



# SILVA CELL<sup>®</sup>

THE DIFFERENCE IS DESIGN

The Integrated Tree, Soil and Stormwater System

# INTEGRATED TREE, SOIL, AND STORMWATER SYSTEM

The Silva Cell is a modular suspended pavement system that uses soil volumes to support large tree growth and provide powerful on-site stormwater management through absorption, evapotranspiration, and interception.



The first trees planted in Silva Cells were planted over 10 years ago. Now more than 20,000 trees are growing in Silva Cells, in over 1,500 projects in 20 countries around the world, and we're adding more every day.

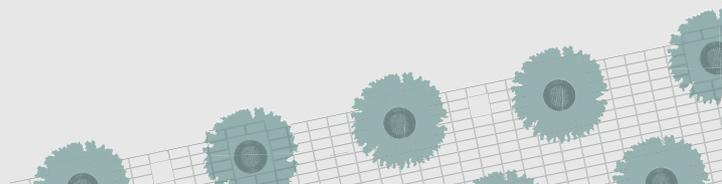
Our invention of the Silva Cell has created a revolution in how trees are planted in our urban environment. Cities are creating street tree soil volume standards and using Silva Cells to achieve them to mitigate the effects of climate change, while increasing shade and beauty.

Developers use the Silva Cell to provide stormwater management and beautiful, shade producing street trees. Plazas and parking lots are reducing the effects of ever-increasing

paving by storing stormwater on-site to reduce water pollution while growing large, healthy trees. The Silva Cell is a tool at the forefront of a green infrastructure revolution, changing how urban infrastructure functions.

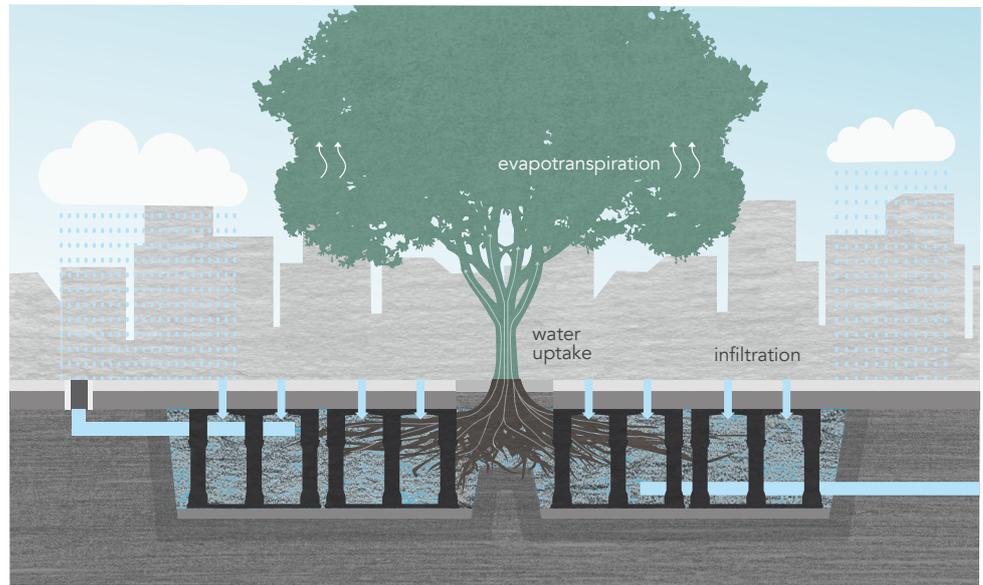
## The Difference is Design

- Independent system – no lateral connections
- Flexibility in layout to accommodate utilities
- Modular system means easily scalable
- Minimum cover to achieve vehicular loading
- Walk-through compaction for optimal rooting environment



# CREATING HIGH-PERFORMANCE GREEN INFRASTRUCTURE

The integration of green utilities like soil, trees, and water into urban areas can help alleviate some of our most pressing ecological challenges - including air and water quality, rising temperatures, flooding, and erosion from daily rainfall events.



The Silva Cell is a patented modular suspended pavement system that holds unlimited amounts of lightly compacted soil while supporting traffic loads beneath paving. That soil serves two important functions: growing large trees and treating stormwater on-site.

