regulations and Plan Amendments for Multimodal Transportation Districts, including regulation changes related to traffic calming, parking, sidewalks and pedestrian and bicycle facilities, and incentives for developments located in multimodal transportation districts: ***http://www.dot.state.fl.us/planning/systems/sm/los/pdfs/MMTDregs.pdf***
- New York Department of Transportation's Sustainable Streets Strategic Plan includes an initiative to retrofit underused roads into public plazas, streamlining design review for capital projects, and goals to connect tree pits for better surface drainage, among other stormwater management improvements: ***http://www.nyc.gov/html/dot/html/about/stratplan.shtml***
- Chicago, Illinois's Green Alley Program retrofits existing alleys with permeable pavement for better stormwater management, localized flood mitigation, heat reduction, material recycling, and energy conservation: ***http://egov.cityofchicago.org/webportal/COCWebPortal/COC_EDITORIAL/GreenAlleyHandbook.pdf***

- North Carolina Department of Environment and Natural Resources offers guidance to developers on eliminating curbs and gutters, including siting and design considerations, maintenance concerns, effectiveness and cost considerations: ***http://www.p2pays.org/ref/41/40403.pdf***
- New York City requires street trees for every 25 feet of street frontage of a zoning lot: ***http://www.nyc.gov/html/dcp/pdf/street_tree_planting/tree_adopted_cc_043008.pdf***, page 8.
- Seattle Public Utilities' Natural Drainage System projects redesign residential streets to include vegetated drainage systems that use swales, wetlands, trees and other natural features to treat pollutants and minimize the speed and volume of road runoff: ***http://www.seattle.gov/util/About_SPU/Drainage_&_Sewer_System/Natural_Drainage_Systems/***

4 Encourage Efficient Parking

4.A Reduced Parking Requirements

4.A.1

QUESTION: Does your local government provide flexibility regarding alternative parking requirements (e.g., shared parking, off-site parking) and discourage over-parking of developments?

Do parking requirements vary by zone to reflect places where more trips are on foot or by transit? Yes

GOAL: Match parking requirements to the level of demand and allow flexible arrangements to meet parking standards.

WHY: Inflexible parking requirements that do not allow for alternative approaches, as well as standards that require too much parking for specific uses increase the amount of impervious surface in a development. Over-parking a development also encourages greater vehicle use and detracts from the overall pedestrian environment.

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
ADOPT PLANS/EDUCATE:			
The comprehensive plan recognizes the advantages to reduced parking requirements generally and specifically for mixed-use and transit-oriented developments.	1		
The comprehensive plan recommends alternative, flexible approaches to meeting parking demands (e.g., shared parking, counting on-street spaces towards site parking requirements).	1		
Comprehensive/bicycle plans recommend provision of bicycle parking spaces/storage lockers and concomitant reduction in vehicle parking space requirements.	1		
REMOVE BARRIERS:			
Allow flexibility in meeting parking space requirements through shared parking, off-site parking, and similar approaches.	1	1	
Permit businesses with different peak demand periods to share their required parking spaces.	1	1	
ADOPT INCENTIVES:			
Permit reduction in vehicle parking spaces through the provision of a minimum number of bicycle parking spaces.	1		
Allow by-right reduction in required parking spaces (e.g., 25%) in mixed-use and transit-oriented developments and districts.	1		
Permit developers to undertake parking studies to establish that specific developments (e.g., senior housing, affordable housing) require fewer parking spaces than typical projects.	1		
		2 PAGE TOTAL	◀ CARRY THIS SUBTOTAL TO NEXT PAGE = 2

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
Create parking districts to finance/construct centralized parking lots/ structures as shared parking facilities to reduce on-site parking.	1	1	
ENACT REGULATIONS			
Revise parking regulations to reduce minimums below standard ITE (Institute of Transportation Engineers) requirements based on analysis of local developments and actual parking demand/experience.	2		
Charge developers for every space beyond parking minimums to offset environmental impacts.	1		
Enact parking standards that allow credit for adjacent on-street parking.	1		
Create zones with reduced parking requirements (e.g., transit overlay districts, mixed-use activity centers, multi-modal districts).	1		
Waive all parking minimums in downtown and other locations that are pedestrian-oriented and/or have good transit access.	1		
Adopt parking standards that reduce requirements based on sliding scale tied to degree of walkability/transit access locations (20% reduction in areas well served by bus, 30% reduction in areas served by rail stations).	1		
Require shared parking agreements where appropriate complementary uses exist.	1		
Adopt maximum parking caps (e.g., 125% above minimum) for multi-family and commercial developments.	2		
Reduce minimum parking space size based on analysis of average vehicle size in jurisdiction.	1		

