Green Infrastructure Code Audit

Martin Daley
Capital District Regional Planning Commission

About CDRPC

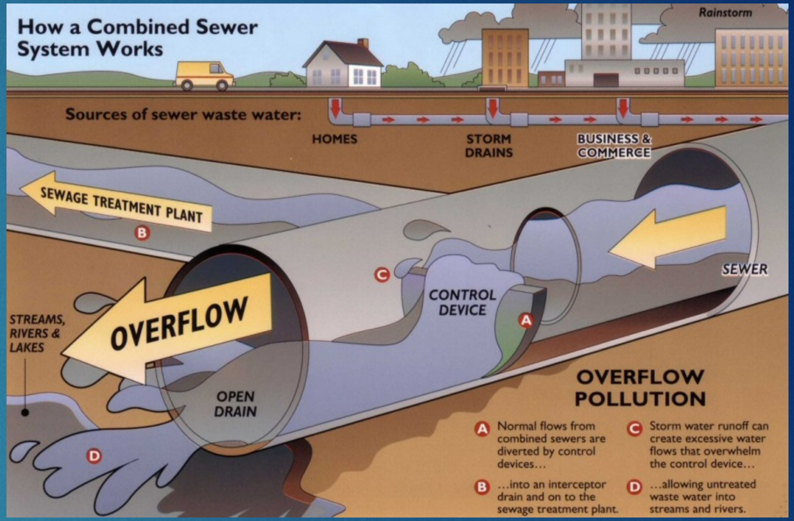
- Established in 1967 by Albany, Rensselaer, Saratoga, and Schenectady Counties
- Conduct audits, studies and research programs which address regional needs and improve community services and distribute the information
- Consult and cooperate with appropriate state, municipal and public or private agencies in matters affecting the region, including, but not limited to the general protection, enhancement, quality of life, growth and development of the region;

Key Program Areas

- Economic Development
- Regional Mapping and Analytics
- Sustainability
- **Water Quality**
- Land Use and Transportation
- Human Services

Water Quality

- **604(b) Clean Water Program**
  - Regional comprehensive water quality management planning activities.
- **CSO Long Term Control Plan**
  - The cities of Albany Cohoes, Rensselaer, Troy and Watervliet; and the Village of Green Island.
  - Coordinate programs and projects that will result in meeting the state WQ standard in the Hudson River



GI Local Laws – Project Team

- CDRPC
- Barton & Loguidice, D.P.C.
- Harris Beach, P.L.L.C.
- Ryan Biggs | Clark Davis Engineering & Surveying, D.P.C.
- O'Brien & Gere, Inc.

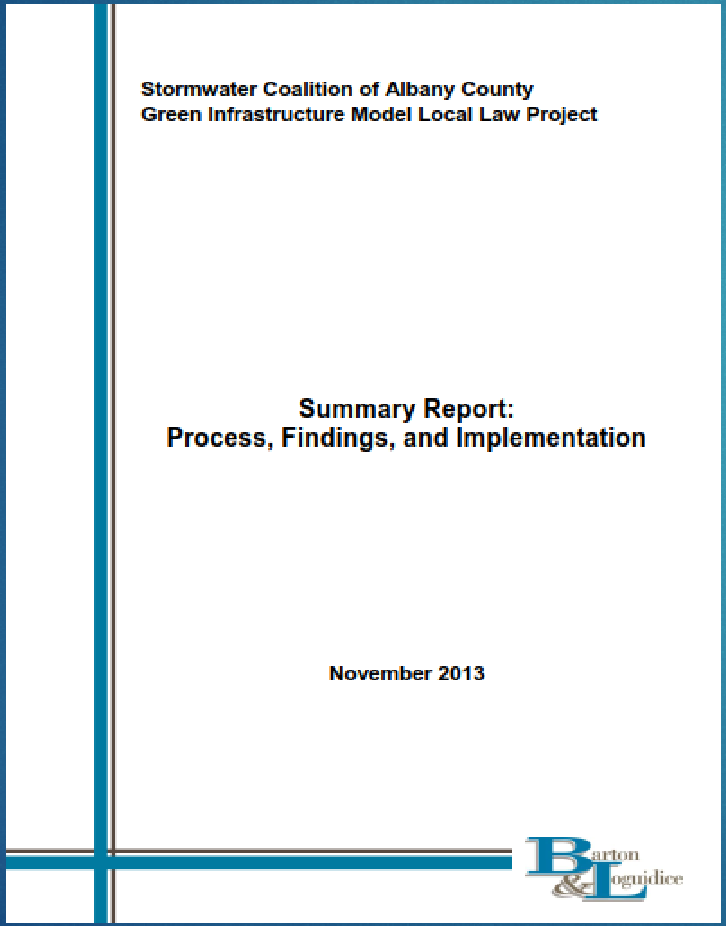
What is Green Infrastructure?

Green infrastructure is an approach to stormwater management that protects, restores, or mimics the natural hydrologic cycle via use of natural and aesthetically pleasing green *practices* that promote infiltration, detention, reuse, and uptake of stormwater that would otherwise leave the site as runoff.

But, Green Infrastructure is also:

Land use, transportation, and conservation policies and programs that preserve natural resources, limit impervious surfaces, encourage density and promote development in previously disturbed areas.

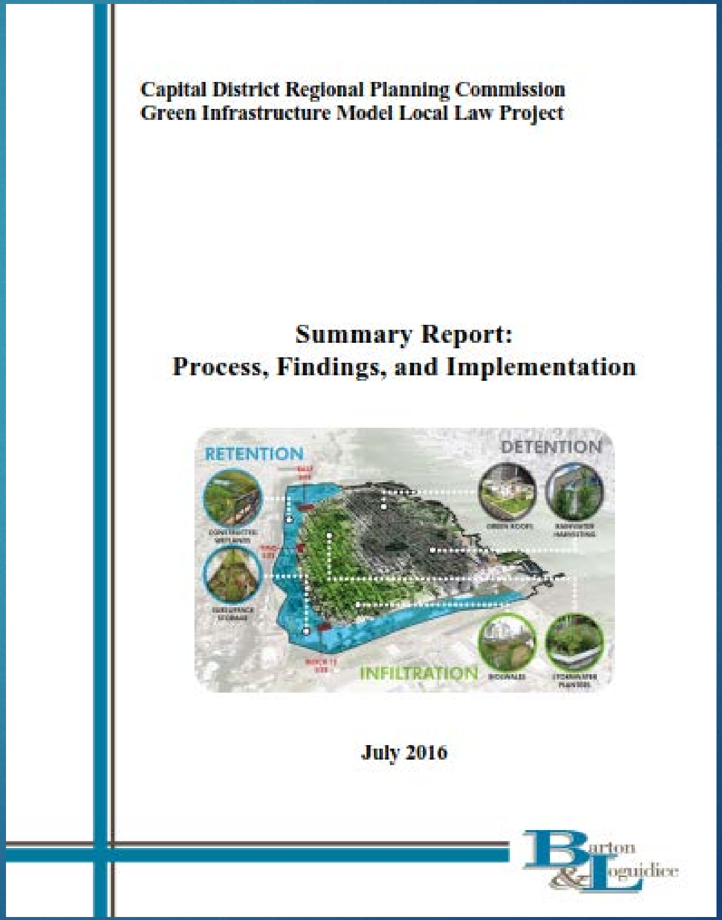
Where did the Audit come from?


Stormwater Coalition of Albany County
Green Infrastructure Model Local Law Project

Summary Report:
Process, Findings, and Implementation

November 2013

Barton & Loguidice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July 2016

Barton & Loguidice

Research Resources

- Codes Developed through Albany County Stormwater Coalition GI project
- Follow-up audit results from APC communities who participated in the Albany County Stormwater Coalition GI project
- City of Chicago, IL "Green Alleys" and Stormwater/GI Code
- Maryland: "Models and Guidelines for Infill Development":
- EPA:
  - "Smart Growth And Economic Success: Investing In Infill Development"
  - "Attracting Infill Development In Distressed Communities: 30 Strategies"
- Georgia (Department of Community Affairs): "Infill Development Program"
- Nashville, TN: Low Impact Development GI Design Sheets and Infill GI and Stormwater requirements
- City of Portland, OR: Accessory Dwelling Unit Standards
- Washington State Municipal Research and Services Center: Accessory Dwelling Unit guidance
- City of Seattle, WA: Accessory Dwelling Unit standards
- Pima County, AZ: Guest House Code
- Alexandria, VA: "Del Ray Parking Study" Sample Shared Parking Agreement
- Utica, NY: Long Term Control Plan
- New York, NY: GI Language (Construction Code, Zoning, GI Program)
- City of Philadelphia Stormwater Management Guidance Manual, Version 3.0, Dated July 2015
- Buffalo Sewer Authority Stormwater Program

Audit Process

1. Identify land use controls and decision makers
2. Complete audit(s)
3. Obtain model codes and guidelines for consideration

Phase I

IDENTIFY LAND-USE CONTROLS AND DECISION MAKERS

Identify Development Rules and Guidance

- Gather the key documents that contain the development rules in your municipality
  - A list of potential documents to look for is provided with the audit as a checkbox
  - May be hidden in supporting design manuals, review checklists, plans, guidance documents or construction specifications

Stormwater Management Codes

Zoning Codes

Storm Sewer Codes

Comprehensive Plans

Local Waterfront Revitalization Program Plans

Other supporting documents

GI Code Audit

References and Source Material

Instructions for this section:

- Please check or chose the source material document you have to upload or link.
- If you do not have said source material document, choose 'None' and proceed to next question.
- You have the option to either upload a file of the document or link us to a website page that has the document; chose either one to provide us with the source material requested.
- If a source material is located within a previously uploaded or linked document, then upload or link the specific page(s) pertaining to the requested source material or reference; IF that is not possible, then upload or link the entire document again.