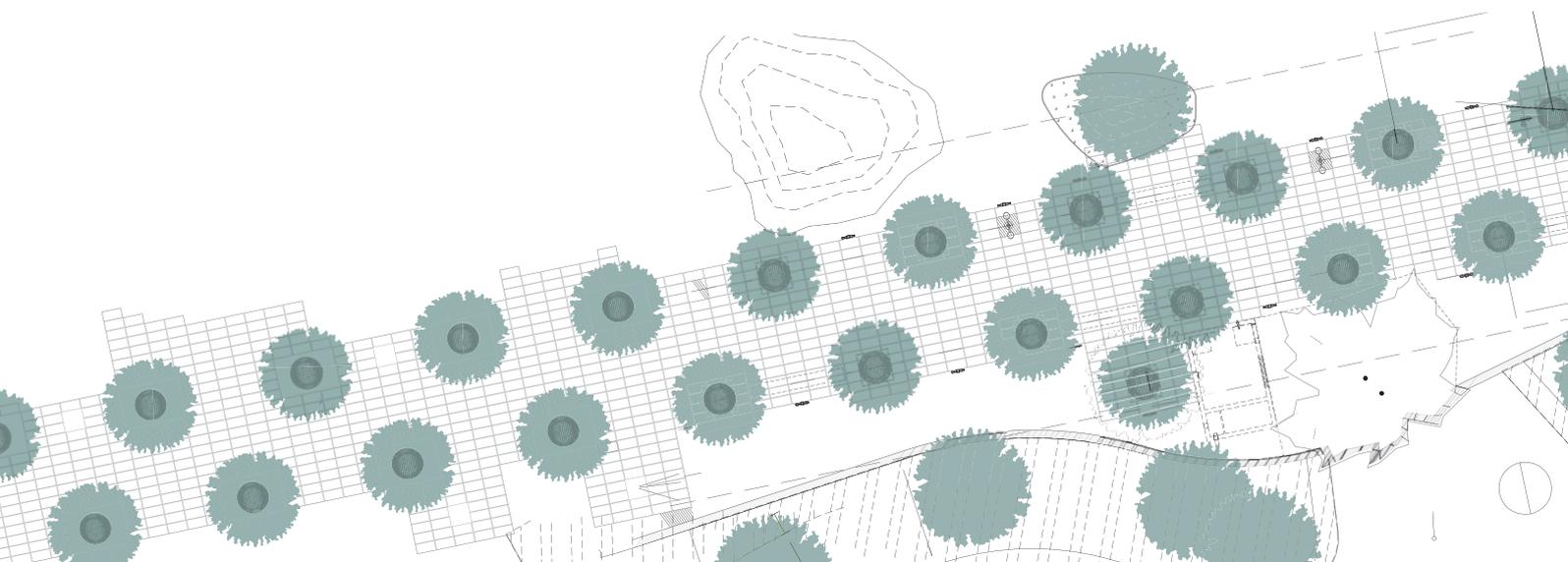
## Water Quality Benefits

Trees are crucial to many water quality benefits, including removal or sequestration of dissolved nutrients, hydrocarbons, and Total Suspended Solids (TSS).

Trees also provide evapotranspiration and slow water flow, allowing more time for sedimentation to occur.

Silva Cells can be used on almost any type of site, including:

- Streets
- Plazas
- Parking areas
- Promenades
- Green roofs/on-structure
- "Break-out" zones



# UNDERGROUND BIORETENTION WITH THE SILVA CELL

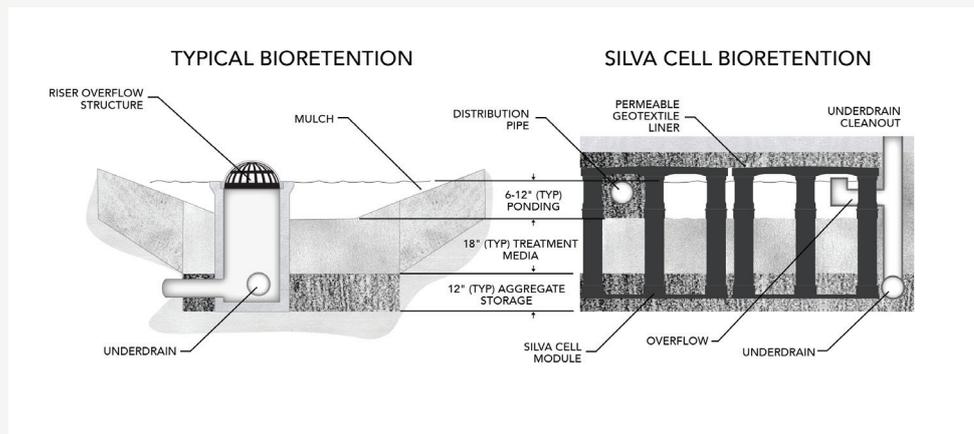
Bioretention is an incredible tool for low-impact development, keeping water where it falls so that it can be cleaned, cooled, and recharged. Open bioretention presents challenges in dense urban areas, where land values and maintenance requirements are high. This is where underground bioretention with the Silva Cell is ideal.

How do the stormwater benefits of the Silva Cell system compare to those of traditional bioretention systems? Research shows they are essentially the same.

Final results from a performance monitoring study in Wilmington, North Carolina (USA) show that Silva Cells can provide stormwater benefits equal to, or better than, traditional bioretention. Similar data has been found at Queensway (CAN) and at Howard Street (UK). Read more about these projects on our website: [www.deeproot.com](http://www.deeproot.com).