1 PAGE TOTAL	+ SUBTOTAL FROM PREVIOUS PAGE 2	=	▼ CARRY THIS SUBTOTAL TO NEXT PAGE 3

4.B TRANSPORTATION DEMAND MANAGEMENT ALTERNATIVES

4.B.1

QUESTION: Can developers use alternative measures such as transportation demand management or in-lieu payments to reduce required parking? NA

GOAL: Provide flexibility to reduce parking in exchange for specific actions that reduce parking demands on site.

WHY: Incentives such as transit passes, vanpool arrangements, flexible work schedules, market-priced facilities, and separate leasing for spaces in apartments and condominiums have quantifiable impacts on parking demand. Incorporating them into parking requirements creates the opportunity to meet demand with less impervious cover.

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
ADOPT PLANS/EDUCATE:			
Comprehensive/transportation plans recognize transportation demand management as an approach to reducing vehicle miles traveled and parking requirements.	1		
REMOVE BARRIERS:			
Rather than include parking spaces with an apartment lease, allow tenants to opt-out by treating parking as a separate optional lease agreement.	1		
ADOPT INCENTIVES:			
Allow businesses that offer employee transit passes, provide vans for employee commuting, allow flexible working arrangements, or charge market rates for parking to 1) provide fewer parking spaces or 2) pay less into a parking district fund for required parking spaces.	2		
Allow developers to make in-lieu fee payments for parking. Fees utilized by local government/parking authority to provide off-site parking lots/structures.	1		
Provide mechanisms for car sharing in transit-oriented development. Where done, area parking requirements are reduced.	1		
ENACT REGULATIONS:			
Create a parking district and allow/require businesses to support public garages rather than provide their own on-site parking.	1		
Require large developments to adopt transportation demand management techniques to lower vehicle use and parking demand.	1		

PAGE TOTAL 0 + SUBTOTAL FROM PREVIOUS PAGE 3 = ▼ CARRY THIS SUBTOTAL TO NEXT PAGE 3

4.C MINIMIZE STORMWATER FROM PARKING LOTS

4.C.1

QUESTION: Are there requirements for landscaping designed to minimize stormwater in parking lots? Yes

GOAL: Require substantial landscaping to help reduce runoff.

WHY: Parking lots generate a large amount of impervious cover. Requiring landscaping reduces the environmental impact of parking and can provide additional community benefits by providing shade and, if appropriately placed, creating natural barriers between pedestrians and cars.

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
ADOPT PLANS/EDUCATE:			
Comprehensive plan calls for landscaping in parking lots to help reduce stormwater runoff.	1	1	
REMOVE BARRIERS:			
Allow alternative or innovative landscaping solutions that provide stormwater management functions to count towards perimeter or other landscaping requirements.	1	1	
ADOPT INCENTIVES:			
Parking lot landscaping and green roofs on parking structures credited towards meeting local stormwater management requirements.	1	1	
Give additional landscaping credit for preservation of large, mature trees within parking lots.	1		
Do not count parking structures with green roofs against the allowable floor area ratio of a site.	1		
ENACT REGULATIONS:			
Adopt parking lot landscape regulations that require provision of trees, minimum percent of parking lot interior area to be landscaped (e.g., 10%), and minimum sized landscaping areas (e.g., minimum of 25 square feet for island planting areas).	1		
In parking lot landscaping regulations, specify the types and sizes of shrubs and trees most appropriate for controlling/reducing stormwater runoff.	1		
Adopt standards requiring a minimum area of the parking lot to drain into landscaped areas.	1		
Require the management of runoff from parking lots through green infrastructure practices, including trees, vegetated islands, swales, rain gardens, or other approaches.	1		encourage but do not require currently.

