

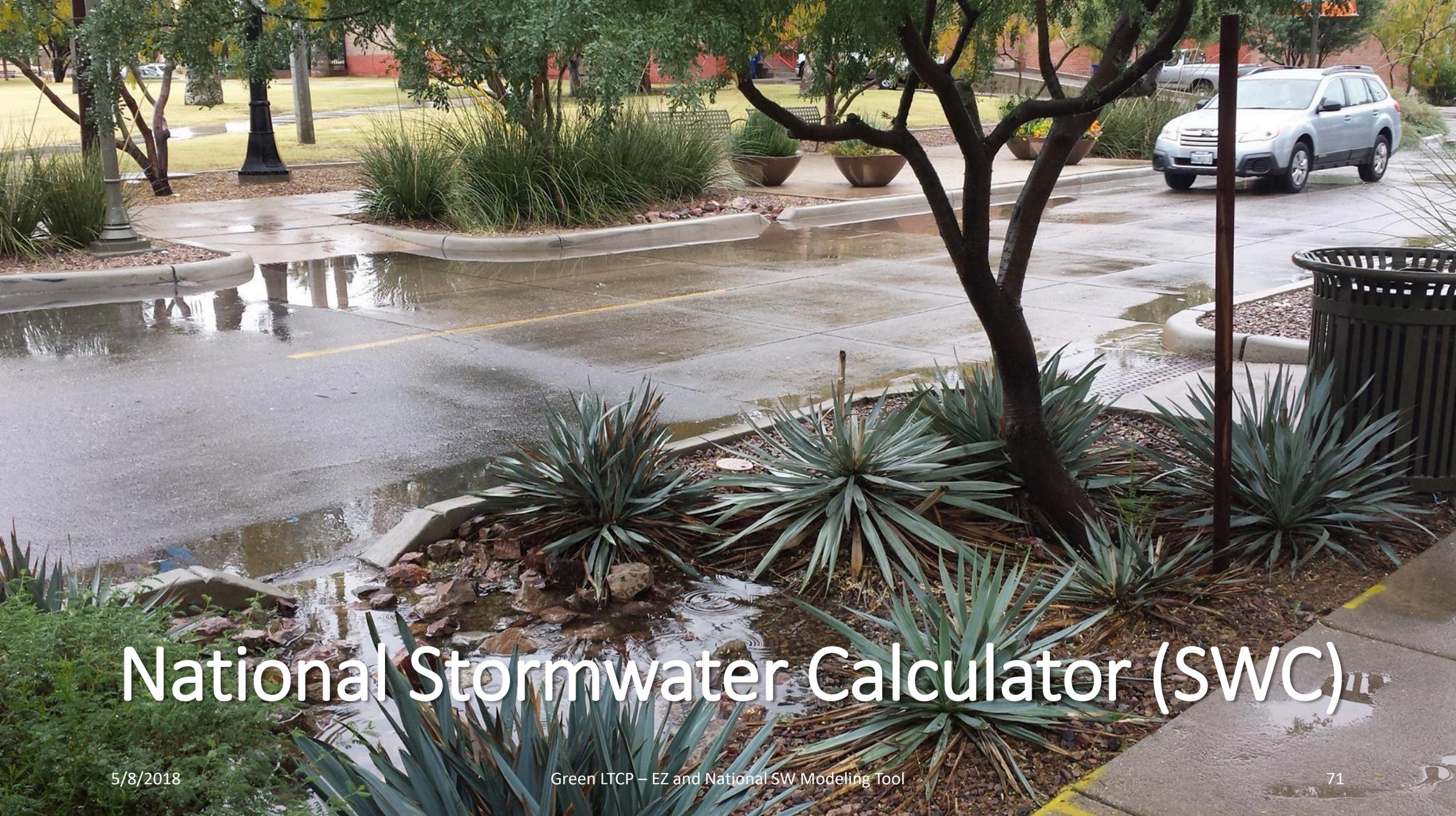
Green LTCP – EZ and National SW Modeling Tool

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U.S. Environmental Protection Agency (EPA)





National Stormwater Calculator (SWC)

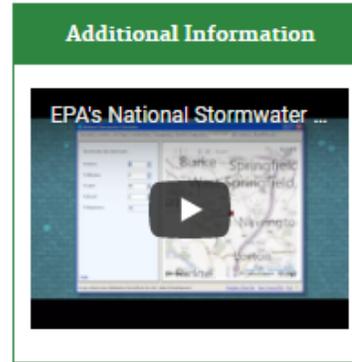
National Stormwater Calculator

Register now for a [free webinar](#) on January 31, 2018 that will provide a demonstration and introduce new features.

Tool to help control runoff and promote the natural movement of water

EPA's National Stormwater Calculator (SWC) is a software application that estimates the annual amount of rainwater and frequency of runoff from a specific site. Estimates are based on local soil conditions, land cover, and historic rainfall records. It is designed to be used by anyone interested in reducing runoff from a property, including site developers, landscape architects, urban planners, and homeowners.