1. **Comprehensive Plan and/or Draft Comprehensive Plans Undergoing Review**

Check all that apply.

- ☐ Comprehensive Plan
- ☐ Draft Comprehensive Plans Undergoing Review
- ☐ None

2. **Zoning Ordinance/Local Law**

Identify Key Personnel

- Completing this step will provide you with a better understanding of the intricacies of the development review process, and for contacts to speak with to obtain answers to the audit questions or obtain more information
  - You may wish to identify and assign a different representative for each section of the audit

GI Code Audit

Information for Responsibility of Development

25. Sets Road Standards

First Name

Last Name

Title

Agency

Email Address

Phase II

COMPLETE CODE AUDIT

Local Law audit - Scorecard

Four key areas:

- **Reduction of Impervious Cover**
- **Preservation of Natural Areas and Conservation Design**
- **Design Elements for Stormwater Management**
- **Promotion of Efficient, Compact Development Patterns and Infill**

Category I

REDUCTION OF IMPERVIOUS COVER

6. Does your community have an official multi-use trails plan?

- ◯ Yes
- ◯ No
- ◯ Unknown

7. Has your municipality adopted Complete Streets legislation?

- ◯ Yes
- ◯ No
- ◯ Unknown

8. Does your municipality's residential subdivision regulations require news streets to incorporate stormwater retention, detention, and/or infiltration features?

Check all that apply.

- ☐ Retention & detention

9. Does Your municipality's residential subdivision regulations require news streets to incorporate stormwater retention, detention, and/or infiltration features?

Check all that apply.

- [x] Retention & detention
- [x] Infiltration
- [ ] None
- [ ] Unknown

Show where in your code (include page number/subsection/link to document).

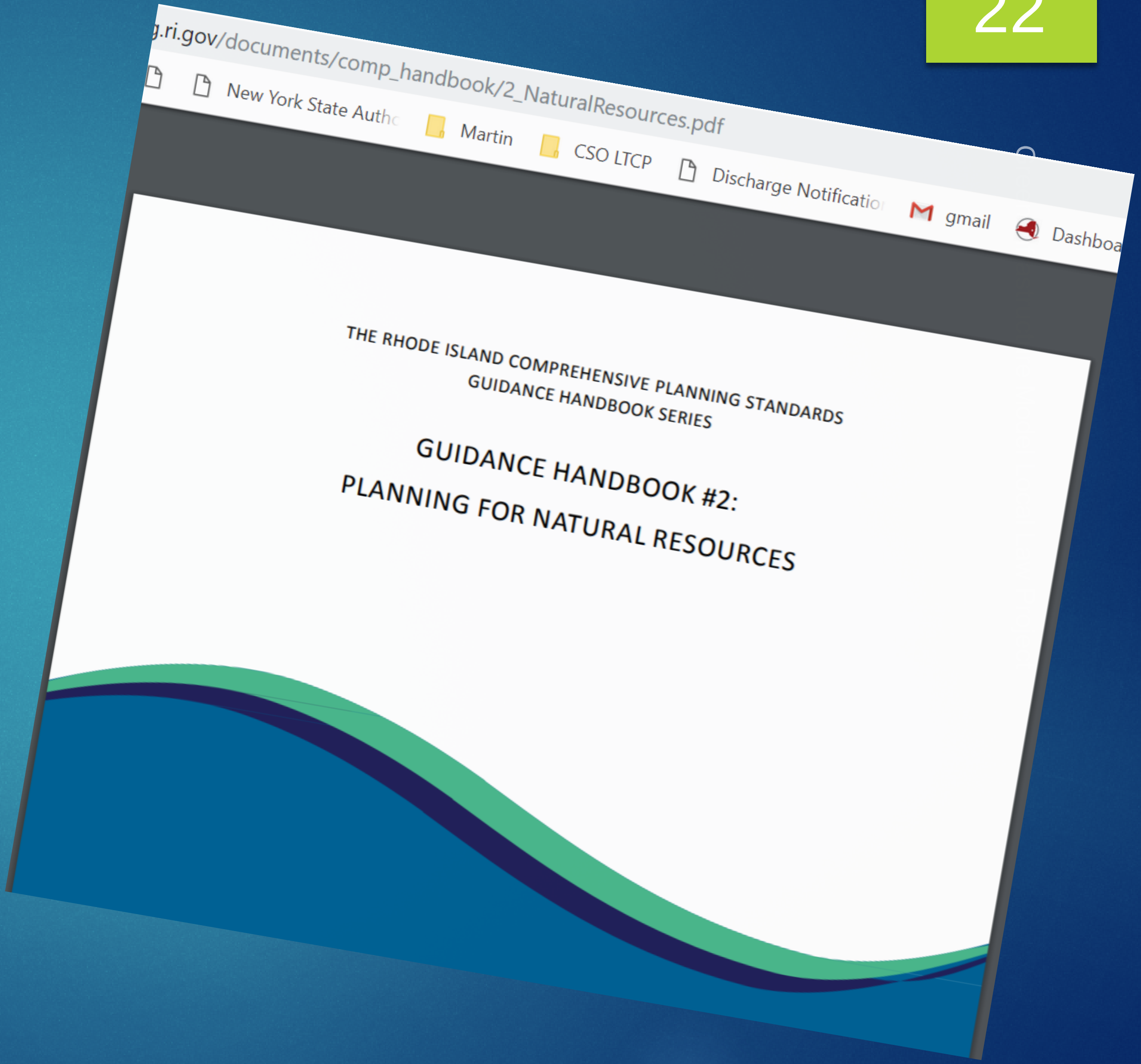
SS 105.21

10. What is the minimum right of way (ROW) width for a residential street?

- ( ) 40 feet or less
- ( ) 41 feet or more
- ( ) Unknown

Category II

PRESERVATION OF NATURAL AREAS AND CONSERVATION DESIGN


.ri.gov/documents/comp_handbook/2_NaturalResources.pdf
New York State Auth
Martin
CSO LTCP
Discharge Notificatio
gmail
Dashboa
THE RHODE ISLAND COMPREHENSIVE PLANNING STANDARDS
GUIDANCE HANDBOOK SERIES
GUIDANCE HANDBOOK #2:
PLANNING FOR NATURAL RESOURCES

GI Code Audit Survey: All Categories

Category 2: Preservation of Natural Features and Conservation Design: Locating Sites in Less Sensitive Areas

34. Does the municipality have a floodplain management ordinance or local law that prevents filling in or new construction in the 100-year floodplain?

- ○ Yes
- ○ No
- ◉ Unknown

Comments/Elaborate

Category 2: Preservation of Natural Features and Conservation Design: Stream and Wetland Buffers

41. Does the municipality have a stream buffer ordinance or local law?

- (•) All streams
- ( ) Some streams
- ( ) No streams
- ( ) Unknown

What is the minimum buffer width (in feet)?

And where in your code (include page number/subsection/link to document).

Category III

DESIGN ELEMENTS FOR STORMWATER MANAGEMENT

GI Code Audit Survey: All Categories

Category 3: Design Elements for Stormwater Management: General Questions

63. Has your community adopted a Green Infrastructure Design Manual to guide the installation of green infrastructure?

- ◯ Yes
- ◯ No
- ◯ Unknown

64. Does your municipality set limits on peak flow rate from site stormwater discharge?

- ◯ Yes
- ◯ No
- ◯ Unknown

Category IV

PROMOTION OF EFFICIENT, COMPACT DEVELOPMENT PATTERNS AND INFILL

GI Code Audit Survey: All Categories

Category 4: Promotion of Efficient, Compact Development Patterns, and Infill

81. Have areas of municipality been zoned for higher density development based on following:

- ☐ existing infrastructure capacity
- ☐ cost for providing new services
- ☐ access to transit
- ☐ Unknown

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82. Does your ordinance differentiate between previously undisturbed, adaptive reuse, and infill sites?