PAGE TOTAL 3 + SUBTOTAL FROM PREVIOUS PAGE 3 = ▼ CARRY THIS SUBTOTAL TO NEXT PAGE 6

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
Enact specific alternative landscaping and parking regulations to support infill development (parking requirements, parking lot landscaping options that focus on perimeter landscaping to encourage smaller lots, etc.).	2		
Require parking structures to incorporate green roofs to reduce stormwater runoff.	1		
Reduce drive aisle widths in parking lots to decrease the amount of pervious surface. For multi-family developments, drive aisles can be shared. In commercial developments, typical drive aisles can be reduced 5–10%.	1	1	

1 PAGE TOTAL + SUBTOTAL FROM PREVIOUS PAGE 6 = 7 (TOTAL POINTS AVAILABLE: **41**)

▼ **Total score for SECTION 4: ENCOURAGE EFFICIENT PARKING**

This section has been reviewed and scored by GARRETT FERRY

Department name Design (Facilities Services) Signee

Resources

- "Parking Spaces/Community Places: Finding the Balance through Smart Growth Solutions" (pg. 14, 18-19, 21), U.S. EPA Development, Community and Environment Division: ***http://www.epa.gov/piedpage/pdf/EPAParkingSpaces06.pdf***
- "Shared Parking, Second Edition," Urban Land Institute: ***www.uli.org/bookstore/***
- "Developing Parking Policies to Support Smart Growth in Local Jurisdictions: Best Practices," Metropolitan Transportation Commission: ***http://www.mtc.ca.gov/planning/smart_growth/parking_study/April07/bestpractice_042307.pdf***
- "Driving Urban Environments: Smart Growth Parking Best Practices," Maryland Governor's Office of Smart Growth: ***http://www.smartgrowth.state.md.us/pdf/Final%20Parking%20Paper.pdf***
- "Design Principles for Parking Lots," Tennessee Valley Authority Economic Development: ***http://www.tvaed.com/sustainable/parking.htm***
- Efficient Parking Strategies, Centralina Council of Governments and Catawba Regional Council of Governments: ***http://www.epa.gov/region4/airqualitytoolkit/9_CaseStudies/SEQL%20-%20Efficient%20Parking%20Strategies.pdf***
- "Parking Management: Strategies, Evaluation and Planning," Victoria Transport Policy Institute: ***http://www.vtpi.org/park_man.pdf***
- "Smart Growth Alternatives to Minimum Parking Requirements," *Proceedings from the 2nd Urban Street Symposium*, July 28-30, 2003: ***http://transtoolkit.mapc.org/Parking/Referenced_pdfs/Forinash_SmartGrowthParkingAlternatives.pdf***
- "Flexible Parking Standards," Georgia Quality Growth Partnership: ***http://www.dca.state.ga.us/toolkit/ToolDetail.asp?GetTool=17***
- "Multifunctional Landscaping: Putting Your Parking Lot Design Requirements to Work for Water Quality," University of Illinois Extension: ***http://urbanext.illinois.edu/lcr/LGIEN2002-0017.html***
- "Low-Impact Parking Lot Design Reduces Runoff and Pollutant Loads," Journal of Water Resources Planning and Management, 2001: ***http://cedb.asce.org/cgi/WWWdisplay.cgi?0101775***
- "Managing Stormwater for Urban Sustainability Using Trees and Structural Soils," Virginia Polytechnic Institute and State University: ***http://www.cnr.vt.edu/urbanforestry/stormwater/Resources/TreesAndStructuralSoilsManual.pdf***

Case Studies

- San Mateo County, California's "Sustainable Green Streets and Parking Lots Design Guidebook" provides policy guidance and design and construction details, including site layout strategies, green infrastructure design guidelines and case studies for both streets and parking lots: ***http://www.flowstobay.org/ms_sustainable_streets.php***
- Minneapolis, Minnesota's zoning code includes regulations to support pedestrian-oriented off-street parking, including parking maximums, shared parking allowances, pedestrian-overlay districts with reduced parking requirements, replacing off-street parking spaces with bicycle racks, and more: ***http://www.ci.minneapolis.mn.us/lrtrezoning/tod-haiwatha-09.asp***
- Boston Metropolitan Area Planning Council gives detailed guidance for reducing parking demand and developing parking requirements based on local factors such as access to transit, expected demographics, auto ownership rates and access to destinations and transit service: ***http://transtoolkit.mapc.org/Parking/Strategies/flexiblerequirements.htm***
- San Diego, California's Community Parking District Program helps older commercial districts collect revenue and implement parking plans to construct public parking facilities, make public transit enhancements, and maximize off-street parking inventory: ***http://www.sandiego.gov/economic-development/business-assistance/small-business/pmd.shtml***
- Placer County, California enacted an In-Lieu Parking Fee that allows developments within specific parking districts to pay a fee in lieu of complying with off-street parking standards. The collected fees are then used to construct new public parking spaces within the same parking district: ***http://www.placer.ca.gov/Departments/Works/TahPkngStudy/DraftParkingFeeOrdinance.aspx***
- Minnesota's Urban Small Sites Best Management Practice Manual provides drawings, design guidelines and plant lists for impervious surface reduction in parking lot design: ***http://km.fao.org/uploads/media/Impervious_surface_reduction_parking_lot_desing.pdf***
- The retrofit of Our Lady Gate of Heaven Parish parking lot in Chicago, Illinois included a large swale that absorbs 100,000 gallons of runoff per year, reducing flooding in the parking lot and in nearby streets and properties. This U.S. EPA-funded project continues to be monitored for

