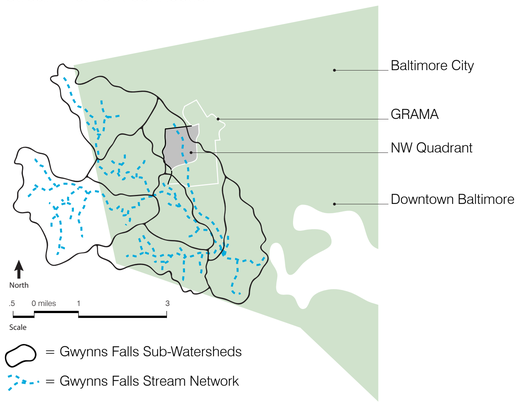
[Stormwater “Check”points]

How can we use urban ecology as a revitalization strategy for stabilizing and growing cities?

Inspiration:

Stream network connection



Through initial analysis, the dynamic ***stream networks*** that flow through the Baltimore City portion of the Gwynns Falls sub-watersheds have been discovered to have an extension that cuts directly through the North West Quadrant of our Grama study area. Therefore, this highlighted ecological characteristic inspired prominent opportunity to ***educate*** the public on significant ***stormwater qualities*** that extend from the BES research goals.

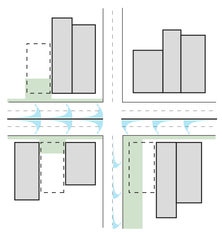
BES utilized goals:

There are several different aspects to this proposed project that includes ***BES goals and principles*** within the given design and functionality.

BES Illustrate the importance of ***stormwater*** within the community and highlight ***infrustructure*** that supports the ***collection, harnessing, and cleansing of street and roofwater runoff.***

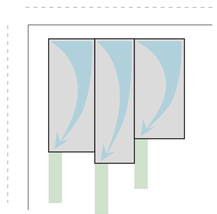
BES Allow community visitors and residents to develop and use an ***understanding*** of the metropolis as an ***ecological system*** through ***visual and physical interaction*** with the site’s features.

Types of “Check”points:



Commercial “Check”points:

Stormwater found to be flowing down high density ***roadways*** will be directed into proposed ***rain garden bioswales*** implemented on adjacent vacant lots and vacant corner intersections.



Residential “Check”points:

Stormwater found to be flowing from individual ***rooftops*** will be directed from their downspouts and into proposed ***rain garden bioswales*** implemented at the ground level daylighting location for that particular residence.

Site and program selection:

Urban stormwater pollution generates several different ecological and health issues for communities when not taken care of properly. With Baltimore’s high density development, the chance to ***harness*** *stormwater* **collected** from high density streets and an assemblage of rooftops provides the area with an ***experiential opportunity to redirect and cleanse the polluted rainwater*** before it is directly introduced into the existing stormwater systems.

This program creates a “***check***”point for urban stormwater systems:

C*ollect* surface and roofwater runoff within bioswale designs.

H*arness* stormwater within introduced permeable material.

E*ducate* the public on their community’s stormwater cleansing characteristics

C*leanse* stormwater before it enters the existing infrastructural system.

K*nit* and tie the newly cleansed stormwater into the existing infrastructural system.

Similar sites:

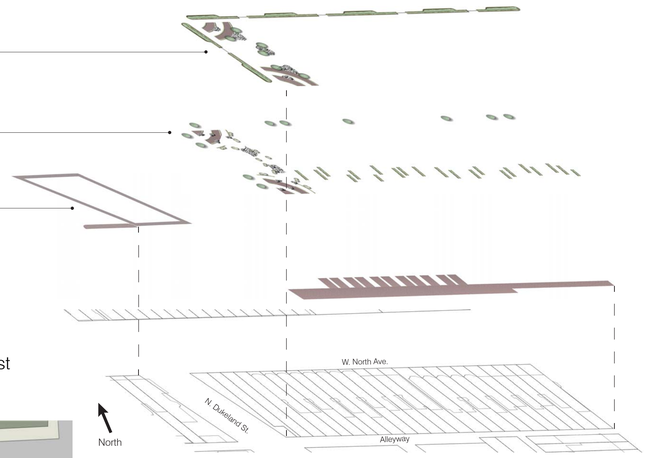
There ***25 additional vacant lots (753.6 acres)*** located along high density roadways within the NW quadrant of GRAMA that offer great opportunity to implement the proposed commercial “check”point design and assist in the community’s educational stormwater harnessing and cleansing. ***Every home*** in the Grama and greater Baltimore area has the potential to benefit from the implementation of the proposed residential “check”point design.