- ○ Yes
- ○ No

Phase III

RESULTS AND MODEL CODES AND GUIDELINES FOR CONSIDERATION

Provision of Codes

- CDRPC will aggregate the audit results
- CDRPC will provide model codes, guidelines, and reference documents based upon results of the audit
- This tool is diagnostic and CDRPC will provide recommendations, but implementation is the responsibility of, and at the discretion of, the community

Laws Vs. Guidelines

- Minimum Action Level
  - "Should" guidelines and bonuses
    - Suited for planning board or BZA consideration
- Best Management Action Level
  - "Shall" Requirements but generally low standards, ratios and percentages
- Model Community Action Level
  - Most stringent, progressive standards that are best suited for communities with acute and/or chronic water quality and/or local flooding issues

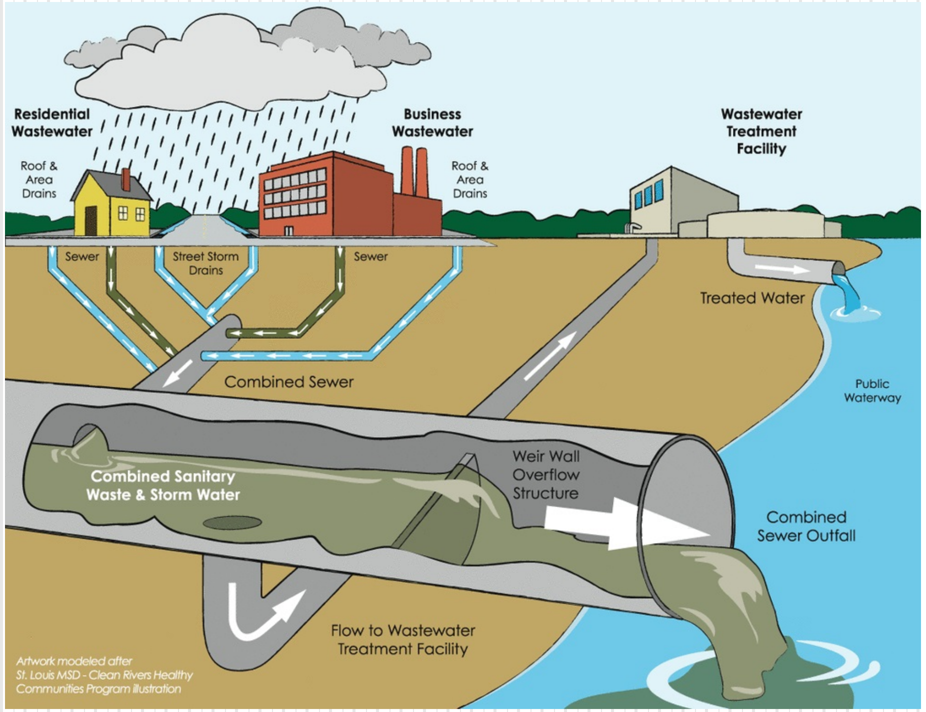
About the Laws and Guidelines

- Dimensions, ratios, percentages, etc. are adjustable – with recommendations on a progressive scale
- Local law language represents a collection of codes that can be pulled from as deemed applicable, or used as a whole
- Each section represents a stand-alone suggested practice/language, and Communities can decide which to implement

Green Infrastructure Toolkit

Mission Statement

- To provide customizable green alternatives to traditional stormwater management on small sites to promote:
  - greener landscapes
  - reduction of heat island effect
  - removal of stormwater pollutants
  - reduction in the incidences of combined sewer overflows



Use and Objectives

- This Toolkit is intended for use on non-residential projects that disturb less than or equal to 1 acre.

- The New York State Department of Environmental Conservation (NYSDEC) and the local Municipal Separate Storm Sewer (MS4) requirements apply to projects that disturb more than 1 acre. http://www.dec.ny.gov/chemical/43150.html

- This Toolkit is intended to supplement the NYSDEC Stormwater Management Design Manual (Design Manual). Practices and definitions included in the Design Manual are acceptable for use on some smaller sites. http://www.dec.ny.gov/chemical/29072.html

- Some of the Design Manual requirements have been relaxed or modified to make green infrastructure (GI) practices easier to adopt for small and challenging sites, particularly urban redevelopment projects.

GI Practices

- **Impervious Area Reduction Practices:**
  - Tree Planting
  - Disconnect Impervious Areas
  - Green Roofs
  - Porous Pavement
- **Infiltration Only Practices**
  - Infiltration Basin
  - Infiltration Trenches
  - Infiltration Chambers and Drywells
  - Shallow Soil System
- **Vegetated Swale**

- **Infiltration or Flow Through Practices**
  - Porous Pavement
  - Vegetated Swale
  - Bioretention Practices
    - Rain Gardens
    - Stormwater Planters
    - Bioretention Areas
- **Rainwater Harvesting**
  - Rain Barrels and Cisterns
- **Flow Through Only Practices**
  - Dry Swale

Changes from NYS DEC Stormwater Design Manual

- Only Applies to sites 1 acre or less.
- Applies to both new and redevelopment sites.
- Focuses on reduction of the runoff volume (RRv). The RRv calculation is simplified to 1" of rain times the directly connected impervious areas of the site.
- Establishes a hierarchy for GI practice selection:
  - Reduce Impervious areas.
  - Use infiltration practices where feasible.
  - Use Flow through practices only where infiltration is not feasible.
- RRv requirements can be met by reducing the existing impervious area by 15%.
- Increases impervious area reduction credit for tree planting from 100 ft^2 to 150 ft^2.
- Reduces pretreatment requirements.

Changes from NYS DEC Stormwater Design Manual

- Reduces separation distance to groundwater from 3' to 2'.
- Reduces minimum infiltration rate required for infiltration practices from 0.5"/hour to 0.2"/hour.
- Increases maximum time to drain practices to 3 days.
- Increases allowed ponding depth for bioretention areas from 6″ to 1'.
- Requires flow through practices to slowly release the RRv over 72 hours if possible.
- Reduces minimum orifice size to ½" diameter when using underdrains to allow for slower release rates.
- Allows infiltration to area of shallow permeable soils, including engineered fill soils.
- Relaxes requirements for disconnected runoff.

Runoff Reduction Sizing

- ***Water Quality Volume (WQv)*** is the volume of runoff from the site that must be captured and treated to reduce downstream pollution from stormwater.
- The rainfall used to calculate the WQV is based on the 90%, 24 hour rainfall event (only 10% of rainfall events exceed this value).
- ***Runoff Reduction Volume (RRv)*** is the portion of the WQv treated by GI practices. The RRv is calculated as follows:

RRv = 1"/12 x Aic

Where:

RRv = is the stormwater volume to be managed through GI.

Aic = Area of directly connected impervious cover (new and/or redeveloped) in square feet.

Runoff of 1" is divided by (12"/1 ft) to obtain the volume in cubic feet.

Practice Selection Flow Chart
Let’s get started…..

1

- Plan to reduce area of roofs, parking lots and other impervious surfaces.
- Maintain grass areas, buffers, sensitive resources.
- See Planning Tips.

2

- Determine the Runoff Reduction Volume (RRv) for the site.
- The RRv is the amount of stormwater to be collected and managed through green infrastructure practices to reduce pollution and downstream impacts.

3

- Check Soils. If Hydraulic Soil Group (HSG) A or B then maximize use of infiltration practices.
- HSG C or D soils may not be suitable for infiltration. See Soils and Infiltration Testing.

4

- Apply other GI practices to manage the remaining RRv after applying infiltration practices have been utilized to the maximum extent feasible.

Impervious Area Reduction

- Reducing the area of impervious cover directly reduces both the volume of runoff and the peak discharge from the site for all storm events.

For the purposes of this Tool Kit, a project that reduces the impervious cover area by 15% from existing conditions has satisfied the RRv Requirements.