performance data: ***http://www.cnt.org/natural-resources/demonstration-projects/olgh-case-study***

- The Florida Aquarium Parking Lot and Queuing Garden in Tampa, Florida maximizes existing site vegetation for stormwater management and provides education to Aquarium visitors. This website includes construction cost information, lessons learned, monitoring results and maintenance protocols: ***http://www.sustainablesites.org/cases/show.php?id=16***
- Several parking lot demonstration sites in Blacksburg, VA, Ithaca, NY and Davis, CA provide details about newly constructed parking lots and retrofitted lots that include trees, structural soils and pervious pavements for managing stormwater: ***http://www.cnr.vt.edu/urbanforestry/stormwater/DemonstrationSites.html***

5 Adopt Green Infrastructure Stormwater Management Provisions

5.A Green Infrastructure Practices

5.A.1

QUESTION: Are green infrastructure practices encouraged as legal and preferred for managing stormwater runoff? Yes

GOAL: Make all types of green infrastructure allowed and legal and remove all impediments to using green infrastructure (including for stormwater requirements), such as limits on infiltration in rights-of-way, permit challenges for green roofs, safety issues with permeable pavements, restrictions on the use of cisterns and rain barrels, and other such unnecessary barriers.

WHY: Green infrastructure approaches are more effective and cost efficient than conventional stormwater management practices in many instances, and provide other substantial community benefits.

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
ADOPT PLANS/EDUCATE			
Inform the public, through education and outreach programs, that green infrastructure practices can manage stormwater runoff on their property.	1	1	
Create a green infrastructure workshop or training program for internal and external reviewers to ensure that the stakeholders who use this tool will have the ability to understand and use it effectively.	1	1	
REMOVE BARRIERS			
Development and other codes encourage and allow property owners to adopt home-based green infrastructure practices, such as rain gardens, rain barrels, and other rainwater harvesting practices.	1	1	departments not property owners
Review and change, where necessary, building codes or other local regulations to ensure that all local government departments/agencies have coordinated with one another to ensure that green infrastructure implementation is legal, e.g. remove restrictions on downspout disconnection.	1	1	
ADOPT INCENTIVES			
Credit green infrastructure practices towards required controls for stormwater runoff.	1	1	
Establish a "Green Tape" expedited review program for applications that include green infrastructure practices.	1		
Reduce stormwater utility rates based on the use of green infrastructure practices.	1		
		5 PAGE TOTAL	◀ CARRY THIS SUBTOTAL TO NEXT PAGE = 5

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
ENACT REGULATIONS			
Zoning and subdivision regulations specifically permit green infrastructure facilities, including but not limited to: (1 point for each technique to a maximum of 4 points) · Green roofs; · Infiltration approaches, such as rain gardens, curb extensions, planter gardens, permeable and porous pavements, and other designs where the intent is to capture and manage stormwater using soils and plants; · Water harvesting devices, such as rain barrels and cisterns; and · Downspout disconnection.	1 to 4	0 1 1 1 3	
Developers are required to meet stormwater requirements using green infrastructure practices where site conditions allow. Developers must provide documentation for sites that do not allow on-site infiltration, reuse, or evapotranspiration to meet locally determined performance stormwater management standards.	1 to 2	2	
		5 PAGE TOTAL	SUBTOTAL FROM PREVIOUS PAGE + 5 = ▼ CARRY THIS SUBTOTAL TO NEXT PAGE 10

5.A.2	
QUESTION:	Do stormwater management plan reviews take place early in the development review process? Yes
GOAL:	Incorporate stormwater plan comments and review into the early stages of development review/site plan review and approval, preferably at pre-application meetings with developers.
WHY:	Pre-site plan review is an effective tool for discussing with developers alternative approaches for meeting stormwater requirements. This will incorporate green infrastructure techniques into new projects at early design stages, well before construction begins.

