UCONN
COLLEGE OF AGRICULTURE, HEALTH AND NATURAL RESOURCES

CLEAR

UConn Stormwater Corps

Town of South Windsor

Stormwater Reduction Plan

By: Emma Serenson and Paige Booth

Faculty Advisors: David Dickson and Mike Dietz

Introductions

Paige Booth

Senior

Environmental Science

Sustainable Systems

Emma Serenson

Senior

Natural Resources

Water Resources and Climate

Agenda

Overview

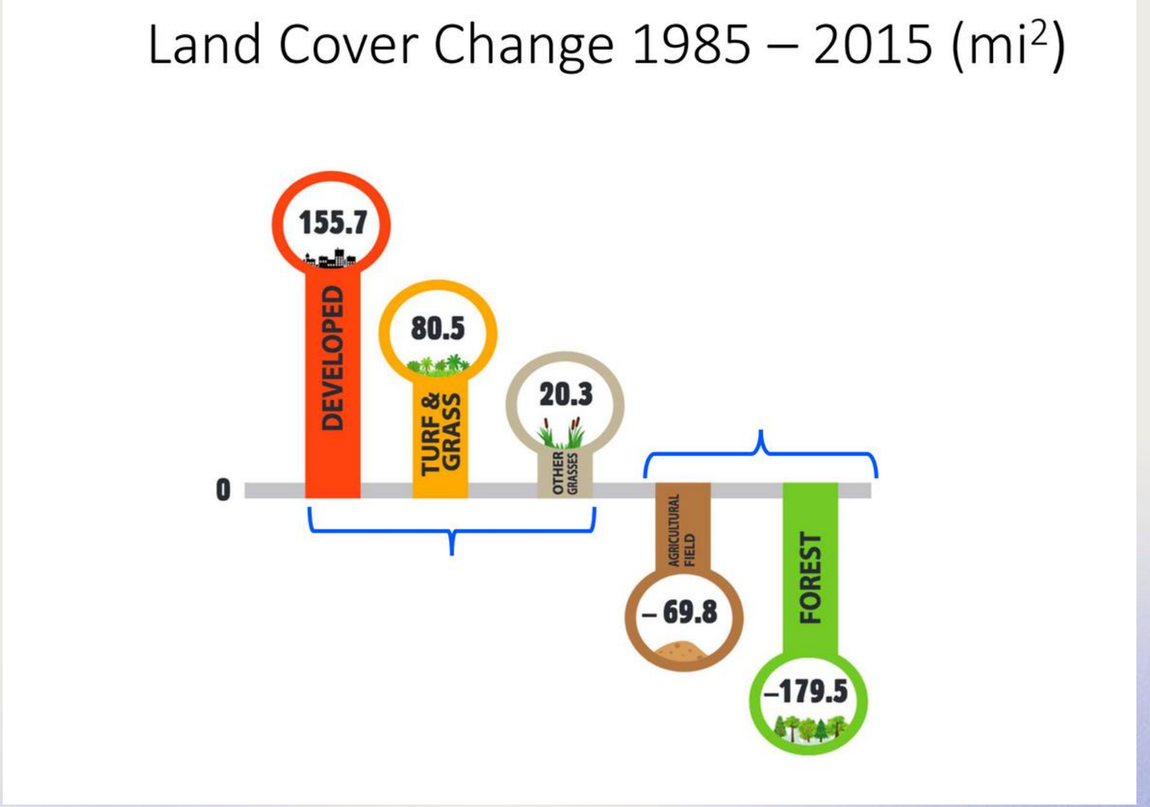
UConn Stormwater Corps is a part of a larger program headed by UConn Clear. UConn Undergraduates take a classroom semester and then are teamed up with a Connecticut municipality. We then completed the following steps:

- Held an initial meeting with South Windsor’s representative
- Did online research on potential sites
- Went on an in-person site visit
- Created our recommendations
- Presented to the town of South Windsor

Impervious Surfaces

As the state of Connecticut continues to become more developed, it is gaining more **impervious surfaces**.

- These are **man-made, hard surfaces**, such as asphalt or concrete, that **do not allow the infiltration of water**.
- They cause the water to **run off** into nearby water bodies **untreated**.



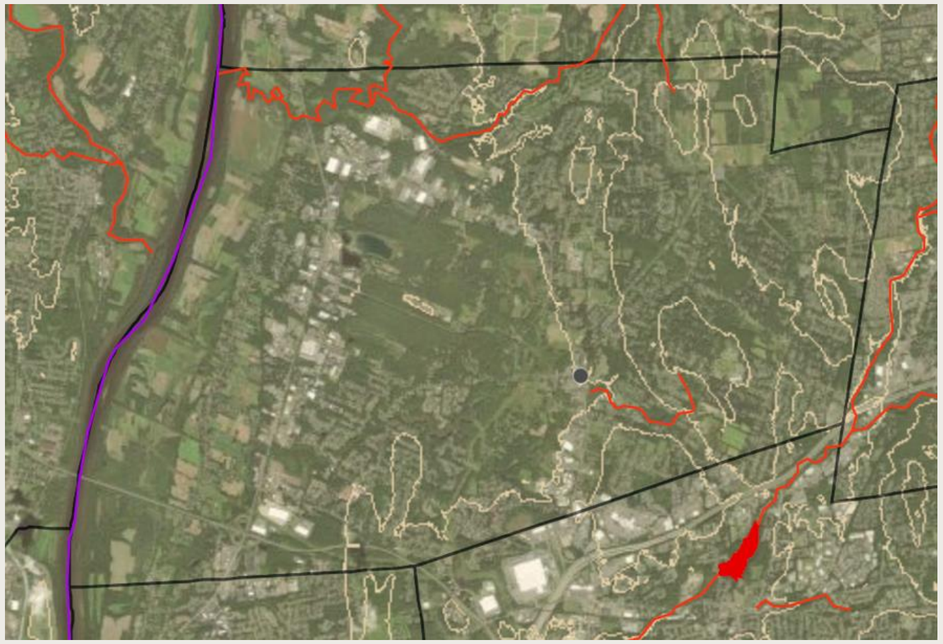
Between 1985 and 2015 developed land increased while pervious surfaces, like forests, decreased.

MS4 Requirements

In 2017, the CT government updated the general permit for **Municipal Separate Storm Sewer Systems (MS4)**.

The requirements include:

- Education
- Public Involvement
- Illicit discharge detection and elimination
- Construction Site Stormwater Runoff Control
- Post-construction stormwater management in new development or redevelopment
- Pollution Prevention/Good Housekeeping