Green Roofs in the Capital Region

Doane Stuart School, Troy, NY

- 22,000ft^2 multi-use green roof system
- Project design and construction funded through a $1.4 million EFC GIGP grant
- Stormwater runoff reduction of 50%-90%
- http://www.doanestuart.org/academics/green-roof-2/

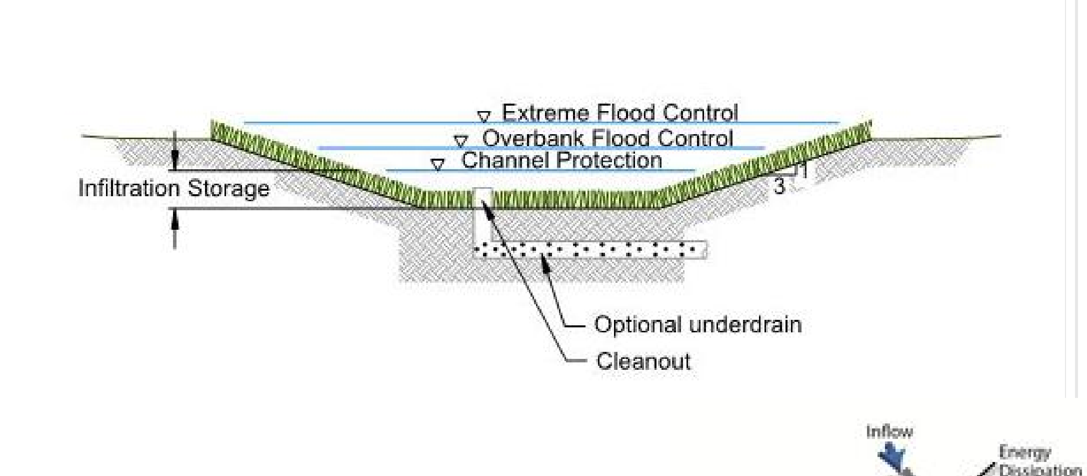
Infiltration Practices

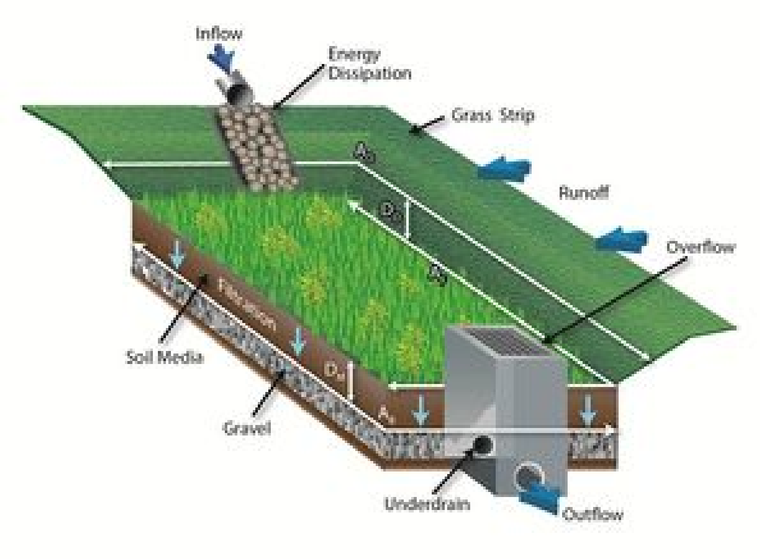
- In addition to these practices, there are a number of GI practices can be designed as either infiltration systems or flow through systems with underdrains. Use the infiltration type systems whenever possible:
  - Porous Pavement with infiltration
  - Bioretention Area with infiltration
  - Stormwater Planter with infiltration
- Underdrains from Flow Through GI practices can be directed to infiltration practices.
- Design guidance:
  - All infiltration practices require suitable soils with a minimum infiltration rate of 0.2"/hour. (reduced from Design Manual minimum of 0.5"/hour).

    Refer to Soils and Infiltration Testing.
  - Maintain a minimum of 2' separation to groundwater or bedrock. May not be permitted or greater separation distance may be required for "hot spots", over aquifers, or as required by local requirements.
  - Keep infiltration practices 10' away horizontally from buildings and foundations and 100' from onsite wells. The separation distance to buildings can be reduced with careful design to prevent water from entering basement areas.