The SWC accesses several national databases that provide soil, topography, rainfall, and evaporation information for a chosen site. The user supplies information about the site's land cover and selects low impact development (LID) controls they would like to use. The LID controls include seven green infrastructure practices.



Access the Mobile Web App

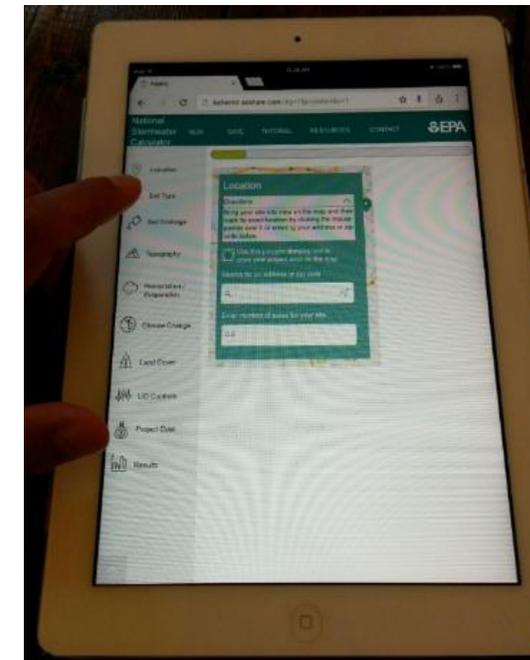
Green Infrastructure as Low Impact Development Controls +

Capabilities +

Real-World Applications +

Software and Documentation +

Desktop and Mobile Versions Available



What the SWC Provides:

- Screening-level post construction stormwater runoff reduction and cost analyses of various green infrastructure/low impact development (LID) practices, including:
 - Green roofs, rain gardens, cisterns, etc. throughout the U.S.
- Allow non-modelers (planners, landscape architects, developers, home owners, students, etc.) to conduct screening level stormwater runoff for small to medium sized (less than 1 - 12 acres) sites
- Robust modeling results from EPA's Stormwater Management Model (SWMM)
- Reliable regional planning cost estimates

Storm Water Management Model (SWMM) Programmed within the SWC



Environmental Topics

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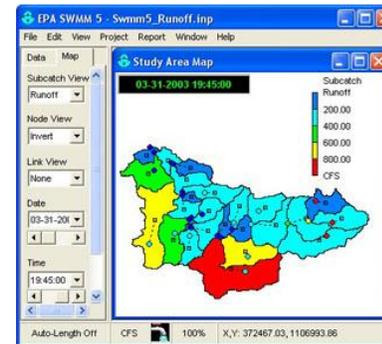
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Storm Water Management Model (SWMM)

Version 5.1.012 with Low Impact
Development Controls

- [Description](#)
- [Capabilities](#)
- [Applications](#)
- [Add-in Tool](#)
- [Support](#)
- [Downloads](#)
- [Documentation](#)
- [Helpful Resources](#)
- [Contact](#)



- Calculator is based on SWMM: Dynamic rainfall-runoff simulation model for long-term simulation of runoff quantity
- SWMM produces stormwater runoff estimates in the background of the Stormwater Calculator

LID Cost Estimation Module (Released May 2017):

- **Intended Uses:**

- National and regional (metropolitan areas) planning level cost estimates (magnitude (high & low) of costs between planning scenarios)

- **Limitations:**

- Doesn't provide final construction/build costs
- Doesn't provide lifecycle costs (gives annual operation and maintenance (O & M) costs, not replacement costs)
- Regional costs not available for all areas of the US (many of the Western states)



LID Cost Estimation Module: Development of Regionalized LID/Green Infrastructure Costs

- **Utilization of Bureau of Labor Statistics (BLS) Data for regional costs**
 - National Producer Price Index: outputs of service, construction, utilities, and other goods producing entities
 - Examples include: concrete storm sewer pipe, construction sand and gravel, etc.
 - Consumer Price Index: regional/city data (23 major US cities)
 - Examples include: fuels and utilities, energy, and diesel fuel
- **Data easily updated and maintained annually by EPA**
- **Development of regional costs comparable to Engineering News Record (ENR) and RS Means**

SWC:

Site Parameters and Embedded National Data-sets

- **Location:** Bing Maps
- **Soils:** NRCS SSURGO (*web service*)
- **Slope:** NRCS SSURGO
- **Hydraulic Conductivity:** NRCS SSURGO
- **Precipitation and Temperature:** National Climate Center (NCDC)-NOAA (*EPA's BASINS Model*)
- **Evaporation:** Calculation based on meteorological data
- **Climate Change Future Scenarios:** Precipitation & evaporation (*EPA's CREAT 2.0*)
- **Land-Cover/Use:** User provided
- **LID Practices (*new costing module available*):** User provided

How the SWC may compliment Green LTCP-EZ

- Sizing of LID/GI controls
 - Gallons controlled (Currently done for GI projects with the Northeastern Ohio Regional Sewer District GI Grants Program:
<https://www.neorsd.org/stormwater-2/green-infrastructure-grant-program/>
)
 - May design LID/GI controls for 24-hour design storms
 - Provides historical hourly rainfall (NOAA weather stations)
- Provides present regional planning level capital and annual O & M costs