Phasing strategy:

Phase 1: Commercial “check”point installation, initial gathering area construction and initial rock garden installation.

Phase 2: Residential “check”point installation, final gathering area construction, rock garden connections and street tree planting.

Phase 3: Repavement of surrounding areas and surfaces.



In order to implement this design correctly and ***affordably,*** the aspect of creating multiple phases of construction will allow the city of Baltimore and the NW Quadrant of Greater Rosemont and Greater Mondawmin area to redesign the existing vacant lot in a ***timely and cost affective*** manner.

Each phase is designed to also ***stand alone*** in order to allow for time to past and funds to be provided for the extension of future phases.

Main design characteristics

-Large plantings:
- White Oak
- River Birch
- American Beautyberry
- Northern Bush Honeysuckle

- Rock garden water collection zones
- Large rock seating

- Permeability:
- Gathering areas
- Alleyway drive and parking
- Crosswalks
- Bus stop and shelter

- Commercial “check”point
- Residential “check”point

Planting options: (Source: Blue Water Baltimore)

Scientific Classification	Common Classification	Height (ft)	Spacing (ft)	Pot size (gal)	Quantity	Price per unit ($)	Installation price ($)
Trees							
Betula nigra	River Birch	30-40	30-40	3	6	35	210
Quercus alba	White Oak	40+	30-40	3	11	35	385
Shrubs							
Callicarpa americana	American Beautyberry	4-6	4-6	1	12	15	180
Diervilla lonicera	Northern Bush Honeysuckle	2-3	2-3	1	12	15	180
Total					41		955

Quercus alba

Betula nigra

Calicarpa americana

Diervilla lonicera

Scientific Classification	Common Classification	Height (in)	Spacing (in)	Pot size	Price per unit ($)
Shade-loving sedges and ferns					
Carex appalachica	Appalachian Sedge	6-12	9-12	gal	10
Carex flaccosperma	Thinfruit Sedge	6-12	9-12	gal	10
Carex pensylvanica	Pennsylvania Sedge	6-12	9-12	gal	10
Dryopteris marginalis	Marginal Wood Fern	18-24	18-24	gal	10
Polystichum acrostichoides	Christmas Fern	12-18	9-12	gal	10
Shade-loving perennials					
Aster lateriflolius	Calico Aster	24-36	18-24	gal	10
Heuchera americana	American Alumroot	24-36	12-15	gal	10
Mertensia virginica	Virginia Bluebells	18-24	9-12	gal	10
Sedum ternatum	Woodland Stonecrop	6-12	3-6	gal	10
Tiarella cordifolia	Allegheny Foamflower	6-12	9-12	gal	10
Sun-loving grasses					
Andropogon glomeratus	Bushy Bluestem	48-72	48-71	gal	10
Bouteloua curtipendula	Sideoats Grama	18-24	13-14	gal	10
Calamagrostis canadensis	Blue Joint Grass	18-24	24-35	gal	10
Panicum virgatum	Switchgrass	36-48	36-47	gal	10
Schizachyrium scoparium	“Standing Ovation” Little Bluestem	24-36	24-35	gal	10
Sun-loving perennials					
Asclepias tuberosa	Butterflyweed	24-36	15-18	gal	10
Chelone glabra	White Turtlehead	24-36	18-24	gal	10
Eupatorium dubium 'Little Joe'	Coastal Plain Joe Pye Weed	24-36	18-24	gal	10
Lobelia siphilitica	Great Blue Lobelia	24-36	18-24	gal	10
Monarda didyma	Scarlet Beebalm	24-36	15-18	gal	10