Impaired waters (red) in South Windsor

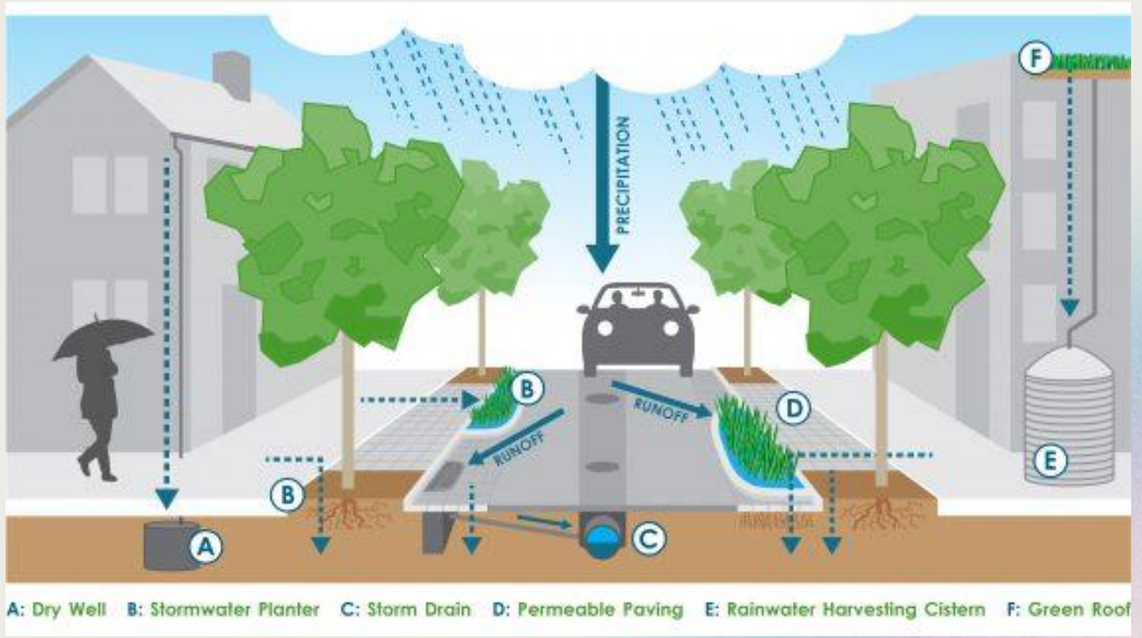
Green Stormwater Infrastructure (GSI)

Green Stormwater Infrastructure (also known as **Low Impact Development** or LID) is a practice used to **reduce stormwater runoff** while promoting the natural process of **water infiltration** into the ground.

This practice also allows for **water quality improvement** and can reduce nutrient runoff.

In this report we touch upon three types of GSI:

1. **Rain Gardens**
2. **Bioswales**
3. **Pervious Pavement**



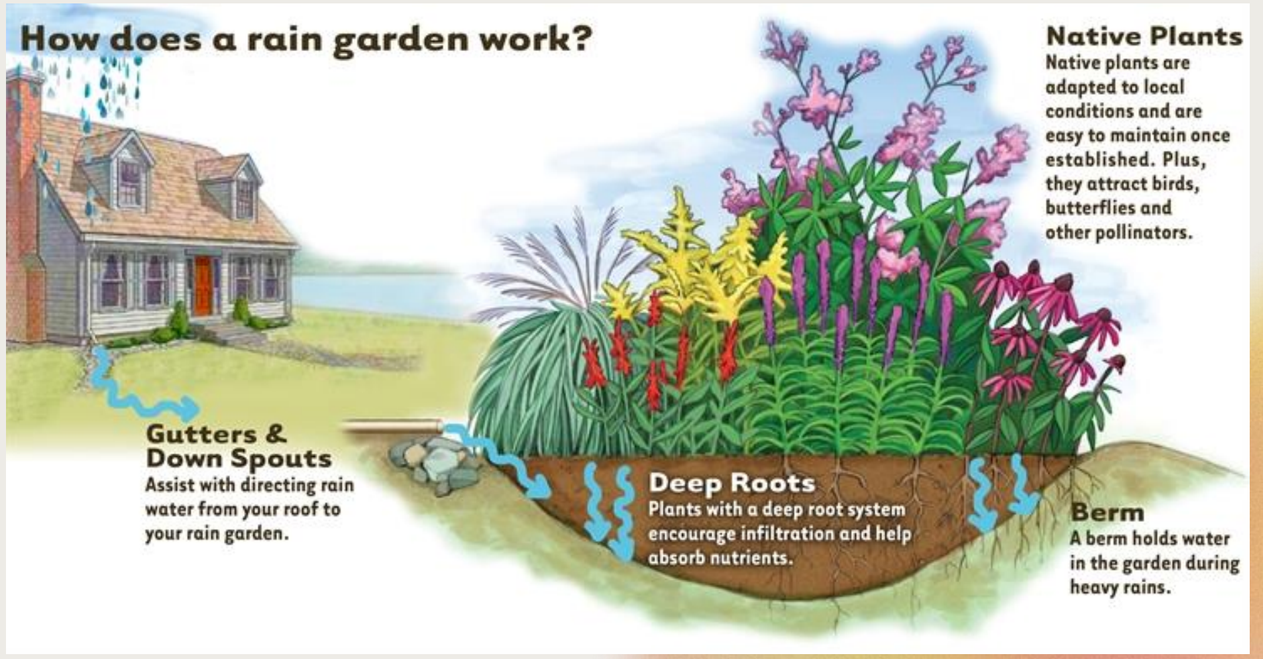
Rain Gardens

Rain gardens are a type of green infrastructure that **captures runoff** from impervious surfaces (such as roofs, sidewalks, and pavement) and **infiltrates thorugh the soil** into the ground in order to **recharge the groundwater**.

This design consists of a **depression** filled with **native** and facultative **wetland plants**

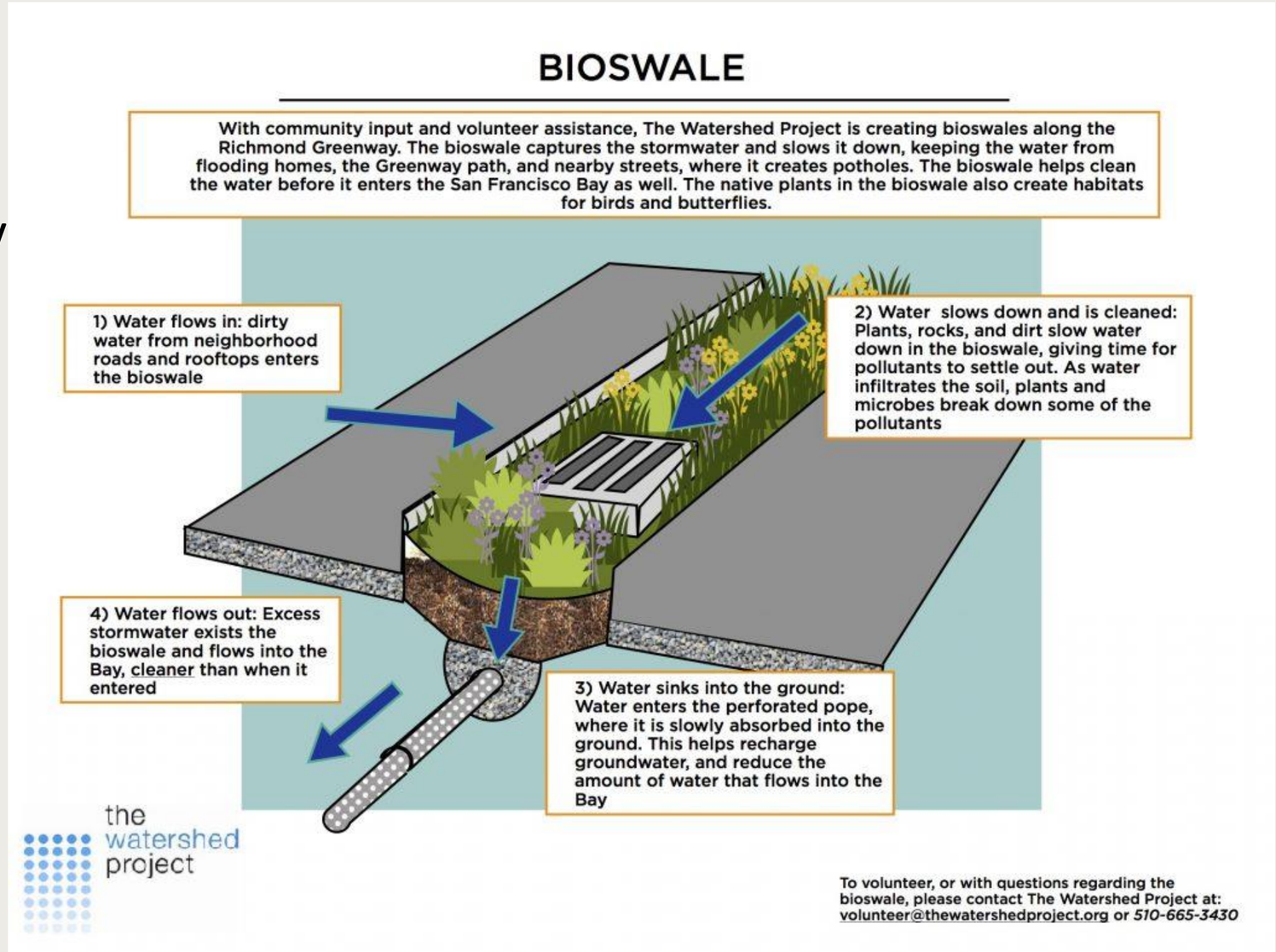
- Also may include **curb cuts** along with stone channels to **direct water** into the garden