Infiltration

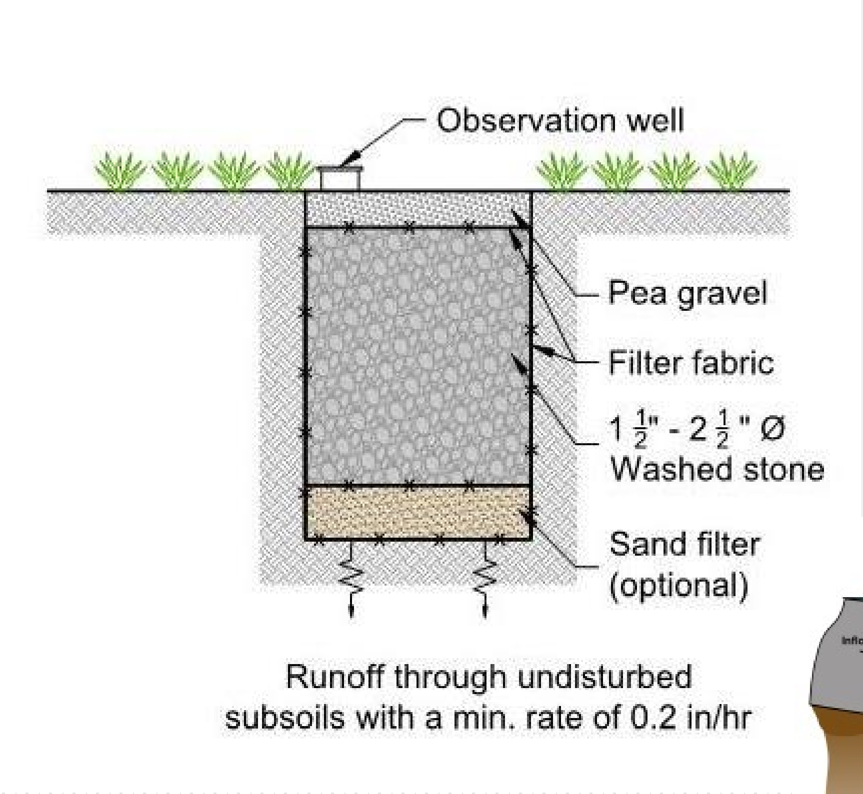
INFILTRATION BASIN

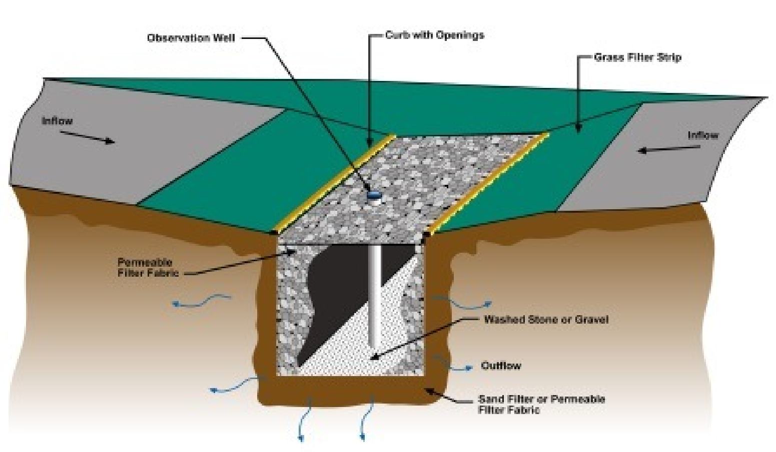




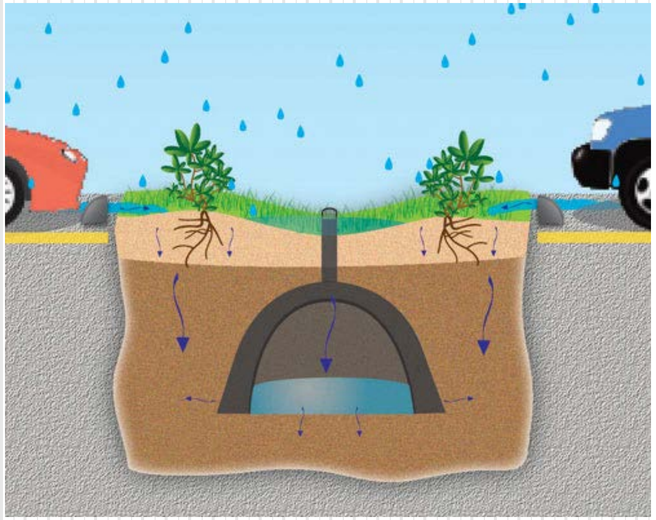
Infiltration

INFILTRATION TRENCH

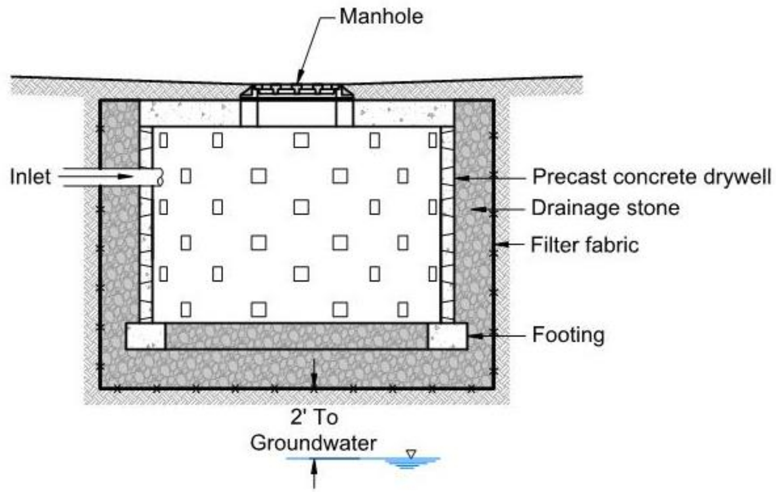




Infiltration Chambers & Drywells



Storm Chambers

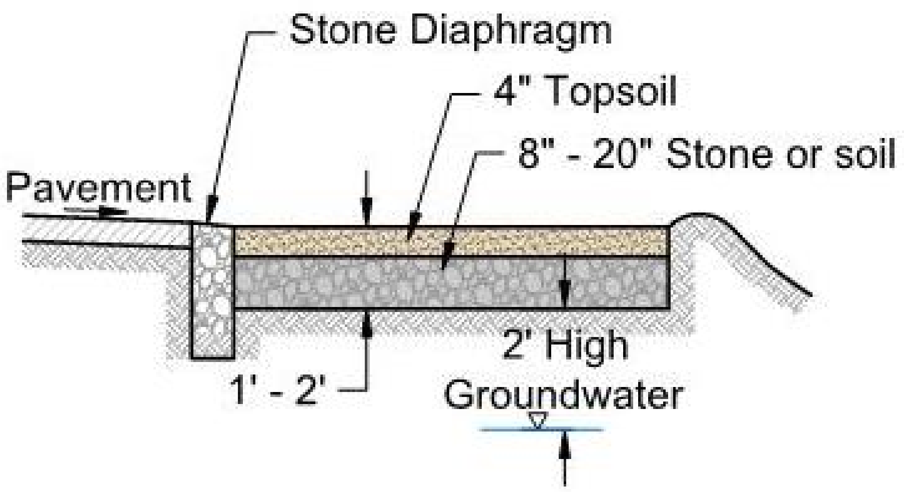


Drywell

Infiltration Practices

- **Shallow Soil System**
  - Stormwater from small impervious areas can be directed to a shallow soil system.
  - A shallow soil system consists of a 1' to 2' layer of soil, either native or imported fill. (This is a variance from the Design Manual which does not allow infiltration in fill).
  - Existing disturbed soils should be restored (see Design Manual, 5.1.6).
  - The upper 4" layer is topsoil to support turf. The soil below can be native permeable soils or imported fill.
  - The shallow soil system is designed to store the RRv within the void spaces in the 1' to 2' depth of soil. Porosities will vary from 0.2 for topsoil to 0.4 for drainage stone.
  - Underdrains and/or surface overflows will be needed where the underlying soils are poor (< 0.2"/hour infiltration).

Shallow Soil System

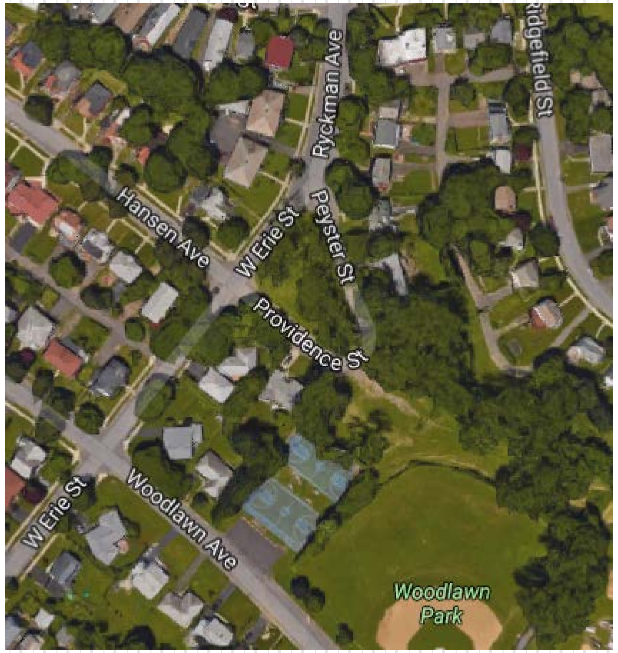


Local Infiltration Project: Ryckman and Hansen Overflow Abatement Project, City of Albany, NY

Project Included:

- Modifications to existing stormwater conveyance.
- Utilization of existing underground detention system.
- New constructed wetland for stormwater management.
- New underground infiltration gallery.

Collectively, these practices provide for the storage of over a million gallons.



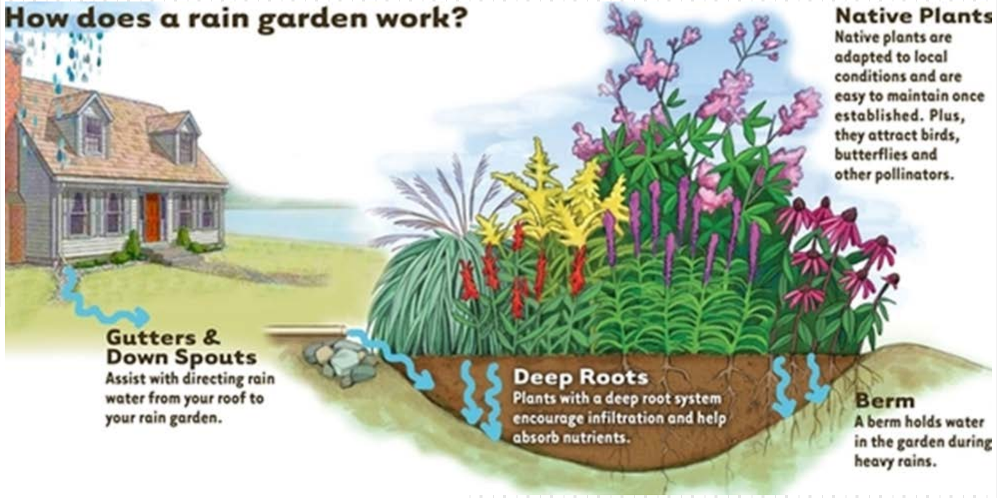
Bioretention Practices

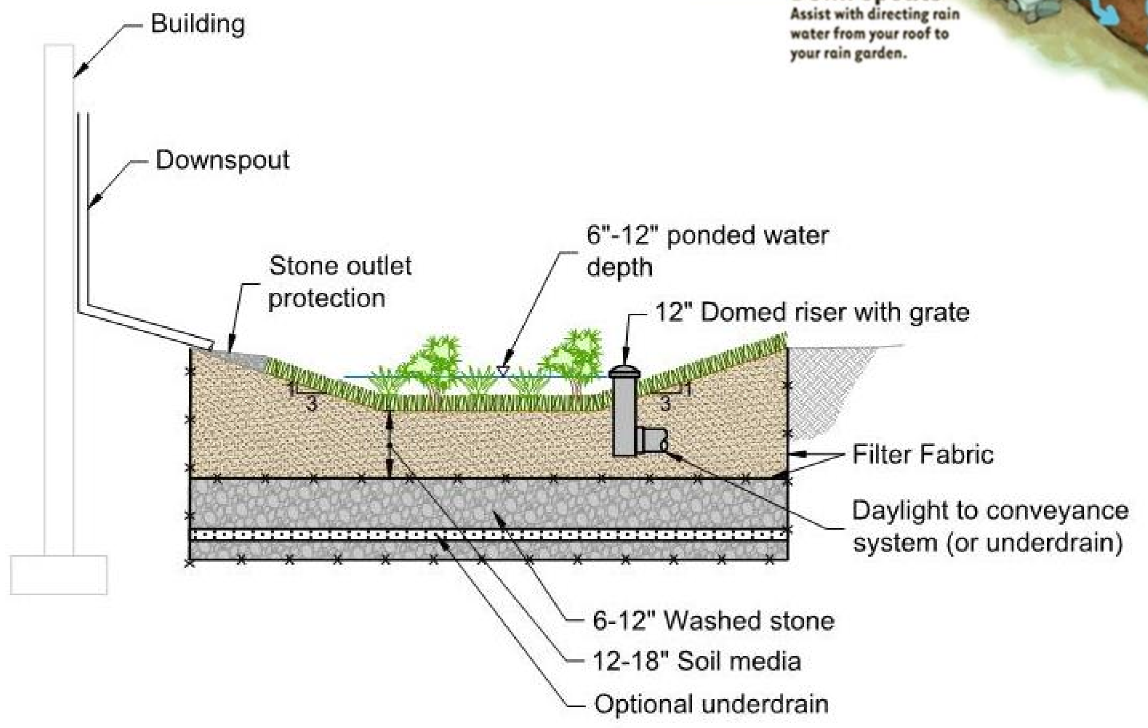
- Overview
  - Selected plants & soils used to retain and treat stormwater.
  - Can be infiltration type (preferred) or flow through type.
  - The Design Manual describes bioretention areas, rain gardens and stormwater planters. These are all bioretention practices. The terminology may vary between references.
- Where to use
  - Use for roof runoff, paved plazas or sidewalk areas, parking lot medians and along drives.
- Bioretention – Infiltration Type
  - Use as first choice if soils are suitable (infiltration rate > 0.2 inches/hour).
  - Keep infiltration practices 10' away horizontally from buildings and foundations. The separation distance to buildings can be reduced with careful design to prevent water from entering basement areas.