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
ADOPT PLANS/EDUCATE:			
Encourage/require a pre-site plan meeting with developers to discuss stormwater management and green infrastructure approaches. · Voluntary = 1 point · Mandatory = 2 points	1 to 2	2	
Include landscape architects in design and review of stormwater management plans.	1	1	
ADOPT INCENTIVES:			
Provide accelerated review of projects where developer attended a pre-application meeting.	1		
ENACT REGULATIONS:			
Preliminary stormwater plan review occurs contemporaneously with preliminary site plan review and before any development approvals.	1	1	
Development applications must include preliminary/conceptual stormwater management plans that incorporate green infrastructure elements and describe how stormwater management standards will be met.	1	1	

5 PAGE TOTAL + SUBTOTAL FROM PREVIOUS PAGE 10 = ▼ CARRY THIS SUBTOTAL TO **NEXT PAGE** 15

5.A.3	
QUESTION:	Do local building and plumbing codes allow harvested rainwater for exterior uses, such as irrigation, and non-potable interior uses, such as toilet flushing? Yes
GOAL:	Ensure that the municipality allows and encourages stormwater reuse for non-potable uses.
WHY:	Stormwater reuse is important for dense, urban areas with limited spaces for vegetated green infrastructure practices.

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
ADOPT PLANS/EDUCATE:			
Local government provides information brochures/manual for homeowners describing acceptable rainwater harvesting techniques.	1		
REMOVE BARRIERS:			
Local development, building, and plumbing codes updated to allow reuse of stormwater for non-potable purposes.	1	1	
ADOPT INCENTIVES:			
Reduce stormwater management facility requirements for developments employing comprehensive rainwater harvesting.	1	1	
Reduce stormwater utility rates based on the use of harvest and reuse techniques.	1		
ENACT REGULATIONS:			
Require developments to adopt rainwater harvesting techniques as elements of stormwater management plans.	1	1	

3 PAGE TOTAL + SUBTOTAL FROM PREVIOUS PAGE 15 = ▼ CARRY THIS SUBTOTAL TO NEXT PAGE 18

5.A.4	
QUESTION:	Are provisions available to meet stormwater requirements in other ways, such as off-site management within the same sewershed or "payment in lieu" of programs, to the extent that on-site alternatives are not technically feasible? NO
GOAL:	Allow off-site management of runoff while still holding developers responsible for meeting stormwater management goals.
WHY:	In some cases, it is impracticable or infeasible to treat all or even some of the stormwater runoff on site. In such instances, alternative means should be provided through contribution to off-site mitigation projects or off-site stormwater management facilities (preferably green infrastructure facilities).

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A
For infill and redevelopment areas, off-site green stormwater management plans should be developed in cooperation between local government and landowners/developers. Allowing off-site management of stormwater runoff requires sewershed designation within the local government to ensure that true mitigation is possible and realize the equal stormwater management and water quality benefits through off-site management.	2	
Retrofit projects that will utilize green infrastructure stormwater management techniques should be identified and prioritized within the sewershed.	1	
Amend stormwater management regulations and development codes as necessary to allow off-site stormwater management, especially for infill and redevelopment areas.	1	
Establish system that allows/requires payment-in-lieu fees for off-site stormwater management facilities. Fees should be set sufficiently high as to cover the true cost of off-site management. Consider limitations on amount of off-site management allowed (more for infill areas, less for greenfield sites).	1	

0 PAGE TOTAL + SUBTOTAL FROM PREVIOUS PAGE 18 = ▼ CARRY THIS SUBTOTAL TO NEXT PAGE 18

5.B.1

QUESTION: Does your stormwater ordinance include monitoring, tracking, and maintenance requirements for stormwater management practices? Yes

GOAL: Incorporate monitoring, tracking, and maintenance requirements for stormwater management practices into your municipal stormwater ordinance.