Rain gardens can be used for both **managing stormwater** and **aesthetic purposes** and can have a great **educational component** as well.



Bioswales

Bioswales are similar to rain gardens, but their focus is to **hold water** and allow it to **infiltrate**. They are **depressions** in the ground designed to **let water in** and **infiltrate** into the ground instead of running off. This way the water can be **disconnected and filtered** by the soil and plants.



Pervious Pavement

Pervious pavements are alternative to traditional pavements that allow the **infiltration of stormwater to reduce runoff**. There are different kinds, including pervious asphalt (1), pervious concrete (2), pervious pavers (3), and pervious interlocking concrete pavers (picps).

1

2

3

While effective, these methods are usually more expensive than other forms of LID. However, if repaving is already planning on being done, it can be a good option to **increase disconnection.**

Site Selection

Selected sites were chosen using aerial imagery and contour lines from CTECO as well as satellite view and street view on Google Maps.

Using technology we were able to narrow down our choices to:

- **public buildings** that have frequent visitors
- **educational buildings** (e.g. schools)

During on-site visits, we were able to analyze the sites in which we took into account multiple factors:

- **visibility** of the rain garden
- if the space can provide an **education aspect**
- signs of **erosion/ponding**
- if there were **existing storm drains** around the potential area
- the **cost** of the LID and **maintenance**