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Commercial "Check"point

Paved gathering area

Rock garden extension

Rock garden water collection

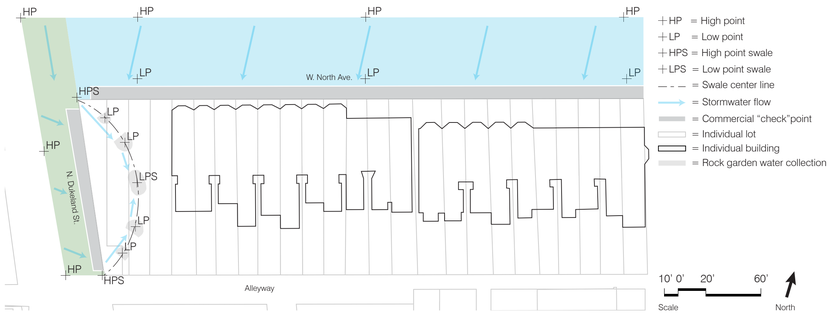
10' 0' 20' 60'
Scale North

The first phase in this "check"point design project will be to implement ***commercial "check"points, pave the initial sections of the permeable gathering areas, construct rock garden stormwater collection zones and line them with River Birches.*** These additions will help will ***stormwater runoff collection, air and noise quality, and visual connections*** to the repurposed vacant lot.

Commercial "check"point collection

BES

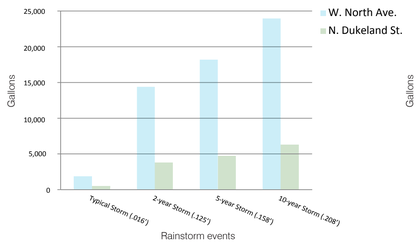
Commercial "check"points will be placed in between the ***street*** and existing sidewalks in order to ***collect, harness, infiltrate and cleanse stormwater street runoff*** from the surrounding site.



Streetwater runoff collection rates

Equation: G = (A x i)(7.48)

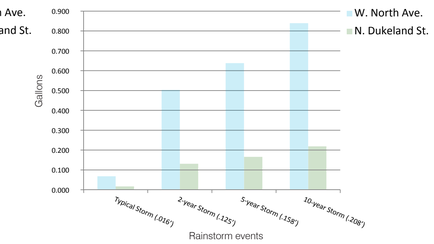
G = roofwater collection in gallons per hour
A = area of drainage in sq. ft.
i = rainfall intensity in feet per hour



Rational Method for peek runoff rates

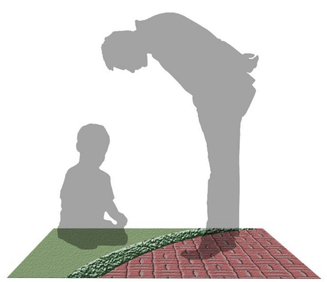
Equation: q = C x i x A x 7.48

q = peek runoff rate in gallons per second
C = dimensionless coefficient: (.95 = % of water that does not stick to surface)
i = rainfall intensity in inches per hour
A = area of drainage in acres

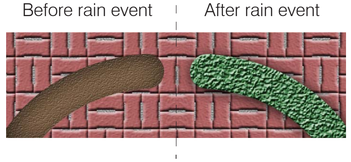


Incorporated Bryophytes

BES



Before rain event | After rain event



Bryophytes commonly grow close together in clumps or mats in ***damp*** or ***shady locations***. As water falls on the site, these species begin their ***reproductive and growing processes,*** *providing the public with a* ***hands on, educational experience***.