WHY: These measures will help ensure that the successful tracking and monitoring of green infrastructure practices remain in proper working condition to provide the performance required by the stormwater ordinance.

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
ADOPT PLANS/EDUCATE:			
Develop a system to monitor and track stormwater management practices deployed at greenfield and redevelopment sites. Tracking of management practices should begin during the plan review and approval process with a database or geographic information system (GIS). The database should include both public and private projects.	1	1	
Provide model checklist for maintenance protocols for ease of inspection, tracking, and enforcement.	1		
Sponsor demonstration projects for green infrastructure management best practices.	1		
REMOVE BARRIERS:			
Ensure that proper local agencies have authority to enforce maintenance requirements.	1	1	
ADOPT INCENTIVES:			
Create self-inspection maintenance certification program that allows **developers/landowners to train/retain private inspectors to certify compliance** with stormwater management plans and long-term maintenance.	1		
ENACT REGULATIONS:			
Require long-term maintenance agreements that allow for public inspections of the management practices and account for transfer of responsibility in leases and/or deed transfers.	1		
Conduct inspections every 3 to 5 years, prioritizing properties that pose the highest risk to water quality, inspecting at least 20% of approved facilities annually.	1	1	
Develop a plan approval and post-construction verification process to ensure compliance with stormwater standards, including enforceable procedures for bringing noncompliant projects into compliance.	1	1	

4 PAGE TOTAL + SUBTOTAL FROM PREVIOUS PAGE 18 = ▼ CARRY THIS SUBTOTAL TO NEXT PAGE 22

Implementation Tools and Policies	Pts. Avail.	Pts. Rec. or N/A	Notes and Local References
Inspections of construction sites occur at for at least 25% of permitted projects to ensure proper installation of approved practices.	1	1	
Require conservation/green infrastructure bond/escrow in zoning/subdivision ordinances to ensure installation/maintenance of green infrastructure storm water management facilities.	1		

1

PAGE TOTAL

SUBTOTAL FROM PREVIOUS PAGE + 22 = 23 (TOTAL POINTS AVAILABLE: 39)

▼ **Total score for SECTION 5: GREEN INFRASTRUCTURE STORMWATER MANAGEMENT PROVISIONS**

This section has been reviewed and scored by Garrett Feary

Department name Design (Facilities Services) Signee

Resources

- Green Infrastructure Municipal Handbook, U.S. EPA Green Infrastructure website: ***http://cfpub.epa.gov/npdes/greeninfrastructure/munichandbook.cfm***
- *A Catalyst for Community Land Use Change*, National NEMO Network 2008 Progress Report with local regulations for water quality protection: ***http://nemonet.uconn.edu/about_network/publications/2008_report.htm***
- Public Entity Environmental Management System Resource Center: ***http://peercenter.net/***
- Environmental Management System, U.S. EPA: ***http://epa.gov/ems/***
- "The Economics of Low-Impact Development: A Literature Review," EcoNorthwest: ***http://www.econw.com/reports/ECONorthwest_Low-Impact-Development-Economics-Literature-Review.pdf***
- "Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices," U.S. EPA Office of Water: ***http://www.epa.gov/owow/nps/lid/costs07/***
- New York City's PlaNYC for Water: ***http://www.nyc.gov/html/planyc2030/html/plan/water.shtml***
- Puget Sound Partnership Low Impact Development Local Regulation Assistance Project: ***http://www.psparchives.com/our_work/stormwater/lid/lid_regs.htm***
- Massachusetts Low Impact Development Toolkit: ***http://www.mapc.org/regional_planning/LID/PDFs/LID%20Local%20Codes%20Checklist.pdf***
- Plan Review checklist and flow chart, Office of Watersheds, Philadelphia Water Department: ***http://www.phillyriverinfo.org/WICLibrary/DevelopmentProcess_Final.pdf***
- General Factors that Influence the Selection of Stormwater Management Facilities, Portland Bureau of Environmental Services: ***http://www.portlandonline.com/shared/cfm/image.cfm?id=129055***
- Operations and Maintenance of Treatment Best Management Practices, Santa Clara Valley Urban Pollution Prevention Program: ***http://www.scvurppp-w2k.com/om_workproduct_links.htm***
- Stormwater Center Maintenance Agreements Guidance and Case Studies: ***http://www.stormwatercenter.net/Manual_Builder/Maintenance_Manual/4Maintenance_Agreements/Maintenance%20Agreements%20Introduction.htm***