Bioretention – Flow Through Type

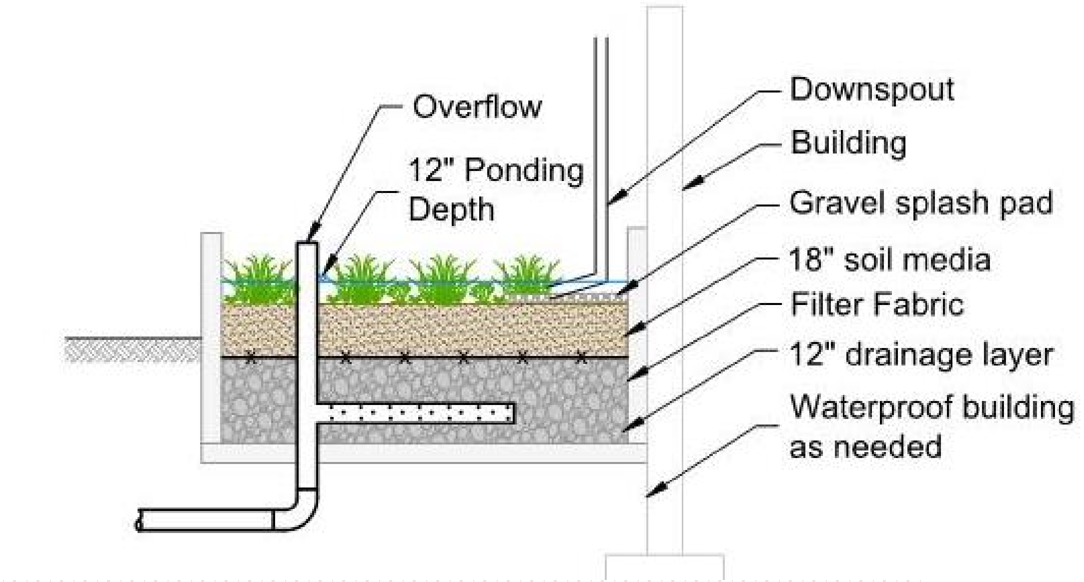
  - Requires underdrain with discharge to storm system or separate infiltration practice.
  - Provides water quality treatment, temporary storage of the RRv and some reduction in peak runoff when the release rates are controlled.

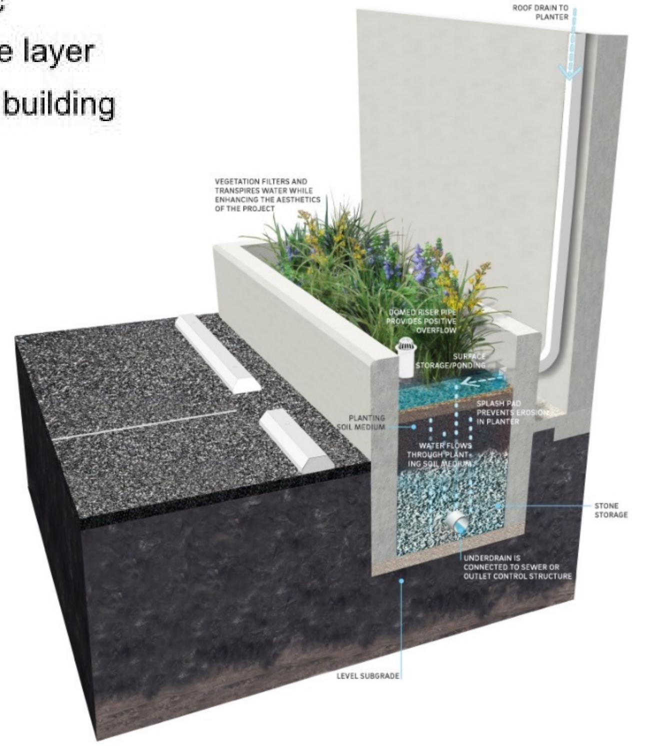
Rain Gardens



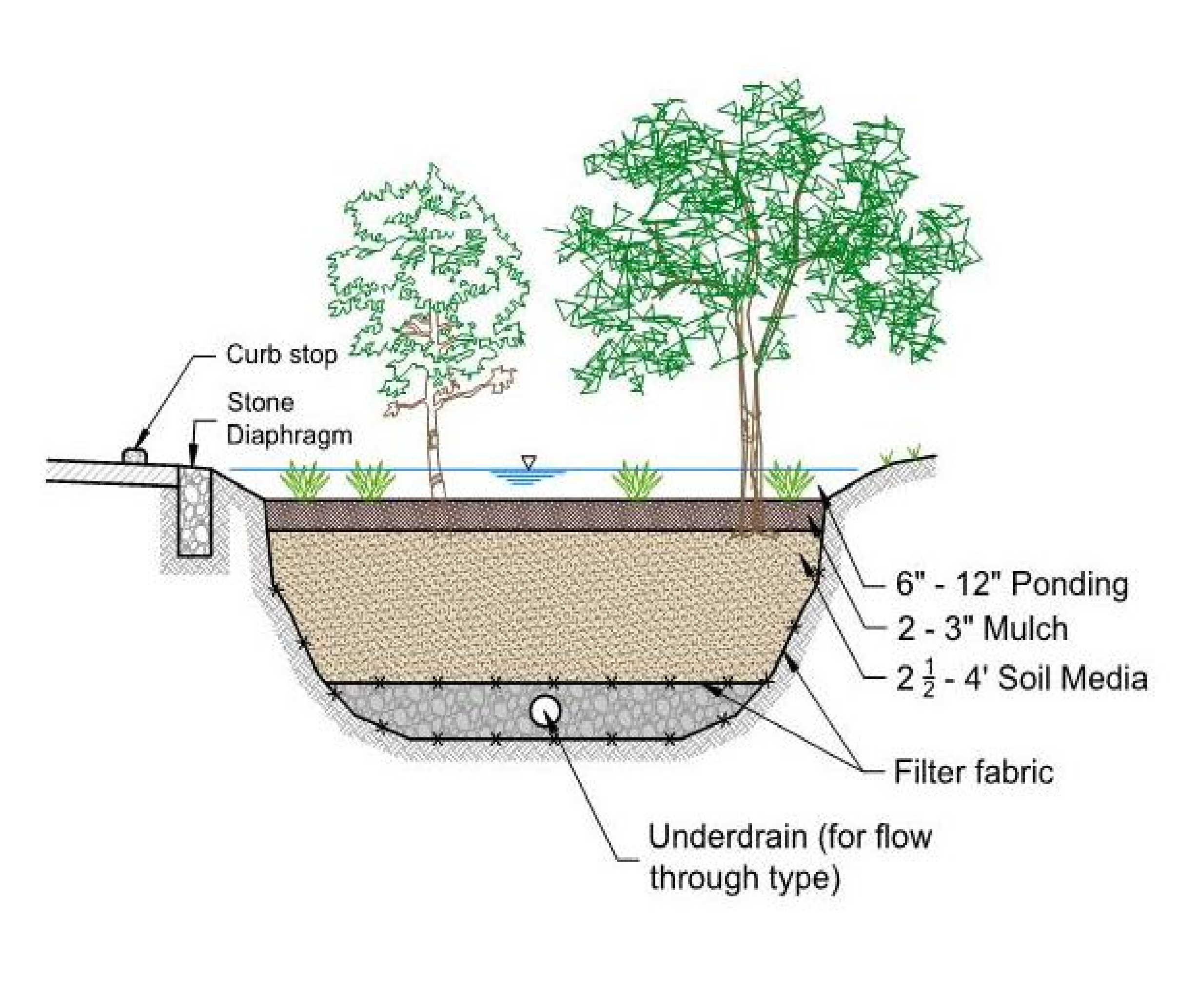


Stormwater Planter – Flow Through Type





Bioretention Area



Bioretention Area

City of Pittsfield, Ma.