Commercial "check"point water capacity

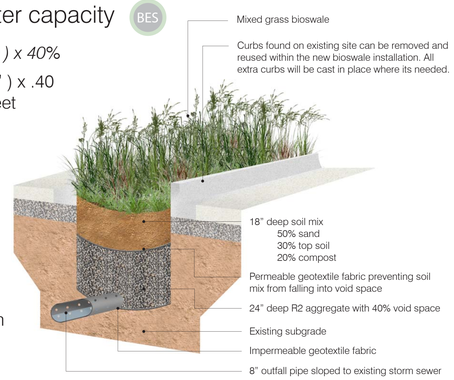
BES

Equation = (Area) x (Aggregate depth) x 40%

W. North Ave. bioswales = (594') x (2') x .40
= 475 cubic feet
= 3,554 gal

N. Dukeland St. = (242') x (2') x .40
= 244 cubic feet
= 1,828 gal

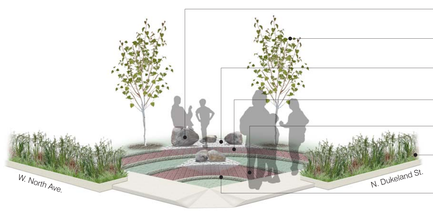
Each swale has the ***ability to hold an amount of water larger than the amount that will run from the street during a typical rain storm event.*** When the time comes where a larger, more uncommon storm occurs, the ***overflow will travel down the existing slope and into the existing stormwater system.***



Water flowing down W. North Ave. will be able to enter the commercial "check"points through several different ***curbcuts*** along the street.

Gathering area paving options

BES



Sitting rocks

Young River Birch

Rock garden water collection

9% aperture Eco-Tek brick

6% aperture Eco-Tek brick

Commercial "check"point

Bryophyte planting

Gathering area paving options

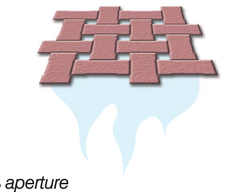
BES

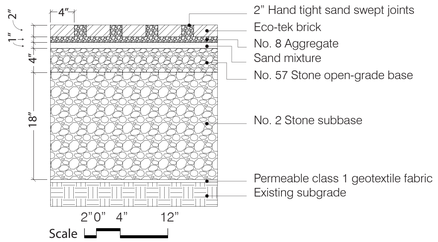
Eco-Tek brick pavers

(Source: R.I. Lampus Co.)

9% aperture

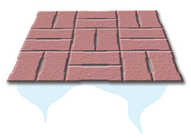
This custom brick arrangement allows for large amounts of surface water infiltration.

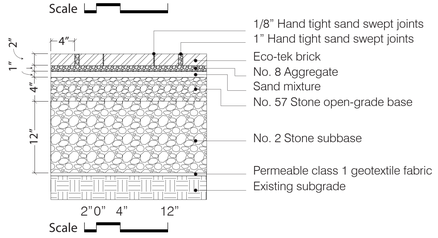




6% aperture

This custom brick arrangement allows for partial surface water infiltration.

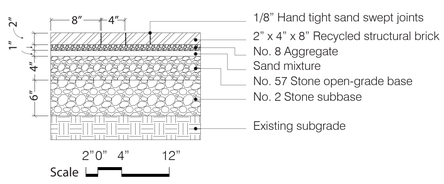




Recycled brick pavers

0% aperture

These ADA accepted pavers allow bricks from deconstructed vacant buildings to be recycled.