SWC Application: NE Ohio Regional Sewer District Green Infrastructure Grant Program for Combined Sewer Area



Green Infrastructure Grant Program



The Sewer District recognizes the importance of green infrastructure such as rain gardens, bioretention, pervious pavement, and other site-based stormwater management practices in the combined sewer area. The Green Infrastructure Grants Program for the Combined Sewer Area is open to communities and non-profit organizations in the combined sewer area interested in implementing green

5/8/2018

NORTHEAST OHIO REGIONAL SEWER DISTRICT 2018 GREEN INFRASTRUCTURE GRANT FOR THE COMBINED SEWER AREA

*Pre-Construction – Average Annual
Runoff (in) of Total Drainage Area
Treated: _____

*Post-Construction - Average Annual
Runoff (in) of Total Drainage Area
Treated: _____

Annual Runoff Reduction (g/yr.): _____
(Runoff Reduction (in) / 12 x Treated Drainage Area (acre) x 325,851.433 = gal/yr.)

*Analysis using the US EPA Stormwater Calculator ver.1.1
<http://www2.epa.gov/water-research/national-stormwater-calculator>

SWC Mobile Web App Application (Northport, MI)

Location:

The screenshot displays the EPA National Stormwater Calculator interface. At the top, the EPA logo and "National Stormwater Calculator" are on the left, and navigation links "NEW", "SAVE", "OPEN", "RESOURCES", and "CONTACT" are on the right. A vertical toolbar on the left contains icons for location, drawing, search, and other functions. The main map area shows an aerial view of Northport, MI, with a yellow polygon highlighting a project area along E Nagonaba St. A teal location pin is placed on the map. A teal overlay box on the left contains the following text:

Location

Directions >

Use this polygon drawing tool to draw your project area on the map.

Search by address or zip code

Nahonaba, N..., MI

Enter number of acres for your site

1.903661776621...

The map includes street names: W Main St, E Main St, Waukazoo St, N Main St, E 3rd St, E 2nd St, Bay St, Rose St, and E Nagonaba St. Other features include Haserot Park and Grand Traverse Bay. A scale bar at the bottom right shows 100 feet and 25 meters. Copyright information at the bottom reads: © 2017 HERE © 2017 Microsoft Corporation Available Exclusively by DigitalGlobe.

Soil Runoff Potential:

 National Stormwater Calculator

NEW SAVE OPEN RESOURCES CONTACT



Soil Type

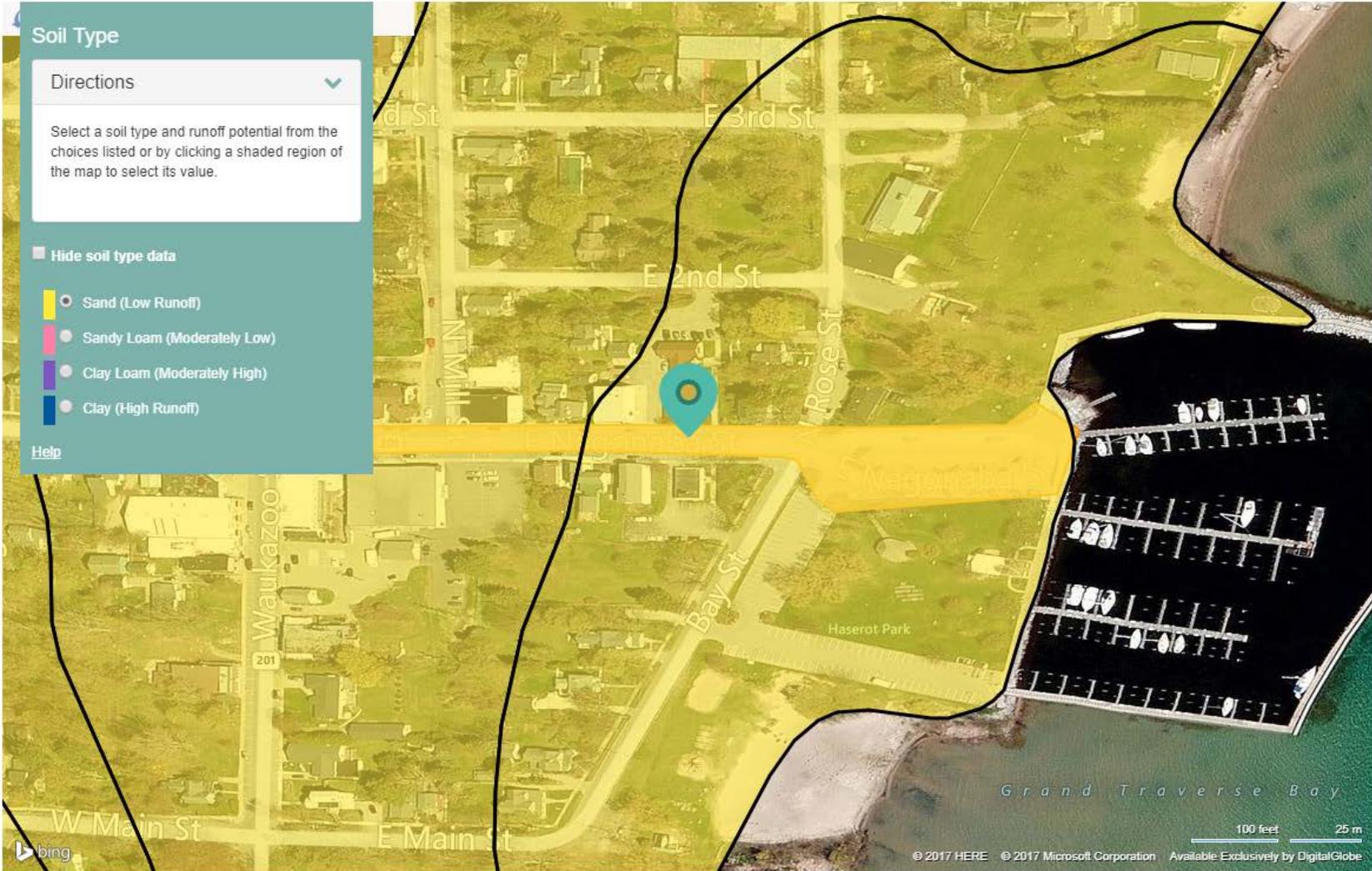
Directions 

Select a soil type and runoff potential from the choices listed or by clicking a shaded region of the map to select its value.

Hide soil type data

-  Sand (Low Runoff)
-  Sandy Loam (Moderately Low)
-  Clay Loam (Moderately High)
-  Clay (High Runoff)

[Help](#)



Grand Traverse Bay

100 feet 25 m

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Soil Infiltration Capacity:

EPA National Stormwater Calculator NEW SAVE OPEN RESOURCES CONTACT

Soil Drainage

Directions

Enter your own conductivity value directly into the input field below or click a shaded region on the map to select its conductivity value. If you leave the edit box blank, the default conductivity associated with the

Hide soil drainage data

How fast does rainwater runoff from previous areas of your site (inches/hour)?

- <= 0.01 inches/hour
- > 0.01 to <= 0.1 inches/hour
- > 0.1 to <= 1.0 inches/hour
- > 1 inches/hour

Help

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Topography/Slope:

 National Stormwater Calculator

NEW SAVE OPEN RESOURCES CONTACT



Topography

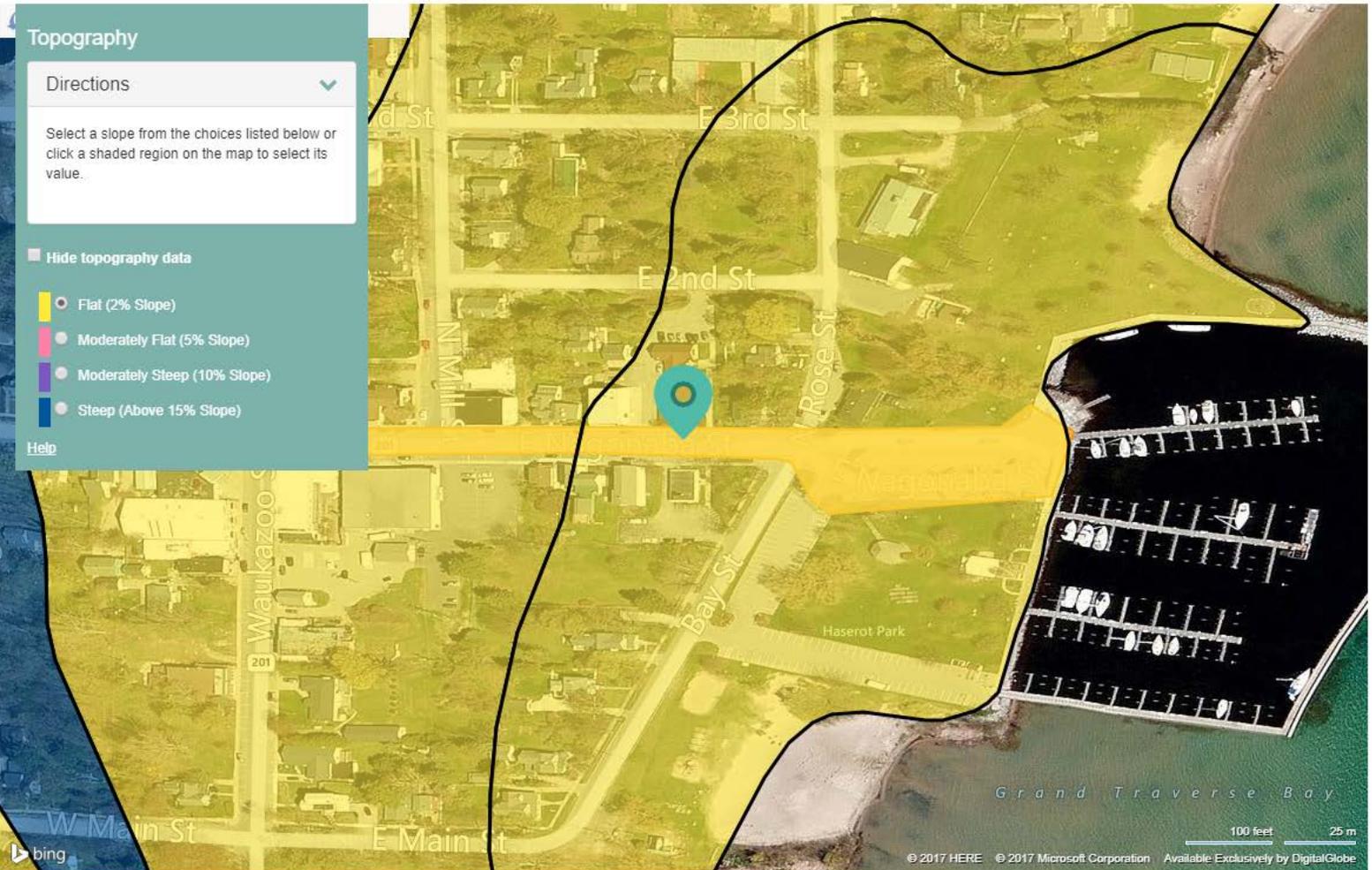
Directions 

Select a slope from the choices listed below or click a shaded region on the map to select its value.

Hide topography data

-  Flat (2% Slope)
-  Moderately Flat (5% Slope)
-  Moderately Steep (10% Slope)
-  Steep (Above 15% Slope)

[Help](#)



Grand Traverse Bay

100 feet 25 m

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Historical Weather (precipitation/evaporation)

The screenshot displays the EPA National Stormwater Calculator interface. The top navigation bar includes the EPA logo, the text "National Stormwater Calculator", and links for "NEW", "SAVE", "OPEN", "RESOURCES", and "CONTACT". On the left side, there is a vertical toolbar with various icons for map navigation and data visualization. The main content area is titled "Precipitation/Evaporation" and contains the following sections:

- Directions:** A dropdown menu with a right-pointing arrow.
- Instructions:** Text stating "Select a rain gage location to use as a source of hourly rainfall data and a weather station to use as a source for evaporation rates." Below this is a partially visible line: "Select the checkbox if you would like the".
- Rain Gage:** A dropdown menu currently set to "CHARLEVOIX".
- Weather Station:** A dropdown menu currently set to "CHARLEVOIX".
- Rainfall Information:** A scrollable area containing:
 - Record Start Date: 1987/05/31
 - Record End Date: 2006/12/31
 - Annual Rainfall: 32.17
- Download rainfall/evaporation data:** A link with a download icon.
- Help:** A link.

The background is a map of the Charlevoix, Michigan area, showing various towns and townships such as Stutsmanville, Harbor Springs, Boyne City, and Traverse City. Several green circular icons with raindrops are overlaid on the map, indicating the locations of rain gauges and weather stations. A scale bar at the bottom right shows 5 miles and 10 km. The bottom left corner features the Bing logo, and the bottom right corner contains copyright information: "© 2018 HERE, © 2018 Microsoft Corporation Terms".

Climate Change Scenarios & 24-Hour Design Storm Events

EPA National Stormwater Calculator NEW SAVE OPEN RESOURCES CONTACT

Climate Change

Directions >

Helpful Resources >

- Scenarios for Climate Assessment and Adaptation - Regions
- GlobalChange.gov - Regions & Topics
- US Environmental Protection Agency - Future of Climate Change
- World Climate Research Programme

Select a future climate change scenario to apply:

- No Change
- Hot/Dry
- Median Change
- Warm/Wet

Select the time period to which the climate change scenario applies:

- Near Term (2020 - 2049)
- Far Term (2045 - 2074)

Save charts as PDF

Percentage Change in Monthly Rainfall for Far Term Projections

This line chart displays the percentage change in monthly rainfall for far term projections (2045-2074) across three scenarios: Hot/Dry (blue triangles), Median (green diamonds), and Warm/Wet (orange triangles). The x-axis represents the months from January to December, and the y-axis represents the percentage change from -40% to 40%. The Hot/Dry scenario shows a significant decrease in rainfall during the summer months (June, July, August) and an increase during the winter months (October, November, December). The Median scenario shows a slight increase in rainfall during the spring and summer months and a decrease during the winter months. The Warm/Wet scenario shows a slight increase in rainfall during the spring and summer months and a decrease during the winter months.