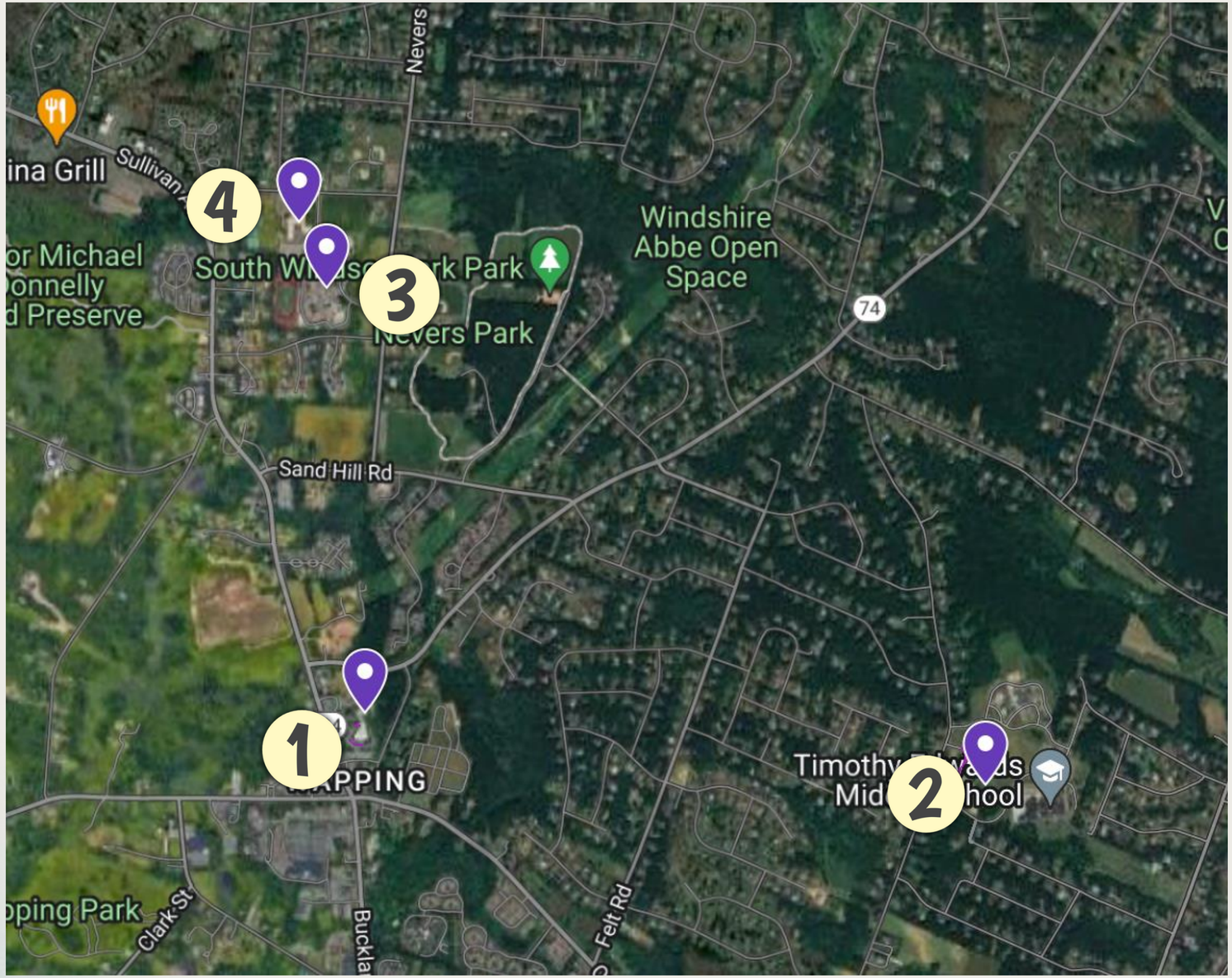
Site Overview

Location 1. Public Library

Location 2. Parks and Recreation Center

Location 3. High School

Location 4. Wapping Elementary School

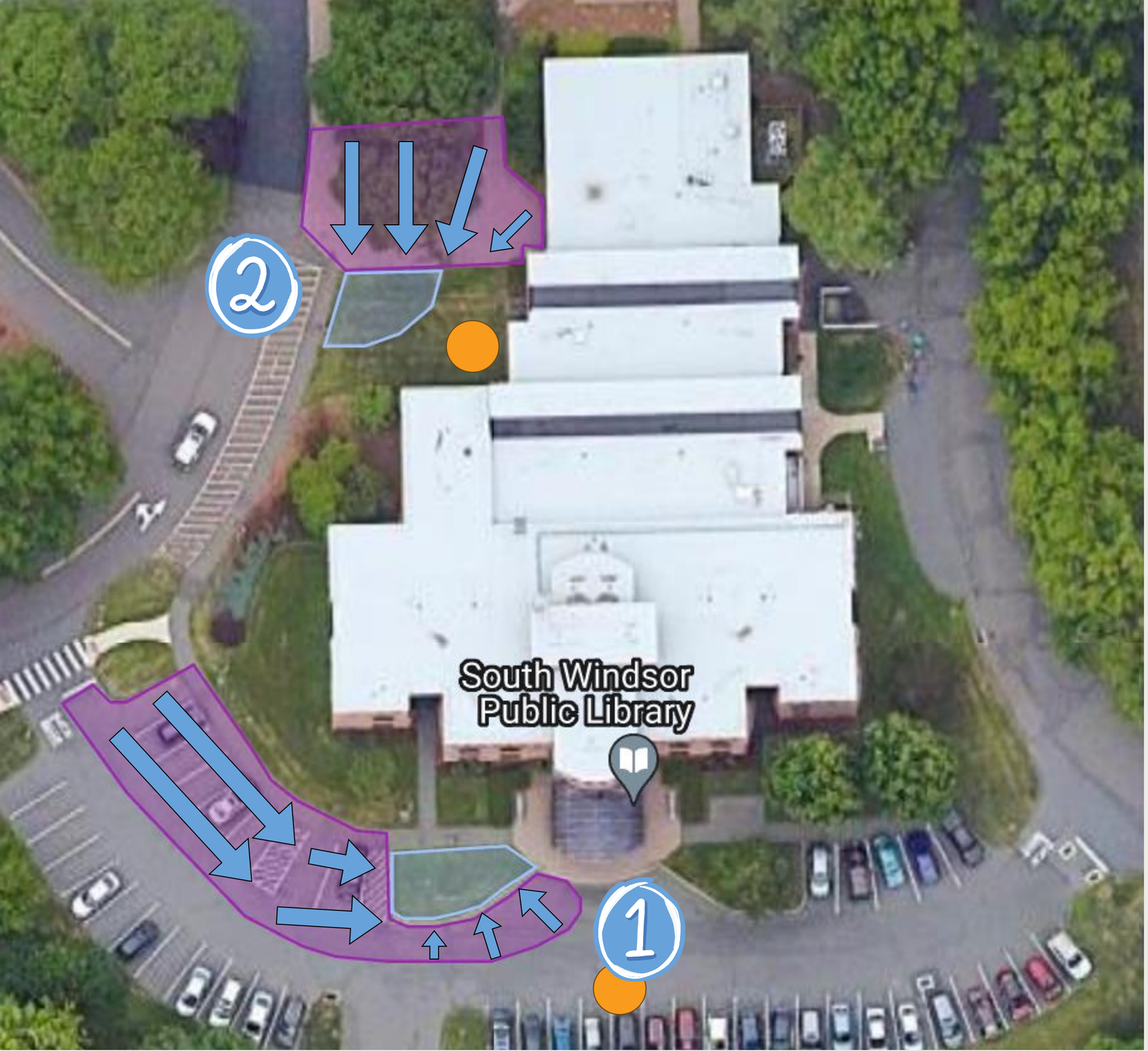


South Windsor Public Library

Location: 1550 Sullivan Ave

LID Recommendations:

1. Rain garden near main entrance
2. Rain garden near upper entrance



1 **Main Entrance**

2 **Upper Entrance**

	Drainage Area
	Potential Rain Garden
	Direction of Water Flow
	Existing Storm Drain

Library

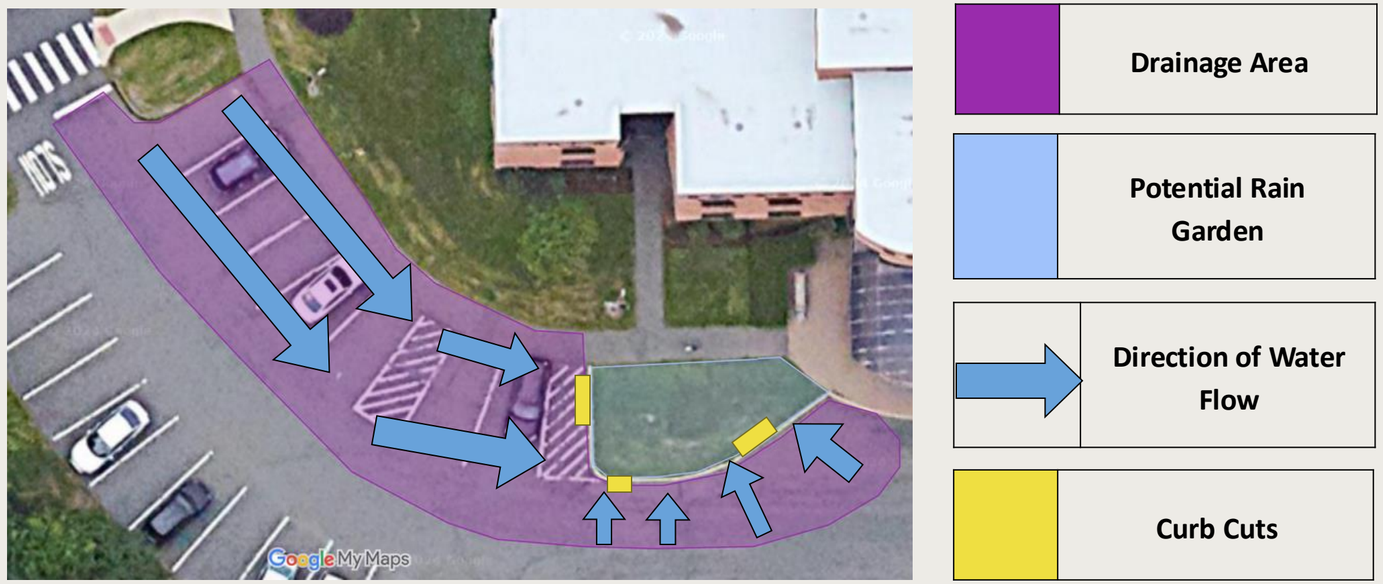
1. Main Entrance

Recommendations:

- Rain garden (9in) in small grass plot

Notes:

- Would need curb cuts to allow water flow into the rain garden
- Opportunity for education
- Reduce stormwater runoff into parking lot drain



Library – Main Entrance

Before

After

Library

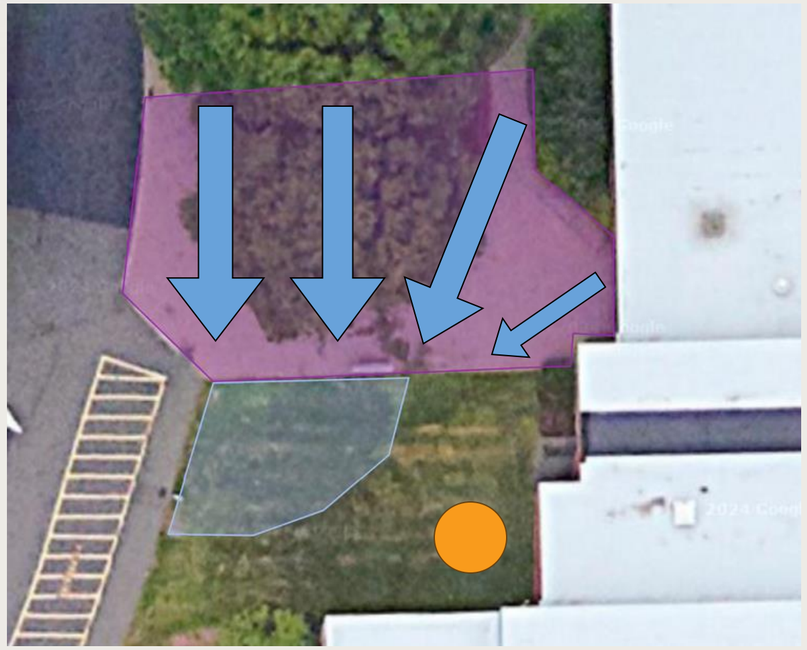
2. **Upper Entrance**

Recommendations:

- Rain garden (6in) on corner of grass plot

Notes:

- There is a storm drain in the middle of the grass area
- Opportunity for educational purposes
- Reduce stormwater runoff into parking lot and into storm drain



Drainage Area

Potential Rain Garden

Direction of Water Flow

Existing Storm Drain

Library – Upper Entrance

Before

After

Maintenance and Considerations

Main Entrance

- A short fence is recommended around the garden
  - Will protect the garden from the high pedestrian traffic area

Upper Entrance

- Rock paths on both sides of the garden will allow runoff to channel into it
  - If rock paths are not possible, then the garden can be created without them

Library Calculations

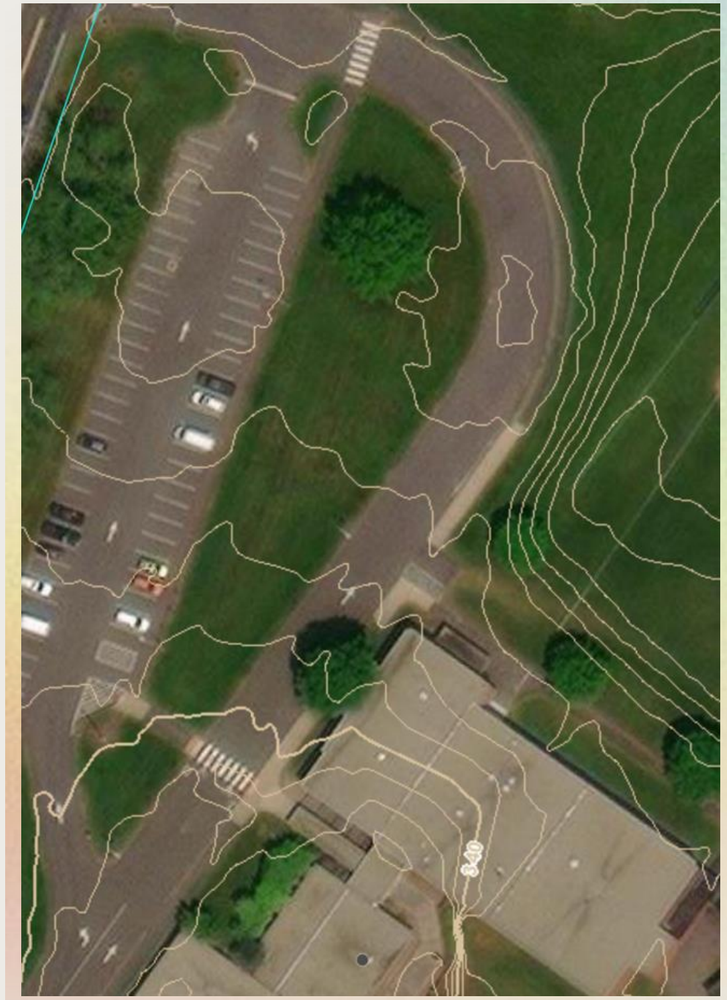
Site	Drainage Area (sq ft)	Suggested Green Infrastructure	Storage Depth (in)	Annual Gallons Treated	Suggested Practice Size (sq ft)	Annual Nitrogen Reduction (lB N/yr)	Annual Phosphorus Reduction (lB P/yr)
Main Entrance	4,530 sq ft	Rain Garden	9 in	119,273 gal	654 sq ft	1.24 lbs	0.16 lbs
Upper Entrance	2,657 sq ft	Rain Garden	6 in	69,957 gal	576 sq ft	0.73 lbs	0.09 lbs

South Windsor Parks and Recreation Center

Location: 350 Foster St

LID Recommendations

1. Two rain gardens in grass island in parking lot
2. Possible site for pervious pavement



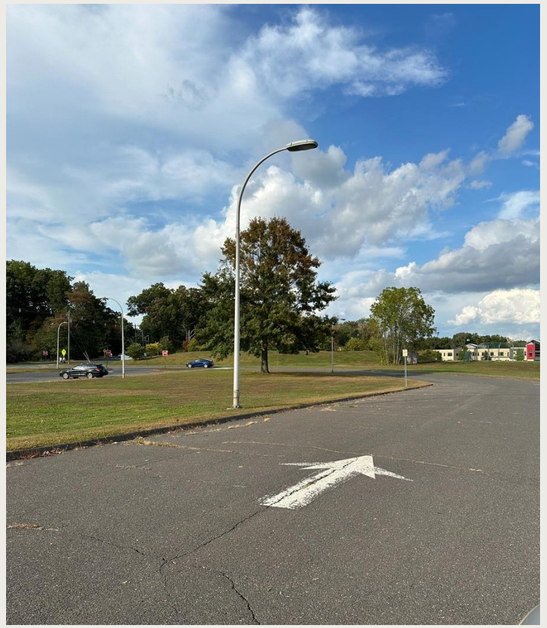
1 **Lower Loop**

2 **Entrance**

	Drainage Area
	Potential Rain Garden
	Direction of Water Flow
	Existing Storm Drain

Parks and Rec

1. Lower Loop by Driveway

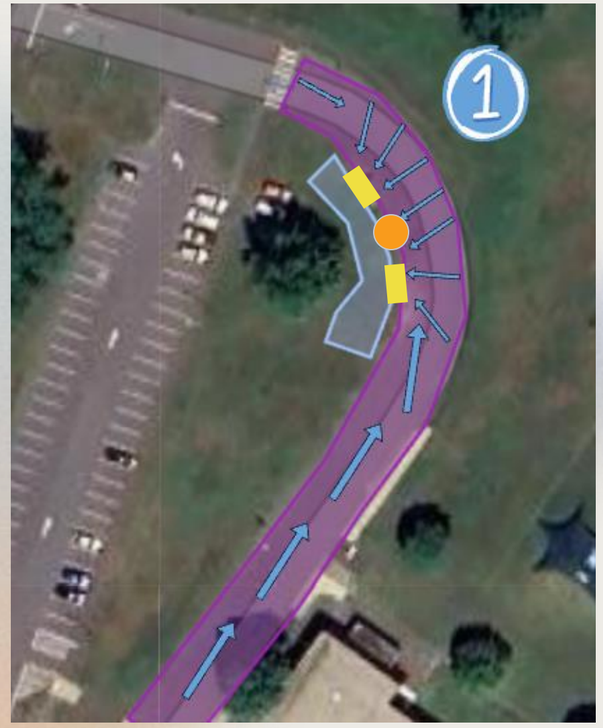


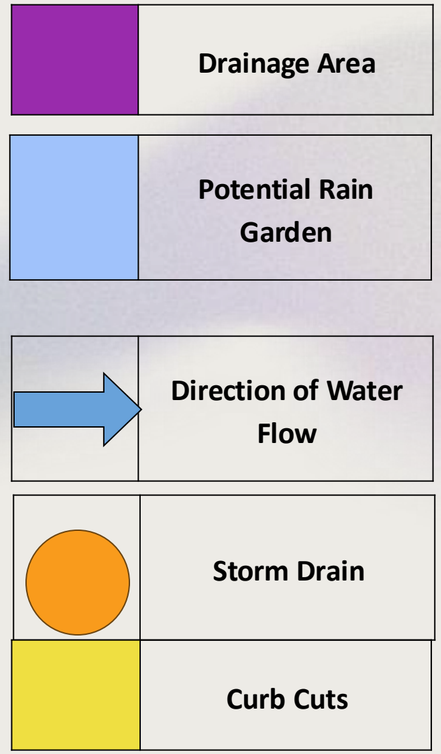
Recommendations:

- Rain garden (9in) behind storm drains with two curb cuts on either side

Notes:

- There are **large crowds of people** in this area, especially in the summer when the rain garden is in full bloom, which presents a good **educational oppurtunity**
- We heard the grass areas in this lot may be turned into more parking, which will affects this recommendation





Parks and Rec- Lower Loop

Before

After

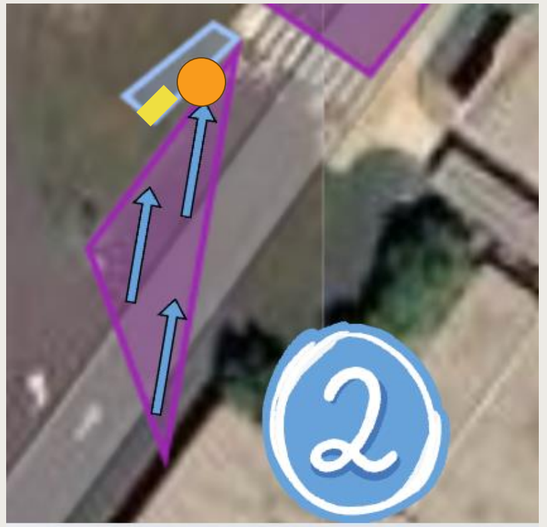
2. **Pathway to the Entrance**

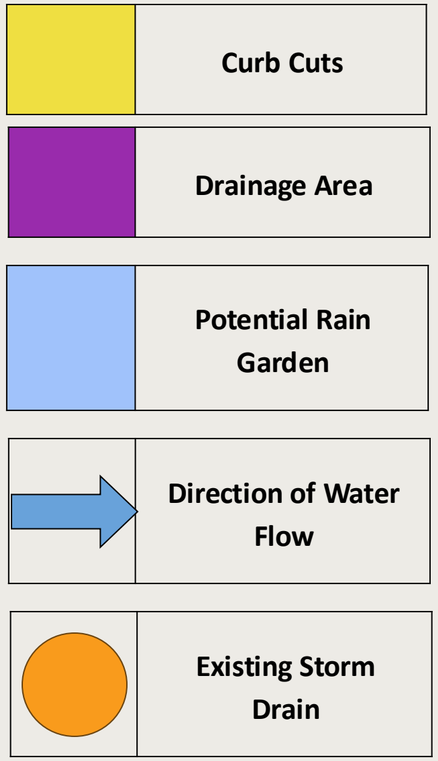
Recommendations:

- Rain garden (6in) behind storm drains curbs

Notes:

- It is close to an **American Flag** with memorial bricks, which could **draw more people in**
- **Educational opportunity** as people walk in
- We heard the grass areas in this lot may be turned into more parking, which will affect this recommendation





Parks and Rec- Entrance

Before

After

Maintenance and Considerations

Lower Loop

- Rain Gardens may need to be weeded occasionally. However, using native plants will reduce the maintenance.
- We heard from a Parks and Rec employee that the grass areas in this lot may be paved over to create more parking
- If this is the case, we recommend:
  - leaving a patch of grass and a rain garden
  - considering some pervious pavement

Parks and Rec Calculations

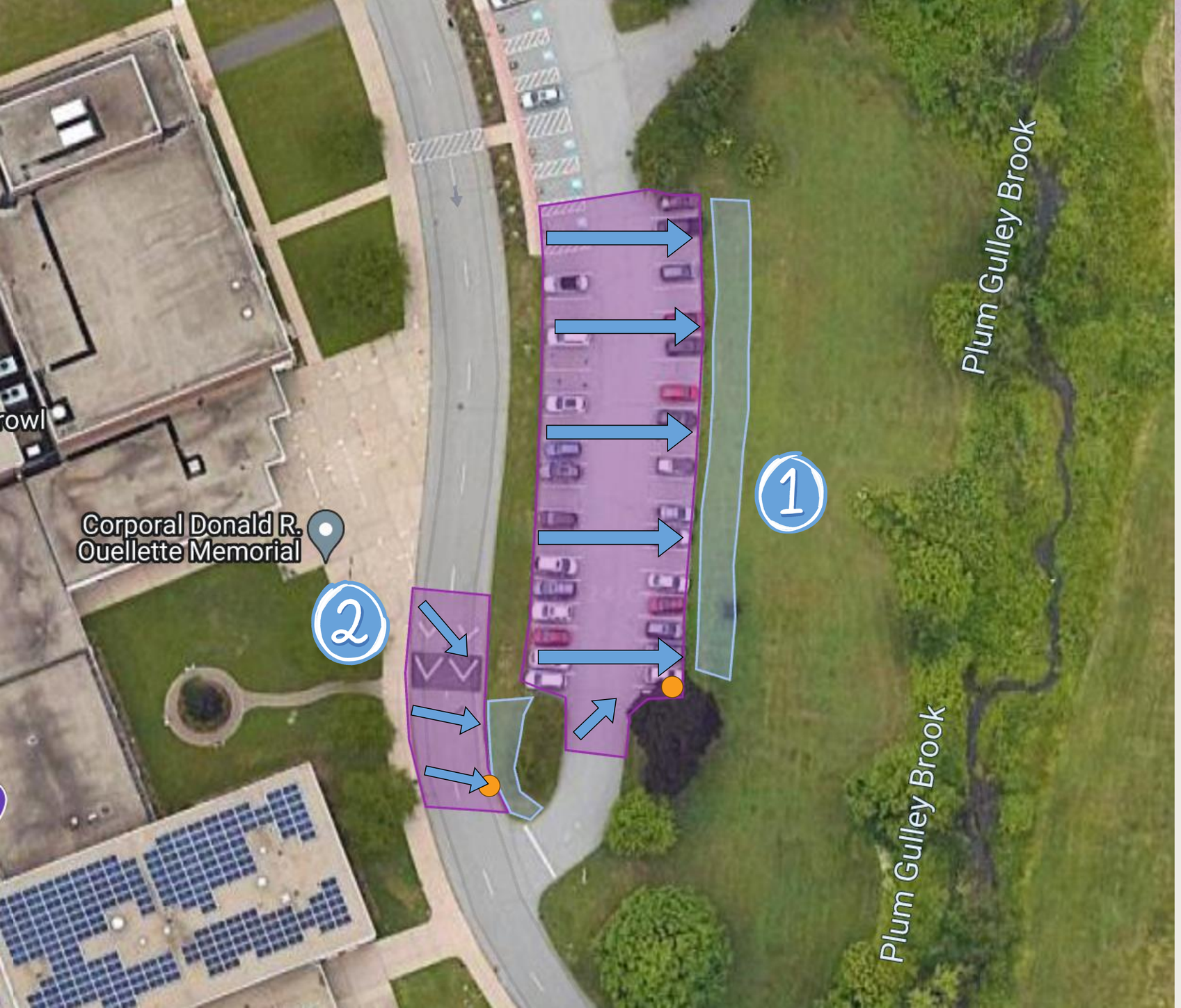
Site	Drainage Area (sq ft)	Suggested Green Infrastructure	Storage Depth (in)	Annual Gallons Treated	Suggested Practice Size (sq ft)	Annual Nitrogen Reduction (lB N/yr)	Annual Phosphorus Reduction (lB P/yr)
1.) Lower Loop	14,462 sq ft	Rain Garden	9 in	380,827 gal	2,089 sq ft	3.16 lb N/yr	.4 lb P/yr
2.) Main Entrance	1,568 sq ft	Rain Garden	6 in	41,295 gal	340 sq ft	.34 lb N/ yr	.04 lb P/ yr