Technical specifications

Dimensions: 4" x 8" x 3 1/8"
Weight per unit: 6.5 lbs.
Units per sq. ft.: 4.97

Units per pallet: 378
Sq. ft. per pallet: 76
Weight per pallet: 2,400 lbs

2

White Oak tree planting

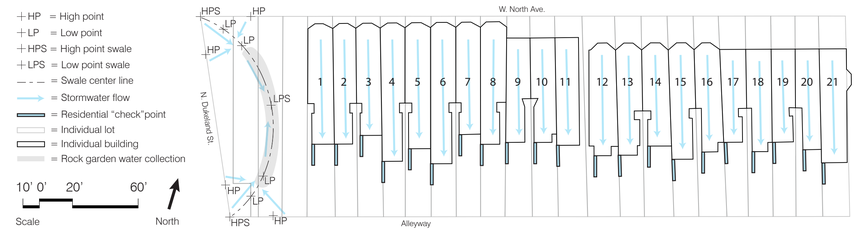
Paved gathering area

Rock garden extension

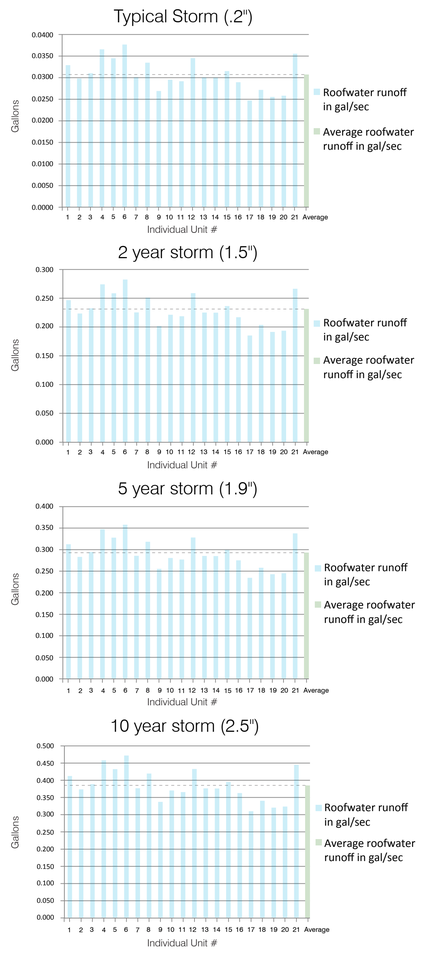
Residential "Check"points

10' 0' 20' 60'
Scale North

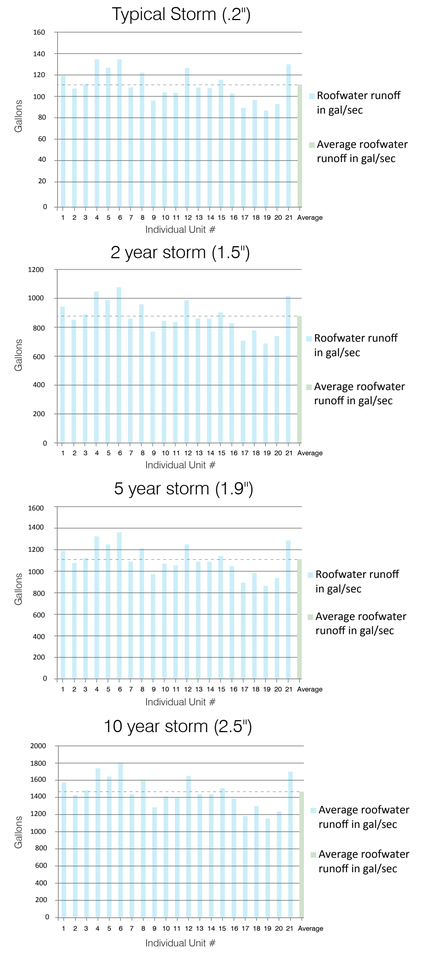
The second phase in this "check"point design project will be to ***plant White Oaks into the existing commercial "check"points, complete the paved gathering areas, extend the rock garden water collection zones, various shrub planting and offer the implementation of residential "check"point designs*** to each of the existing residences on the site. These additions will help will ***stormwater runoff collection, air and noise quality, and visual connections*** to the repurposed vacant lot.