Month	Hot/Dry (%)	Median (%)	Warm/Wet (%)
Jan	-5	15	15
Feb	0	-5	0
Mar	10	25	5
Apr	15	35	10
May	5	25	15
Jun	-15	5	5
Jul	-10	-15	10
Aug	-20	-10	5
Sep	-15	10	10
Oct	5	15	15
Nov	10	5	10
Dec	15	5	5

Annual Max. Day Rainfall (inches) for Far Term Projections

This line chart displays the annual maximum day rainfall (inches) for far term projections (2045-2074) across four scenarios: Hot/Dry (yellow triangles), Median (pink diamonds), Warm/Wet (purple triangles), and Historical (blue circles). The x-axis represents the return period in years (5, 10, 15, 30, 50, 100), and the y-axis represents the rainfall in inches from 2 to 5. All scenarios show an increase in rainfall as the return period increases. The Hot/Dry scenario shows the highest rainfall, followed by the Median, Warm/Wet, and Historical scenarios.

Return Period (Years)	Hot/Dry (inches)	Median (inches)	Warm/Wet (inches)	Historical (inches)
5	2.5	2.3	2.4	2.2
10	2.8	2.6	2.7	2.5
15	3.1	2.9	3.0	2.8
30	3.5	3.3	3.4	3.2
50	3.9	3.7	3.8	3.6
100	4.3	4.1	4.2	4.0

Land Cover:

EPA National Stormwater Calculator

NEW SAVE OPEN RESOURCES CONTACT

Land Cover

Directions >

Forest	<input type="range"/>	15 %
Meadow	<input type="range"/>	0 %
Lawn	<input type="range"/>	20 %
Desert	<input type="range"/>	0 %
Impervious		65 %

Restore Defaults

Help

The screenshot displays the EPA National Stormwater Calculator interface. At the top, the EPA logo and 'National Stormwater Calculator' are on the left, and navigation links 'NEW', 'SAVE', 'OPEN', 'RESOURCES', and 'CONTACT' are on the right. The main area features a satellite map of a residential neighborhood with streets labeled: W 4th St, W 3rd St, W 2nd St, W 1st St, E 4th St, E 3rd St, E 2nd St, E 1st St, E Nagonaba St, Mill St, N Mill St, N Rose St, Waukazoo St, Bay St, and Haserot Park. A red location pin is placed on E Nagonaba St, and a thick orange path highlights a route from the pin, east along E Nagonaba St, and then south along Bay St. A control panel on the left side of the map, titled 'Land Cover', includes a 'Directions' button and sliders for 'Forest' (15%), 'Meadow' (0%), 'Lawn' (20%), and 'Desert' (0%). The 'Impervious' category is set to 65%. Below the sliders are 'Restore Defaults' and 'Help' buttons. A vertical toolbar on the far left contains icons for map navigation and analysis. At the bottom of the map, there is a scale bar (0 to 100 feet) and copyright information: '© 2017 HERE © 2017 Microsoft Corporation Available Exclusively by DigitalGlobe'.

Sizing LID/GI Controls

SW Control Sizing Options (examples shown below):

- Design Storm (1 inch)
- Percentile Storm (85th %)

The screenshot displays the EPA National Stormwater Calculator interface. The top navigation bar includes the EPA logo, the text "National Stormwater Calculator", and links for "NEW", "SAVE", "OPEN", "RESOURCES", and "CONTACT". A vertical sidebar on the left contains various icons for site selection and control types. The main content area is divided into two panels:

LID Controls Panel:

Control Type	Value	Unit
Disconnection	0	%
Rain Harvesting	0	%
Rain Gardens	10	%
Green Roofs	0	%
Street Planters	55	%
Infiltration Basins	0	%
Permeable Pavement	20	%

Design Storm for Sizing: 1.0 in.
Buttons: Restore Defaults, Help

Permeable Pavement Information Window:

Permeable Pavement

Continuous Permeable Pavement systems are excavated areas filled with gravel and paved over with a porous concrete or asphalt mix. Modular Block systems are similar except that permeable block pavers are used instead. Normally all rainfall will immediately pass through the pavement into the gravel storage layer below it where it can infiltrate at natural rates into the site's native soil. Pavement layers are usually 4 to 6 inches in height while the gravel storage layer is typically 6 to 16 inches high. The Capture Ratio is the percent of the treated area (street or parking lot) that is replaced with permeable pavement. [Learn More](#)

Permeable Pavement Settings:

Parameter	Value	Unit
Pavement Thickness	5	in.
Gravel Layer Thickness	18	in.
% Capture Ratio	14	%

Pre-Treatment

Buttons: Size for Design Storm, Save and Return, Restore Defaults

The background shows an aerial view of a residential area with streets labeled "Waukawasung St", "Waukazoo St", and "Bay St". A parking lot and "Haserot Park" are also visible. A scale bar indicates 100 feet and 25 meters.

Project Cost: Development Type, Site Suitability, and Cost Region

The screenshot displays the EPA National Stormwater Calculator interface. The top navigation bar includes the EPA logo, the text "National Stormwater Calculator", and links for "NEW", "SAVE", "OPEN", "RESOURCES", and "CONTACT".