City of Watervliet

Bioretention Sizing Example – Flow Through

Bioretention Area - Flow Through			
Area of practice is sized to store the RRv as ponding above soil media			
Required Area, A = (RRv)/dp			
Average height water above bed, havg= dp/2			
Hydraulic gradient, i=(ds+havg)/ds			
Flow through filter, Q = (k)(i)(A)			
Time to Drain, t = RRv/Q			
Item	**Input**	**Units**	**Notes**
Runoff Reduction Volume, RRv	1000	ft^3	
Depth of Ponding, dp	1	ft	Maximum 1’
Required Area, A =	1000	ft^2	
Depth Soil Media, ds	2.5	ft	Typically 2.5'-4'
Soil Permeability, k	0.5	ft/day	Typically 0.5 to 2 ft/day
Avg. height water above bed, avg.	.5	ft	
Hydraulic gradient, i	1.2		
Flow through Practice, Q	600	ft^3/day	
Time to Drain, t	1.67	days	Maximum 3 days

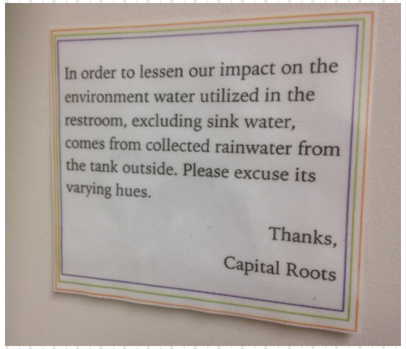
Capital Roots Cistern

Capital Roots in Troy, NY has an insulated cistern that holds 5,200 gallons of stormwater, collected from the rooftop. The water is used year round for flushing toilets and landscaping and has resulted in a 50% reduction in water needs at the facility.

An aerator prevents the cistern from freezing and automatic valve, with a backflow preventer, ensures that there is a back-up municipal water supply on hand in the event of the system runs dry or there is a power outage. After several months of use, the system is reportedly working well with only a few small modifications. Small particles of organic material do collect in the rainwater creating a tan, greyish color.

There was some alarm about the color of water in the toilets, as folks unfamiliar with the rainwater system believed something was amiss with the water supply. Although the discoloration from organic material in the harvested rainwater is normal, the project manager thought this could easily be rectified by posting a sign and switching out the system filter to a smaller micron rating. Only rarely has the cistern ever filled beyond capacity. An overflow is built in and this drains to a bioretention practice.

For more information go to: http://www.capitalroots.org/



Outlet Control For Flow Through Practices

- The release rate is calculated as follows:

  $Q=V/T$

  Where:

  Q = release rate flow in cfs

  V = Volume stored in practice (RRv)

  T = release time.   Target = 3 days.

- Using an orifice for outlet control, the release rate or orifice flow is calculated as follows:

  $$Qf = C \times A \times \sqrt{2gh}$$

  Where:

  Qf = orifice flow in cfs

  C = Orifice Coefficient, typically 0.6

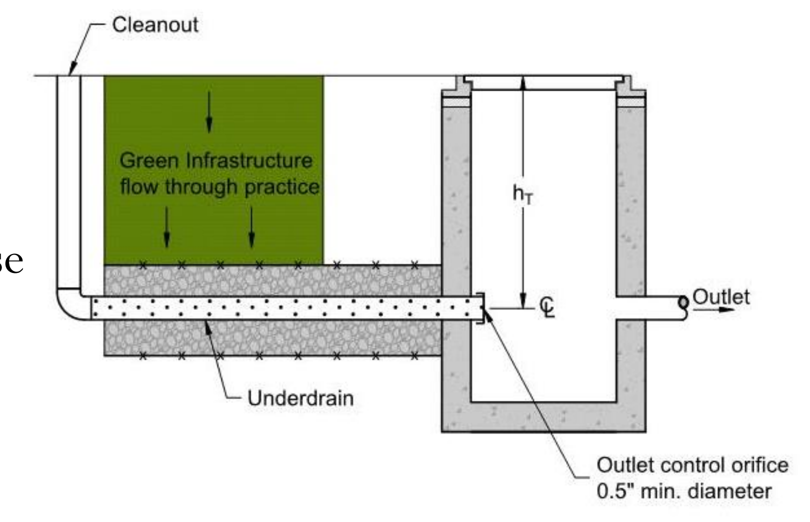
  A = area of orifice, ft^2

  g = acceleration constant 32.2 ft/s^2

  h = average head from center of orifice. = $(h_t - h_0)/2$

  h_t = total maximum head (see sketch)

  H_0 = minimum head (when drained=0) measured from center of orifice.



Planning Guide - GI Banking and Vacant Lots

- The APC has completed a Feasibility Study for a **Green Infrastructure Banking System**.
- Implementation of this program would provide alternatives for difficult sites that are unable to meet stormwater management requirements.
- The Albany County Land Bank Corp., and the Troy Community Land Bank, acquire vacant, abandon and tax foreclosed lots and sells them to eligible buyers.
- Vacant lots present a great opportunity to implement GI practices that can be incorporated into a GI banking program.
- From a stormwater management perspective, particularly in CSO areas, redevelopment of vacant lots should:
  - Encourage uses that maximize pervious surfaces such as pocket parks and community gardens.
  - Minimize impervious surfaces. Porous pavement options should be used where feasible for redeveloping vacant lots for parking.

Cost of Selected GI Practices

GI Practice	Range - $/treated ft^3
Rain Gardens	$3-$6
Stormwater Planters	$21-$41
Bioretention Areas	$9-$46
Infiltration Trench/Drywell	$12-$15
Permeable Pavers	$109-$164
Rain Barrels	$7-$28
Cisterns	$14-$26

From: Water Environment Federation (WEF), Green Infrastructure Implementation, 2014. Costs in 2012 dollars.

Construction Considerations

- Develop and implement an erosion and sediment control plan to protect downstream properties and waterways.
- Proper construction sequencing is critical to make sure the site is stabilized prior to exposing infiltration areas to sediments that can clog these areas.
- Keep heavy equipment off of pervious areas to avoid over compaction.
- Restore Soils in pervious areas – Till to 12" depth See: Soils and Infiltration Testing.

Maintenance Considerations

- General
  - Check for erosion.
  - Integrity of structures and pipes.
  - Flows maintained as intended, soil/infiltration not clogging.
- Pretreatment
  - Remove debris and accumulated sediments.
- Vegetation
  - Water & fertilizer.
  - Weed.
  - Replant as needed.
- Rain barrels and cisterns
  - Need active management to make sure vessel is emptied in advance of storm events.
- Proprietary systems
  - Generally higher maintenance.
  - May include mechanical components.
  - Consult manufacturer's O&M manuals.

Maintenance Tasks

Maintenance Task	Recommended Frequency	Description
Porous Pavement Vacuuming	Semi-annually (2x/year) for concrete, asphalt and flexible pavement; annually in spring for pavers	Porous pavement surfaces require vacuuming to remove debris that may clog the permeable layers/voids prevent infiltration.
Porous Pavement Power Washing	Once every three years (or as necessary)	Power washing restores permeability and should follow porous pavement vacuuming. Porous pavers should not be power washed.
Porous Paver Maintenance (Restoring Aggregate)	As needed when gravel infill is not within 1/2 inch of the paver surface, immediately following vacuuming	Refilling of voids between pavers with additional aggregate material to replace any material that has been lost by vacuuming and/or due to natural migration, settlement, and erosion.
Winter Maintenance for Porous Pavements	As necessary during Winter	Porous pavement surfaces require modified plowing and salting practices during the winter months when snow is present.
Stormwater Structure Cleaning	Semi-annually (2x/year)	Stormwater Structure Cleaning refers to removing debris or clogged materials and vacuuming the interior of the structure.
Inlet Filter Insert Cleaning or Filter Insert Pouch Replacement	Clean Quarterly (4x/year) until it is determined a particular inlet requires less frequent cleaning; Replace annually	Filter inserts need to be cleaned with an industrial vacuum to remove debris and prevent clogging.

Reference: City of Rochester & Monroe County, GI Retrofit Manual, Barton & Loguidice, DPC, 2016 Draft

Maintenance Costs

Maintenance Cost Estimates vary widely, and because systematic GI use is relatively new there are limited records of existing programs. Below is an estimate of maintenance costs for a recent Green Infrastructure Project.

GI TYPE	REQUIRED MAINTENANCE	FREQUENCY	ESTIMATED ANNUAL COST ($)
Porous pavements	Vacuuming of surface Inspection & Cleaning of drainage structures	2 times per year	Avg. $0.15 / SF
Rain Gardens	Water & Care Establishment Weeding, Pruning, Mulching Inspect & Clean overflow drainage Remove litter, debris, sedimentation	4 times per year (Spring & Fall critical)	Avg. $0.30 / SF
Bioretention	Water & Care Establishment Weeding, Pruning, Mulching Inspect & Clean overflow drainage Remove litter, debris, sedimentation Erosion Control, stone apron repairs	3 times per year (Spring & Fall critical)	Avg. $0.75 / SF

Reference: City of Rochester & Monroe County, GI Retrofit Manual, Barton & Loguidice, DPC, 2016 Draft

Local GI Projects

Stormwater Coalition of Albany County
September 24, 2013 Green Infrastructure Tour
11:30am to 5:00pm

Registration and Lunch
Cook Park, Village of Colonie, New York


Stormwater Coalition Green Infrastructure Local Law Advisory Committee (GILLAC) —planning, registration, lunch coordination, troubleshooting

Helping Out For The Day: Jeremy Cramer, Town of New Scotland; Melissa Ashline-Heil, City of Cohoes; Leslie Lombardo, Albany County; Maryella Davenport, City of Albany; Mike Lyons, Town of Colonie.