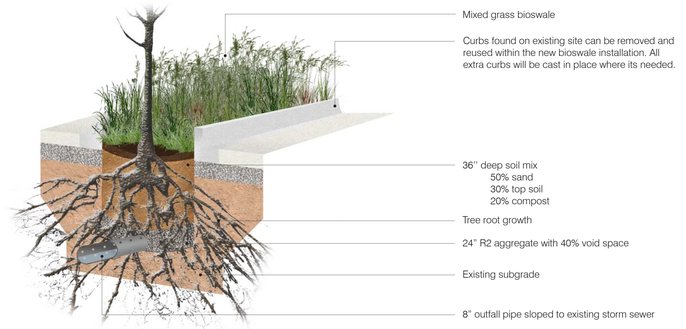
Rational Method for peek runoff rates



Roofwater runoff collection rates



Commercial “check”point tree planting



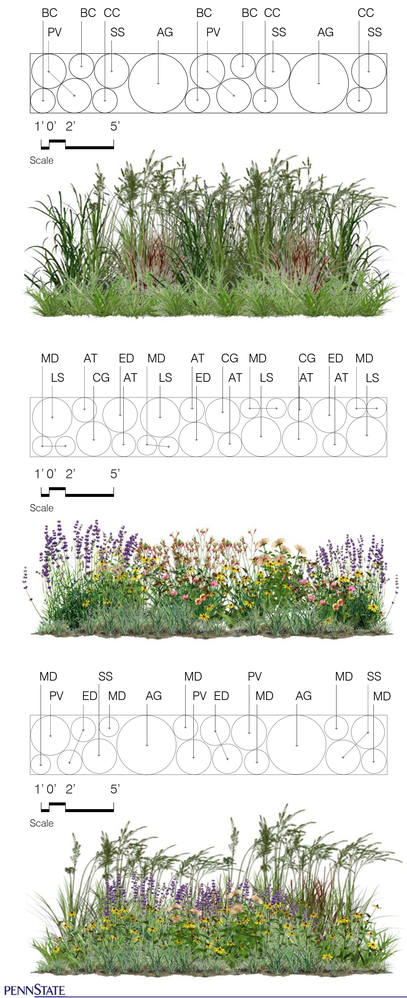
Residential “check”point water capacity

Equation = (Area) x (Aggregate depth) x 40%

Individual bioswales = (24’) x (2’) x .40 = 19.2 cubic feet = 143 gal

Each swale has the ***ability to hold an amount of water larger than the amount that will run from the roof during a typical rain storm event***. When the time comes where a larger, more uncommon storm occurs, the ***overflow will travel towards the alleyway and its pervious, infiltration pavement in the following phase.***

Sun-loving residential “check”point options



Grasses only:

(Source: Blue Water Baltimore)

Scientific Classification	Common Classification	Quantity	Swale price ($)
Andropogon glomeratus	Bushy Bluestem	2	20
Bouteloua curtipendula	Sideoats Grama	4	40
Calamagrostis canadensis	Blue Joint Grass	3	30
Panicum virgatum	Switchgrass	4	40
Schizachyrium scoparium	"Standing Ovation" Little Bluestem	3	30
Totals		16	160

The ***all grass*** residential “check”point placed at the outlet of a home’s gutter system will provide the residence with ***a taller, monochrome*** garden design that will collect, cleanse, and filter the roofwater into the existing stormwater system at ***a low price***.

Perennials only:

(Source: Blue Water Baltimore)

Scientific Classification	Common Classification	Quantity	Swale price ($)
Asclepias tuberosa	Butterflyweed	6	30
Chelone glabra	White Turtlehead	3	20
Eupatorium dubium 'Little Joe'	Coastal Plain Joe Pye Weed	3	20
Lobelia siphilitica	Great Blue Lobelia	4	20
Monarda didyma	Scarlet Beebalm	8	30
Totals		24	240

The ***all perennial*** residential “check”point placed at the outlet of a home’s gutter system will provide the residence with a ***shorter, colorful*** garden design that will collect, cleanse, and filter the roofwater into the existing stormwater system at ***a higher price***.

Perennial/Grass mixture:

(Source: Blue Water Baltimore)

Scientific Classification	Common Classification	Quantity	Swale price ($)
Andropogon glomeratus	Bushy Bluestem	2	20
Eupatorium dubium 'Little Joe'	Coastal Plain Joe Pye Weed	4	40
Monarda didyma	Scarlet Beebalm	6	60
Panicum virgatum	Switchgrass	3	30
Schizachyrium scoparium	"Standing Ovation" Little Bluestem	3	30
Totals		18	180

The ***mixture of grass and perennial*** residential “check”point placed at the outlet of a home’s gutter system will provide the residence with a ***range of height and color*** garden design that will collect, cleanse, and filter the roofwater into the existing stormwater system at ***a more affordable price***.

Versatile corner gathering area

The fully paved gathering area allows for a ***greater amount of surface stormwater to collect and infiltrate*** into the ground.

Larger groups will also be able to gather and set up ***removable canopy netting*** that will provide the normally exposed area with ***some comfortable shade.***

W. North Ave. “check”point design

The implementation of ***street trees*** into the commercial “check”points found along W. North Ave. And N. Dukeland St. will provide the neighborhood with a ***greater amount of shade canopy, resulting in a possible decrease in air pollution, sound pollution, and city heat island effect.***

Side alleyway residential “chec

The implementation of residential “check”point designs ***placed at the outlet of each row home’s gutter system*** will be able to ***collect, infiltrate, and cleanse the fallen roofwater*** before it is introduced into the existing stormwater system.