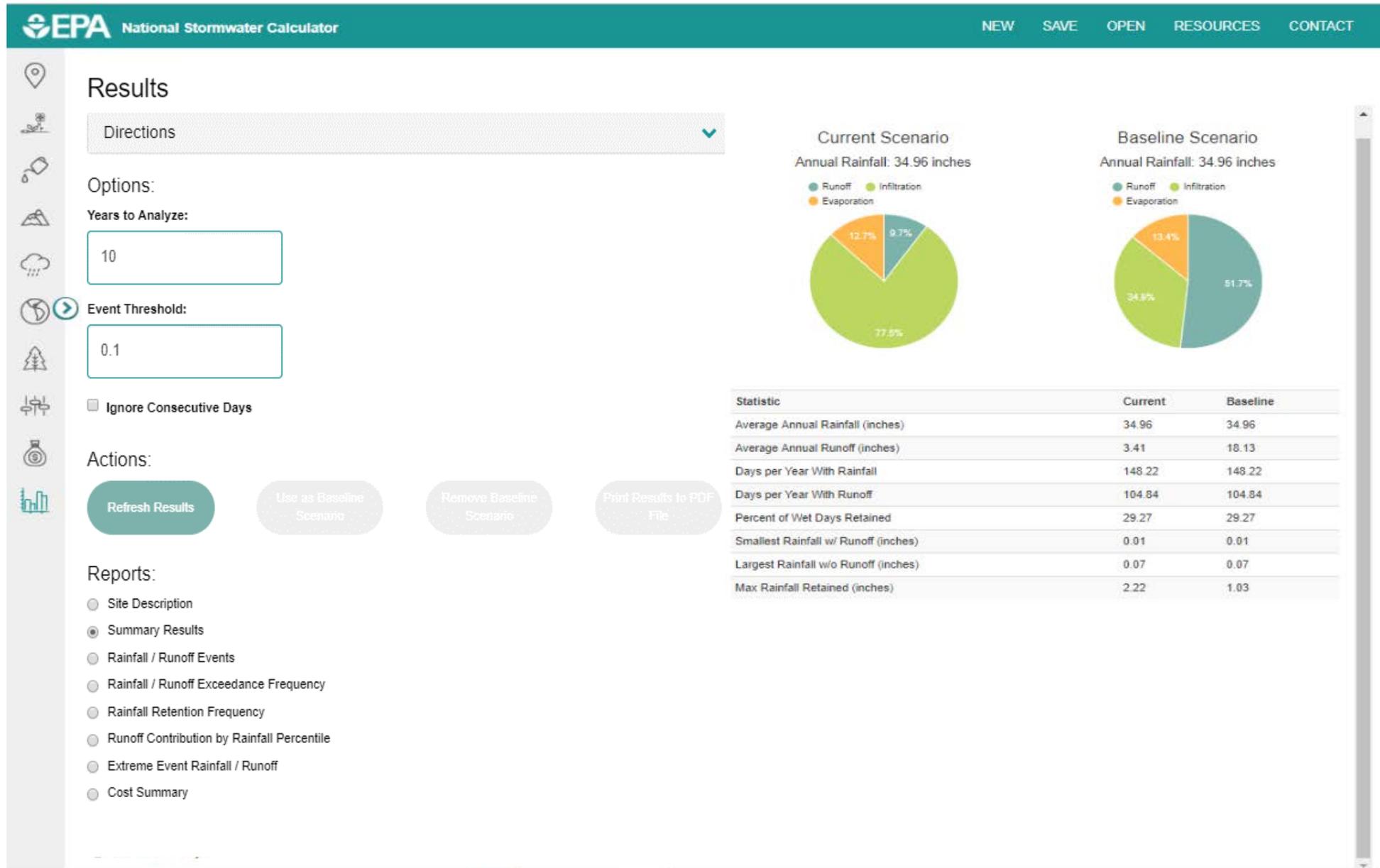
The main interface is divided into several sections:

- Project Cost:** A dropdown menu for "Directions" with a downward arrow. Below it, a text box reads: "Verify cost estimation variables below. Click on each option to learn more."
- Choose a Project Type:** Two radio button options: "Re-Development" (selected) and "New Development".
- Choose your Site Suitability:** Three radio button options: "Poor", "Moderate" (selected), and "Excellent".
- Choose your Cost Region:** A dropdown menu showing "Milwaukee(190.0 miles)".
- Regional Multiplier:** A text input field containing the value "1".

A "Cost Regions" modal window is open, displaying a map of the United States with light blue circles around major cities. The text in the modal reads: "Your 'region' has been determined from the Location tab. Using data from the Bureau of Labor Statistics (BLS) a multiplier has been computed representing the relative regional differences in costs for your nearest region (unless 'National' is shown) compared to National costs. Three regions are reported from 20 of the major cities for which BLS data is available. Users can select another region or select 'National' to apply a multiplier of 1, representing a national average. If you prefer to apply your own multiplier, select 'Other' and enter the multiplier in the Regional Multiplier field (a multiplier >1 would adjust above the National average, while a multiplier < 1 would adjust below the National average). The default multiplier for your region is shown in the Regional Multiplier box. The light blue circles in the figure below represent areas within a 100-mile radius of each major city. See User Guide for more information."