South Windsor High School

Location: 161 Nevers Rd

LID Recommendations

1. Grass Swale in parking lot facing fields
2. Rain garden in grass plot in parking lot



High School

1 **Parking Lot Facing Fields**

2 **Parking Lot Grass Plot**

	Drainage Area
	Potential Rain Garden/bioswale
→	**Direction of Water Flow**
●	**Existing Storm Drain**

High School

Grass Swale

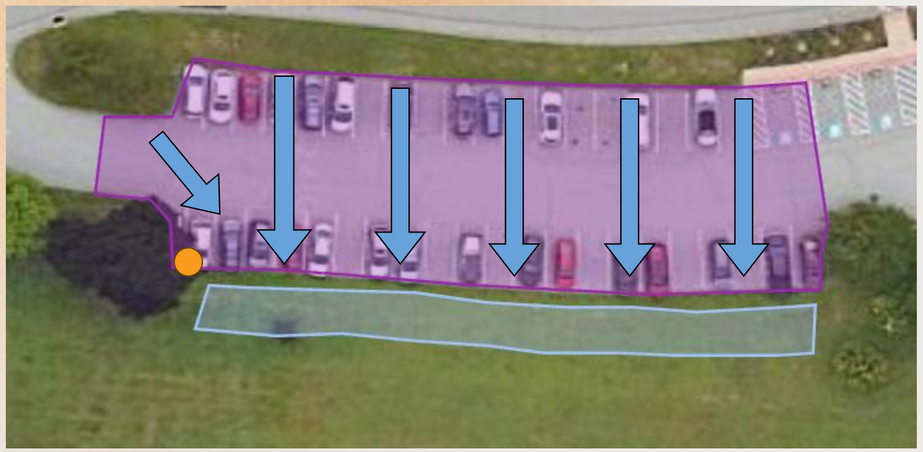
1. Parking Lot Facing Fields

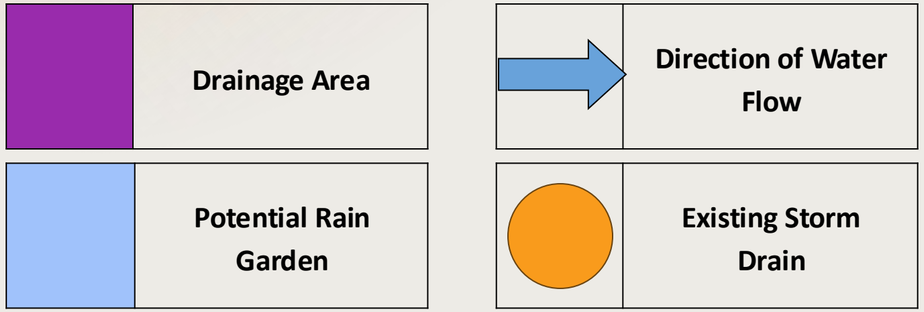
Recommendations:

- Inputting a bioswale (6in) along the perimeter of the southern parking spots

Notes:

- May prevent flooding in parking lot
- May reduce amount of stormwater that goes into the drain
- Helps to recharge groundwater





High School

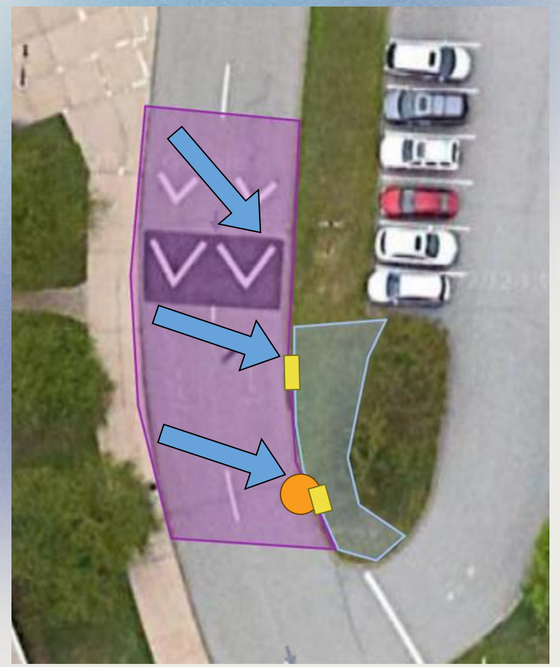
2. **Parking Lot Grass Plot**

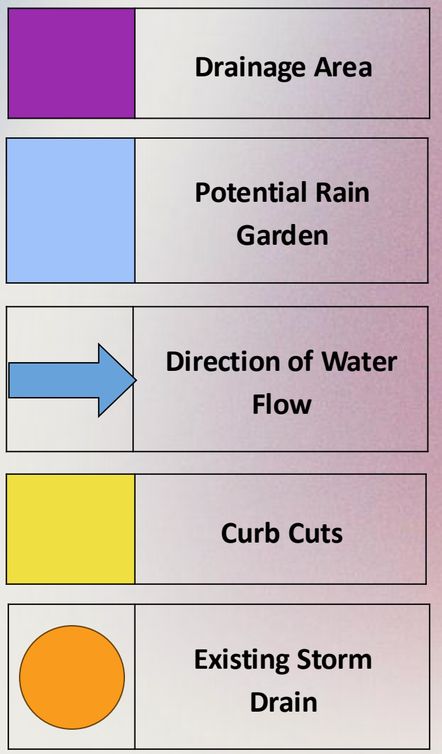
Recommendations:

- Rain garden (6in) on the perimeter of the grass plot

Notes:

- There are 2 trees in the plot
  - The garden will have to be out far enough to avoid the tree crowns
- Opportunity for **education**
- **Reduce** stormwater **runoff**





Before

After

High School – Grass Plot

High School

Maintenance and Considerations

Parking Lot Facing Fields

- Curb cuts along the parking spaces will be needed to allow water into the bioswale
- May need extra maintenance due to high car and pedestrian traffic in the area

Parking Lot Grass Plot

- The garden will have to be **out far enough** on the perimeter to **avoid damaging tree roots**
- The trees will cause more debris and may need extra maintenance

All **storm drains** at the High School **drain** into the **wetland** located around Plum Gulley Brook

- Reducing stormwater runoff will improve overall wetland quality

High School Calculations

Site	Drainage Area (sq ft)	Suggested Green Infrastructure	Storage Depth (in)	Annual Gallons Treated	Suggested Practice Size (sq ft)	Annual Nitrogen Reduction (lB N/yr)	Annual Phosphorus Reduction (lB P/yr)
Parking lot facing fields	12,589 sq ft	Grass Swale	6 in	71,800 gal	2,727 sq ft	0.74 lbs	0.09 lbs
Grass plot in parking lot	2,613 sq ft	Rain Garden	6 in	14,902 gal	566 sq ft	0.15 lbs	0.02 lbs