Case Studies

- Alachua County, Florida's stormwater regulation requires that developers reduce impervious surfaces via vertical construction and alternative parking surfaces and use site contours and minimize disturbance to existing natural features: ***http://growth-management.alachua.fl.us/compplanning/amended_docs/ORDstormCPA-06-01final.pdf***
- Philadelphia, Pennsylvania's stormwater regulation requires that projects infiltrate/manage the first 1" of rainfall from all directly connected impervious surfaces and exempts redevelopment projects from flood control and channel protection requirements: ***http://www.phillyriverinfo.org/Programs/SubprogramMain.aspx?Id=Regulations***
- Portland, Oregon's stormwater requirement uses a mandatory hierarchy that requires on-site infiltration with surface vegetation above all other practices ***http://www.portlandonline.com/bes/index.cfm?c=35122*** (Chapter 1, page 1-18)
- Emeryville, California's stormwater guidelines for dense green redevelopment provide guidance on using green infrastructure in high density, infill sites: ***http://ca-emeryville.civicplus.com/DocumentView.asp?DID=144***
- Portland, Oregon's Ecoroof Floor Area Ratio (FAR) Bonus allows developers to increase a building's footprint or floor area for projects that include an ecoroof: ***http://www.portlandonline.com/bes/index.cfm?a=236916&c=48725***
- Chicago Department of Construction and Permits has a Green Permit Program that offers expedited permits and waived permit review fees for projects that meet a series of green building requirements, including exceptional water management and green roof criteria: ***http://egov.cityofchicago.org/webportal/COCWebPortal/COC_EDITORIAL/GreenPermitBrochure1.pdf***
- Tucson, Arizona's Water Harvesting Guidance Manual describes how the City's code requirements for water harvesting help to meet several other local codes, such as for landscaping, floodplain and erosion hazard management, and stormwater management: ***http://dot.tucsonaz.gov/stormwater/education/waterharvest.php*** (page 26)
- San Francisco, California's Public Utilities, Department of Building Inspection and Department of Public Health partnered to allow the use of rainwater for irrigation and toilet flushing without requiring treatment to potable standards: ***http://sfwater.org/mo_main.cfm/MC_ID/14/MSC_ID/361/MTO_ID/559***

- Seattle, Washington's Green Factor is an amended landscape requirement that property owners meet via a scoring system that encourages green features such as large plants, permeable pavement, green roofs, vegetated walls and tree preservation: ***http://www.seattle.gov/dpd/permits/greenfactor/Overview/***
- San Jose, California's stormwater regulation requires that projects with 10,000 square feet or more of impervious surface area use landscape-based treatment and trees to meet quantity and quality standards: ***http://www.sanjoseca.gov/planning/stormwater/Policy_6-29_Memo_Revisions.pdf***
- Santa Monica, California's stormwater code requires that new development projects maximize permeable areas, maximize runoff to permeable areas, reuse stormwater, and reduce parking lot pollution: ***http://www.smgov.net/uploadedFiles/Departments/OSE/Categories/Urban_Runoff/UR_Brochure.pdf***
- Chicago, Illinois's stormwater regulation requires that new developments manage 0.5" runoff from all impervious surfaces or reduce imperviousness by 15%: ***http://egov.cityofchicago.org/webportal/COCWebPortal/COC_EDITORIAL/StormwaterManagementOrdinance1206.pdf***
- Lenexa, Kansas's stormwater regulation requires new developments to manage 1.37" for water quality using a natural system treatment train approach and also charges a fee for water quantity management which pays for watershed-scale public projects managed by the City: ***http://www.ci.lenexa.ks.us/LenexaCode/viewXRef.asp?Index=2927***
- Fauquier County, Virginia's stormwater maintenance agreements state that if maintenance is neglected the County has the authority to perform the work and recover costs from the property owner: ***http://www.fauquiercounty.gov/documents/departments/commdev/pdf/SWMOrdinance.pdf*** (pages 12-13)
- Philadelphia, Pennsylvania's Stormwater Management Guidance Manual provides maintenance guidelines and schedules for a range of green infrastructure practices, from green roofs to pervious pavements and subsurface infiltration: ***http://www.phillyriverinfo.org/Programs/SubprogramMain.aspx?id=StormwaterManual***

ACKNOWLEDGMENTS

U.S. Environmental Protection Agency's Development, Community and Environment Division (EPA's Smart Growth Program) prepared this scorecard in cooperation with the Office of Wetlands, Oceans and Watersheds.