Shade-loving replacements:

Scientific classification	Common classification
Carex appalachica	Appalachian Sedge
Carex flaccosperma	Thinfruit Sedge
Carex pensylvanica	Pennsylvania Sedge
Dryopteris marginalis	Marginal Wood Fern
Polystichum acrostichoides	Christmas Fern

Shade-loving replacements:

Scientific classification	Common classification
Aster laterifolius	Calico Aseter
Heuchera americana	American Alumroot
Mertensia virginica	Virginia Bluebells
Sedum ternatum	Woodland Stonecrop
Tiarella cordifolia	Allegheny Foamflower

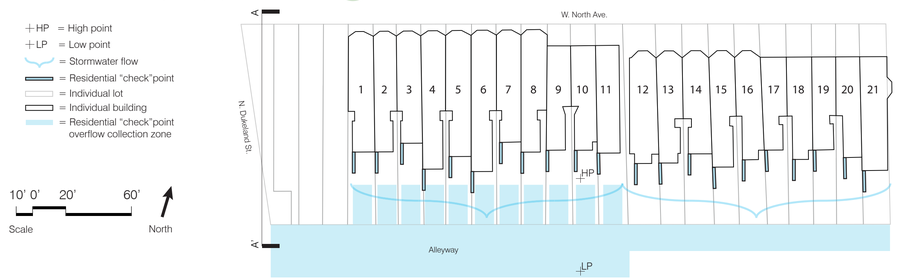
Shade-loving replacements:

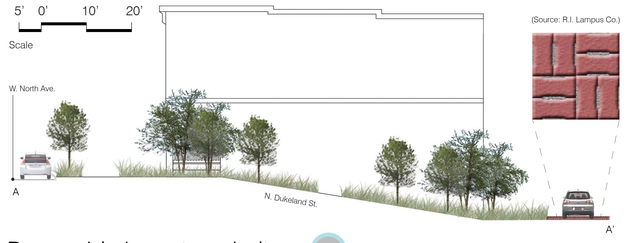
Scientific classification	Common classification
Aster laterifolius	Calico Aseter
Carex flaccosperma	Thinfruit Sedge
Carex pensylvanica	Pennsylvania Sedge
Mertensia virginica	Virginia Bluebells
Tiarella cordifolia	Allegheny Foamflower

3

The final phase in this “check”point design project will be to ***repave the existing bus stop at the corner of W. North Ave., pedestrian crosswalks that stretch across W. North Ave. and N. Dukeland St., and the alleyway connecting N. Dukeland St. and Ashburton St.*** These additions will help will ***stormwater runoff collection, pedestrian safety, and visual connections*** to the repurposed vacant lot.

Permeable alleyway pavement





(Source: R.I. Lampus Co.)

The permeable pavement added to the alleyway connecting N. Dukeland St. and Ashburton St. ***will allow the overflow roofwater running from the adjacent row homes to collect and infiltrate into the ground.*** There it will be cleansed and introduced into the existing stormwater system

Permeable bus stop shelter

The implementation of a ***permeably paved bus shelter*** at the corner of W. North Ave. and N. Dukeland St. will provide the residents with a ***cleaner and more comfortable bus stop***.

The pavement pattern will allow ***surface water*** to quickly ***infiltrate into the ground*** where it will become ***cleansed and introduced into the existing stormwater system, creating a visual connection to the adjacent repurposed vacant lot, inviting residents to stop and visit.***

Permeable pedestrian crosswalks

The implementation of ***permeable pedestrians crosswalks*** will create a clearly ***observed, safer route for all bicyclists and pedestrians***.

The pavement pattern will allow ***surface water*** to quickly ***infiltrate into the ground*** where it will become ***cleansed and introduced into the existing stormwater system, creating a visual connection to the ajdacent repurposed vacant lot, inviting residents to stop and visit***.