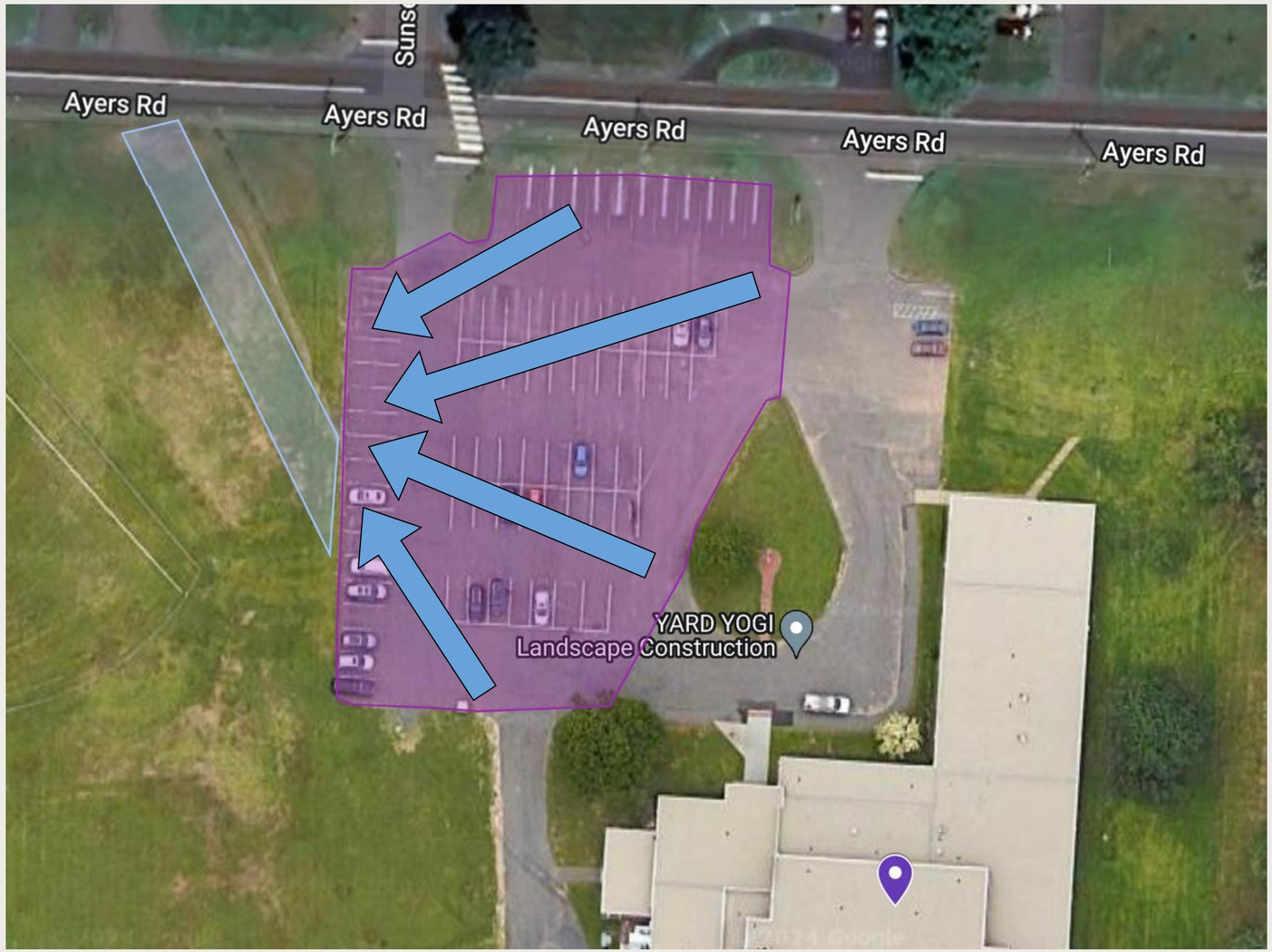
South Windsor Wapping Elementary School

Location: 91 Ayers Rd

LID Recommendations:

1. Grass Swale facing fields

Wapping Elementary School



	Drainage Area
	Potential Grass Swale
	Direction of Water Flow

Wapping Elementary School

1. Concrete path to road

<u>Recommendations:</u>

- Bioswale parallel (9 in) to the concrete path leading from the lot to the road. There is no curb cut needed, but stones could be used to direct the water into the swale

<u>Notes:</u>

- There are no storm drains in the parking lot or nearby on the road
- Educational opportunity for people walking by
- We avoided altering the concrete in case people use it as a walking path
- The swale could be grass or planted

Before

After

Grass or Planted Swale

Wapping Elementary School

Maintenance for Wapping Elementary

Path to road

- The grass swale will be **easy to maintain** since the slope of the swale will be able to be mowed along with the surrounding area
- The area seems to get a good amount of **foot traffic**, so there could be some **compaction of the grass** if people decide to walk through the swale
- People will have to **check in** on the swale to check for **debris**, such as litter, and **clean it out**

Wapping Elementary Calculations

Site	Drainage Area (sq ft)	Suggested Green Infrastructure	Storage Depth (in)	Annual Gallons Treated	Suggested Practice Size (sq ft)	Annual Nitrogen Reduction (lB N/yr)	Annual Phosphorus Reduction (lB P/yr)
Path to road	35,327 sq ft	Grass Swale	9 in	930,274 gal	5,103 sq ft	7.73 lb N/ yr	.98 lb P/ yr

Calculation Totals

Site	Drainage Area (sq ft)	Suggested Green Infrastructure	Annual Gallons Treated	Suggested Practice Size (sq ft)	Annual Nitrogen Reduction (lB N/yr)	Annual Phosphorus Reduction (lB P/yr)
Library 1	4,530 sq ft	Rain Garden	119,273 gal	654 sq ft	1.24 lbs	.16 lbs
Library 2	2,657 sq ft	Rain Garden	69,957 gal	576 sq ft	.73 lbs	.09 lbs
Parks and Rec 1	14,462 sq ft	Rain Garden	380,827 gal	2,089 sq ft	3.16 lb	.4 lbs
Parks and Rec 2	1,568 sq ft	Rain Garden	41,295 gal	340 sq ft	.34 lbs	.04 lbs
SW HS 1	12,589 sq ft	Grass Swale	71,800 gal	2,727 sq ft	0.74 lbs	0.09 lbs
SW HS 2	2,613 sq ft	Rain garden	14,902 gal	566 sq ft	0.15 lbs	0.02 lbs
Wapping Elementary	35,327 sq ft	Grass Swale	930,274 gal	5,103 sq ft	7.73 lbs	.98 lbs
Totals:	**73,746 sq ft**		**1,628,328 gal**	**12,055 sq ft**	**14.09 lbs**	**1.78 lbs**

Sites Not Visited/Selected

- **<u>Rye Street Park and Timothy Edwards Middle School:</u>** We did not get the chance to visit these sites
- **<u>South Windsor Town Hall:</u>** After spending extensive time at the Town Hall/ Library plot, we determined that there were **better opportunities on the library side** rather than the town hall side.
    - However, we think it would be a good idea to **add a sign** by the **pervious sidewalk** for educational purposes
    - We looked at the **stormwater outlet** and determined it was **too difficult** to create a good recommendation.
        - However, if the town wanted to do something about it, we think **clearing out all the asphalt** and creating a **large bioswale** that will encourage **infiltration** of the stormwater **before it enters the stream.**

Contacts

Mike Dietz, Extension Educator & CT Institute of Water Resources Director, 860-486-2436, michael.dietz@uconn.edu

Dave Dickson, 860-345-4511, Extension Educator & CLEAR Director, david.dickson@uconn.edu

Paige Booth, Senior Environmental Science Major, 860-949-5076, paigenbooth@gmail.com

Emma Serenson, Senior Natural Resources Major, 203-905-9843, emmaserenson@gmail.com