The background of the calculator is an aerial satellite view of a residential area with streets labeled "W 4th St", "W 3rd St", "Waukegan", "Waukegan 201", "Bay", "Haserot Park", and "E 4th St". A scale bar at the bottom right indicates "100 feet" and "25 m".

Runoff Reduction Results



Costs Results

EPA National Stormwater Calculator

[NEW](#) [SAVE](#) [OPEN](#) [RESOURCES](#) [CONTACT](#)

Directions >

Options:

Years to analyze:

Event threshold (inches):

Ignore Consecutive Days

Actions:

Refresh Results

Use as Baseline Scenario

Remove Baseline Scenario

Print Results to PDF File

Reports:

- Site Description
- Summary Results
- Rainfall / Runoff Events
- Rainfall / Runoff Exceedance Frequency
- Rainfall Retention Frequency
- Runoff Contribution by Rainfall Percentile
- Extreme Event Rainfall / Runoff
- Cost Summary

Cost Summary

[Tabular View](#) | [Graphical View](#)

Estimate of Probable Capital Costs (estimates in 2016 US.\$)

LID Control Type	Drainage Area %		Has Pre-Treatment?		Current Scenario (C)		Baseline Scenario (B)		Difference (C - B)	
	Current	Baseline	Current	Baseline	Low	High	Low	High	Low	High
Disconnection	0	0	No	No	\$0	\$0	\$0	\$0	\$0	\$0
Rainwater Harvesting	0	0	No	No	\$0	\$0	\$0	\$0	\$0	\$0
Rain Gardens	10	0	Yes	No	\$4,867	\$9,329	\$0	\$0	\$4,867	\$9,329
Green Roofs	0	0	No	No	\$0	\$0	\$0	\$0	\$0	\$0
Street Planters	55	0	No	No	\$8,766	\$23,274	\$0	\$0	\$8,766	\$23,274
Infiltration Basins	0	0	No	No	\$0	\$0	\$0	\$0	\$0	\$0
Permeable Pavement	20	0	Yes	No	\$12,761	\$17,391	\$0	\$0	\$12,761	\$17,391
Total	85%	0%			\$26,394	\$49,994	\$0	\$0	\$26,394	\$49,994

Estimate of Annual Probable Maintenance Costs (estimates in 2016 US.\$)

LID Control Type	Current Scenario (C)		Baseline Scenario (B)		Difference (C - B)	
	Low	High	Low	High	Low	High
Disconnection	\$0	\$0	\$0	\$0	\$0	\$0
Rainwater Harvesting	\$0	\$0	\$0	\$0	\$0	\$0
Rain Gardens	\$50	\$1,218	\$0	\$0	\$50	\$1,218
Green Roofs	\$0	\$0	\$0	\$0	\$0	\$0
Street Planters	\$103	\$2,439	\$0	\$0	\$103	\$2,439
Infiltration Basins	\$0	\$0	\$0	\$0	\$0	\$0
Permeable Pavement	\$131	\$714	\$0	\$0	\$131	\$714
Total	\$284	\$4,371	\$0	\$0	\$284	\$4,371

Note: Site complexity variables that affect cost shown below:

SWC Assisting with Next Steps

- Sharing planning results with decision-makers
- Applying for funding
- Developing:
 - Implementation plans
 - Construction documents
- Informing O&M needs



The screenshot shows the homepage of the Maryland Department of Natural Resources website. The header features the Maryland state logo and the text 'DEPARTMENT OF NATURAL RESOURCES'. A search bar is located in the top right corner. Below the header is a green navigation bar with links for HOME, LANDS, WATERS, PARKS, FISHING, HUNTING, BOATING, WILDLIFE, and TREES. The main content area is divided into two columns. The left column is titled 'News' and contains a list of categories with blue arrows pointing right: Boating, Education, Fishing, Forestry, Hunting, Lands, Parks, Police, Waters, Wildlife, and Events. Below this is a section titled 'Media Tools' with a link for 'Press Releases & News'. The right column features a news article titled 'Over \$800,000 Announced to Support Local Green Infrastructure Projects to Improve Communities and Provide Jobs', dated June 29, 2017. The article text states that the Chesapeake Bay Trust, in partnership with the U.S. Environmental Protection Agency (EPA), the Maryland Department of Natural Resources (DNR), and the City of Baltimore Office of Sustainability, have announced \$843,486 in funding for the Chesapeake Bay Green Streets-Green Jobs-Green Towns Grant Program. The goal of the grants is to help communities develop and implement plans that reduce stormwater runoff, increase the number and amount of green spaces in urban areas. To the right of the article text is a photograph of a group of people standing in front of a large pig sculpture, holding a check from the EPA.

<http://news.maryland.gov/dnr/2017/06/29/over-800000-announced-to-support-local-green-infrastructure-projects-to-improve-communities-and-provide-jobs/>

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