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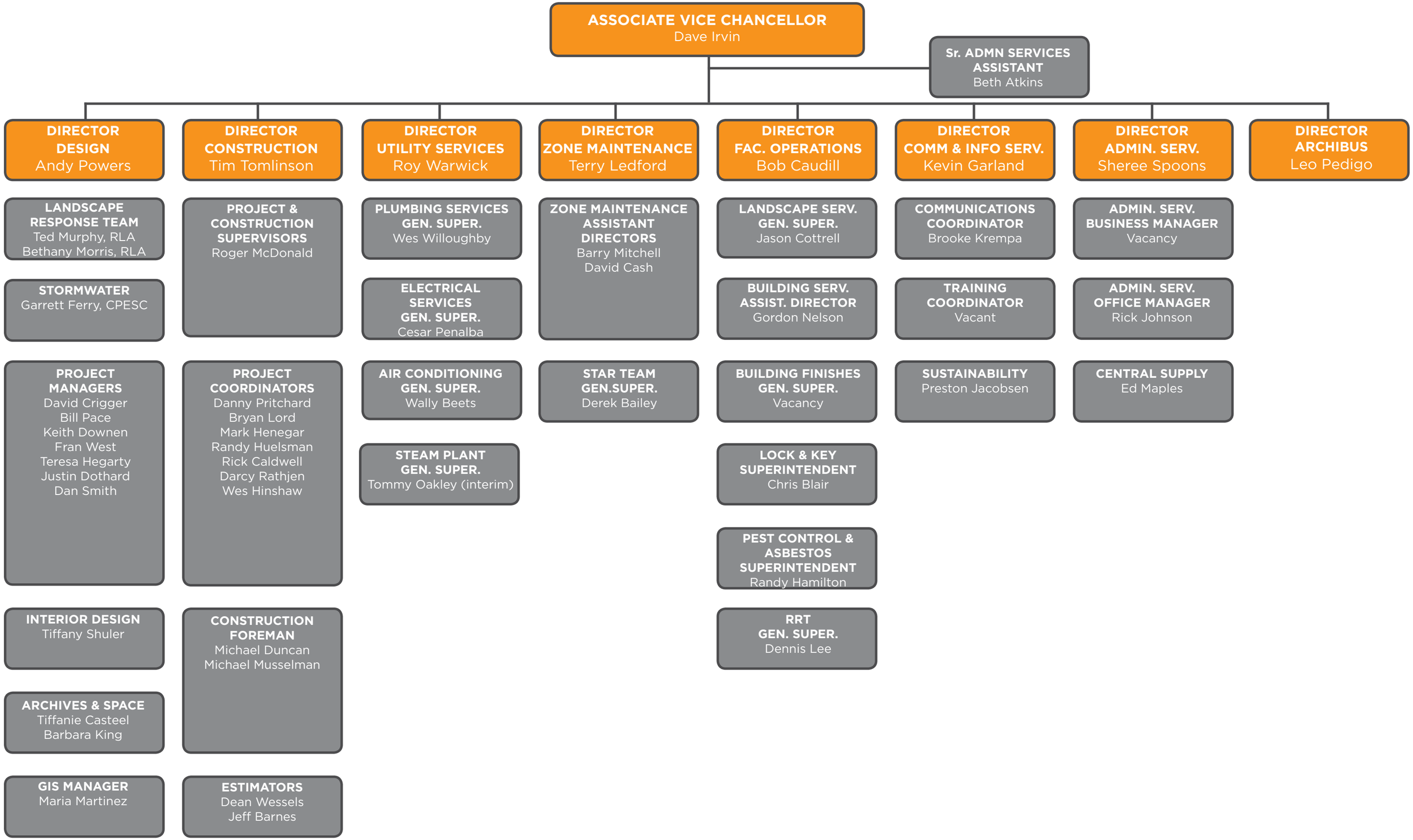
EPA 231B09001
October 2009
http://www.epa.gov

Attachments

Attachment 5:

13. Program Resources; G. Organizational Chart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