Tour Host (Registration and Lunch): Village of Colonie, Carl Fleshman and Randy Rivera....waiting for the buses!

Introductions
Green Infrastructure Explained...

Nancy Heinzen
Stormwater Coalition of Albany County
Program Coordinator

Welcome!

Daniel P. McCoy, County Executive, Albany County

Getting Around—School Buses!

Antoinette Estates

Top of Rapp Road landfill

End of Tour! Cook Park

Tour Funding: *NYSDEC Environmental Protection Fund Stormwater Implementation Grant (Round 10)*
Stormwater Coalition of Albany County: *112 State Street, Room 720, Albany, NY 12203. www.albanycountystormwater.org*

Site 1: Rain Garden (Cook Park, Village of Colonie)

Background: The purpose of the rain garden is to treat small volumes of stormwater runoff using a conditioned planting soil bed and planting materials to filter runoff stored within a shallow depression. This garden receives runoff from a portion of a parking lot and was built in November, 2011. Albany County Cornell Cooperative Extension Master Gardeners designed the garden; Albany County Soil and Water Conservation District provided labor and planting material, and the Village of Colonie Department of Public Works provided equipment and helped dig the garden. The garden is maintained by the Village of Colonie. The Stormwater Coalition of Albany County monitors rain garden performance and facilitates coordination and training as needed. This is one of eight demonstration rain gardens throughout Albany County. Estimated cost of each demonstration rain garden: $1,500 (labor, equipment, materials). Plant supplier: Project Natives, Fiddlehead Creek Nursery, Helderledge, splits of plants from other rain gardens. Multiple sources of funding for all eight demonstration rain gardens.

Presenter: Susan Fezzolla, Cornell Cooperative Extension of Albany County Master Gardeners

Presenter: Randy Rivera, Village of Colonie, Stormwater Program Coordinator

Rain Garden (November, 2011)

Rain Garden (September, 2013)
Two years of growth, multiple native plants

Presenter: Susan Lewis, Albany County Soil and Water Conservation District (right of Randy Rivera)


Site 3: Green Roof (University at Albany-SUNY, Uptown Campus, Liberty Terrace Dorm)

Background: This green roof was installed in 2012 and was one of several natural and sustainable elements incorporated into the Liberty Terrace project. This LEED Gold project also includes a ground source heat pump, rain gardens, daylight maximization, and the use of recycled and locally-sourced materials. The roof garden supplier was Carlisle/S & L Roofing and from top to bottom the roof components include: Carlisle's vegetated sedum mats; Carlisle's 2.5" growth media; Carlisle's Miradrain G4; .060 White EPDM; EPDM Bonding; 1/2" securock cover-board; tapered insulation; 725 TR vapor barrier; 702 Primer; 1/2" DENS deck prime; wood deck. Carlisle's pressure sensitive molded walkway pads surround the vegetated area. An authorized contractor installed the green roof.

Presenter: Diana Delp, Registered Architect, Project Manager, University at Albany-SUNY

Presenter: Peter Spoor, Construction Manager, University at Albany-SUNY (available for questions)

Local GI Projects


Site 2: Porous Pavement, Downspout Disconnect, Soil Restoration, and Reduction of Impervious Cover (Antoinette Estates, Town of Colonie)

Background: As originally planned this was a 13 lot residential sub-division resulting in a total disturbance of 4.8 acres. The original Basic SWPPP (Erosion and Sediment Control Plan) included small rear lots and deed restricted areas. After construction commenced, to address changing market conditions, the developer favored larger lots. This resulted in a redesign of the site to include post construction stormwater practices.

Given site opportunities and constraints, various green infrastructure practices were proposed which met the needs of the developer and addressed the Town's interest in testing out and promoting green infrastructure. These practices included porous pavement for both the Town road and individual lot driveways, plus roof top disconnection. While porous asphalt had been used elsewhere in Albany County, this application involved residential, rather than commercial property and a Town road, rather than the more typical parking lot, or foot/bike path. This novel application resulted in heightened oversight of the project and careful attention to all design, construction and maintenance details. A variety of individuals participated in this project and presentation: John Dzialo, Town of Colonie Stormwater Program Coordinator; Dan Hershberg, PE, Stormwater Design Engineer; Anthony Guidarelli, Owner, Guiderelli Construction, Inc.; Bob Higgins, Town of Colonie Stormwater Inspector; Adam Wands, Town of Colonie, Stormwater Inspector.

While this site was primarily an example of porous pavement and downspout disconnection, two other green infrastructure practices were discussed as well, soil decompaction and the reduction of impervious area (i.e. via Town law...reduce street width).

Dan Hershberg, explaining the project. John Dzialo and Anthony Guidarelli available for questions.

This is the third Tour demonstration of the day. John is spraying about ~ 200 gallons of water onto the porous asphalt pavement.

After ~ 30 seconds, this is what it looks like.

John Dzialo, Town of Colonie, Stormwater Program Coordinator

1. What our test pits showed...well drained soils, suitable for porous asphalt.
2. Decompact pavement sub-grade utilizing methods as described in Deep Ripping and Decompaction (April, 2008 NYSDEC) ...VERY IMPORTANT!
3. Maintenance agreements with homeowners—critical. They need to know how to maintain their porous asphalt driveway.

Adam Wands and Bob Higgins explaining street width dimensions...this site 32' wide (wing to wing). Town standard had been 36'. Town might consider 28' wing to wing. EPA Water Quality Scorecard recommends 18—22' street width.

Downspout Disconnection —Antoinette Estates

3


Site 4: Stream and Habitat Restoration (City of Albany Rapp Road Landfill & Albany Pine Bush Preserve)

Background: June, 2009 NYSDEC issued a permit to expand the Rapp Road landfill (23-acre overfill; 15 acre lateral landfill expansion; extend life of landfill by 7 years assuming currently approved maximum daily tipping rates). Permit requires several actions to minimize and mitigate adverse environmental impacts. One action "...the City fully implement an Albany Pine Bush Ecosystem, Habitat Restoration Plan..." Restoration Plan: create ~20 acres of wetlands; 3200 feet of stream, native plant nursery. Phasing: restore ~ 130 acres of Preserve lands surrounding landfill; test native plant restoration on a closed portion of landfill; restore ~ 130 acres on the closed landfill

Landfill

Stream restoration (Patroon Creek tributary)

Native plants

Stream and Habitat Restoration Albany Pine Bush Preserve

Presenters:

Left to Right:

Joe Giebelhaus, City of Albany Landfill, Solid Waste Manager

Neil Gifford, Albany Pine Bush Preserve Conservation Director

Top of Rapp Road landfill

Landfill Expansion

As the landfill closes, the NYSDEC Permit requires the restoration of closed portions (cap and contour with native sand and plant natives)

Solid waste

4

Additional References

General References that include extensive stormwater tools and resources:

- US Environmental Protection Agency (USEPA)
- University of New Hampshire Stormwater Center
- The Center for Watershed Protection
- Low Impact Development Center
- The Water Environment Federation
- National Association of City Transportation Officials, *Urban Street Stormwater Guide*.

New York State Department of Environmental Conservation (NYSDEC)

- Stormwater Management Design Manual
- NYS Standards and Specifications for Erosion and Sediment Control (Blue Book)
- Better Site Design

New York City

- Guidelines for the Design and Construction of Stormwater Management Systems
- NYC Green Infrastructure Plan (Includes GI cost estimates)
- NYC Standards for Green Infrastructure (Includes CAD drawings)

City of Chicago

- Stormwater Management Ordinance Manual
- Green Alley Handbook

City of Philadelphia

- Stormwater management Guidance Manual
- Green Street Design Manual
- Green Streets Details (CAD drawings)
- Green Stormwater Infrastructure Standard Details (CAD Drawings)
- Green Stormwater Infrastructure Planning & Design Manual
- Green Stormwater Infrastructure Landscape Design Guidebook

City of Portland

- Stormwater Management Manual
- Presumptive Performance Details (CAD drawings)
- Stormwater Simplified Typical Details (CAD drawings)
- Green Street Typical Details (CAD drawings)

City of Rochester and Monroe County

- Green Infrastructure Retrofit Manual

Online GI audit:

http://cdrpc.org/green-infrastructure-code-audit/

GI toolkit:

https://cdrpc.org/programs/water-quality/green-infrastructure-toolkit

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