The Silva Cell system is equal to typical bioretention systems:

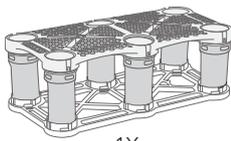
Water quality benefits: For all of the pollutants monitored, the Silva Cell systems performed better or about the same as the mean for bioretention systems in peer reviewed literature (Page et al 2015).



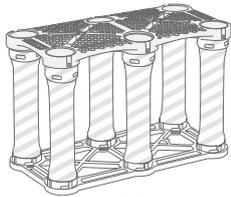
*"The aim of the Howard Street project is to demonstrate and quantify how, in an urban context, Green Infrastructure such as street trees can provide a natural solution to managing surface water runoff and addressing diffuse pollution. It is hoped that the findings from this project can be used to encourage a wider uptake of this natural alternative to engineered drainage systems for new infrastructure projects." - Pete Stringer of City of Trees Manchester*

# PRODUCT DETAILS

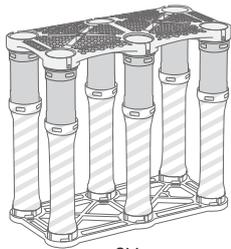
The Silva Cell is composed of a base, posts, and a deck. Each unit is 48" long x 24" wide. The assembled cells transfer paving loads vertically downward to a compacted sub-base through the posts.



1X



2X



3X



**UTILITIES:** 14" apertures easily accommodate new or existing utilities.

**STORMWATER IN/OUT:** Totally open interior allows for easy movement of water into and out of the system.

**FLEXIBILITY:** Independent units allow maximum flexibility around existing or planned site considerations.

Up to 6" spacing delivers soil as efficiently as possible.

	SOIL CAPACITY	HEIGHT
1x	~15.27 ft <sup>3</sup>	16.7 in
2x	~28.21 ft <sup>3</sup>	30.9 in
3x	~39.28 ft <sup>3</sup>	43 in

The Silva Cell is covered by one or more of the following patents:

US PATENTS	CANADIAN PATENTS	EUROPEAN PATENTS
USA 7,080,480	Canada 2,552,348	EP 2059114
USA 8,065,831	Canada 2,662,129	
USA 9,085,886	Canada 2,829,599	
USA 9,085,887		
USA 9,775,303		

Other patents pending.

# LOADING & ENGINEERING

## AASHTO H-20

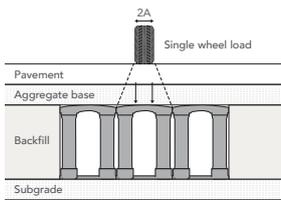


- 32,000 lbs maximum per axle
- 16,000 lbs maximum per wheel
- Tire contact area is 14.25" radius

## AASHTO HS-20



- 32,000 lbs maximum per axle
- 16,000 lbs maximum per wheel
- Tire contact area is 10" x 20" rectangle



The Silva Cell has been meticulously engineered to handle multiple competing needs, including paving and related vehicle loads, providing maximum space for unimpeded soil volume, and ease of construction – including placement within areas of high services and utility infrastructure. We have years of in-ground projects in multiple applications, providing examples of daily use in high demand environments. For more details please contact us to discuss applications for your project.

Independent lab testing and engineering analysis shows that Silva Cell, when installed per manufacturer’s specifications, meets or exceeds most loading requirements and safety factor, including AASHTO H/HS-20 (US), BS EN 1991-1-1:2002 (UK) and standards for tire contact surface area equal to 250 mm x 600 mm (Canada).

### ULTIMATE WHEEL LOAD BY STANDARD PAVEMENT TYPE

The table below provides the maximum load that can be on any single wheel (tire), or per axle, for a given pavement section, assuming tires have a contact area equal to either the AASHTO H-20 standard of a 14.25" radius or the AASHTO HS-20 standard of a 10" x 20" rectangle.

### STANDARD PAVING PROFILES

Silva Cell System Type	Traffic Loading Standard	Pavers		Asphalt		Concrete		Pavers with Concrete	
		3.15" pavers 1" sand base 12" of aggregate		4" of asphalt 12" of aggregate		4" of concrete 4" of aggregate		2.36" pavers 5" concrete	
		Wheel	Axis	Wheel	Axis	Wheel	Axis	Wheel	Axis
1X	H-20	30,200 lbs	60,400 lbs	40,600 lbs	93,200 lbs	34,900 lbs	69,800 lbs	38,600 lbs	77,200 lbs
	HS-20	31,800 lbs	63,600 lbs	48,700 lbs	97,400 lbs	35,900 lbs	71,800 lbs	41,100 lbs	82,200 lbs
2X	H-20	33,200 lbs	66,400 lbs	51,200 lbs	102,400 lbs	38,300 lbs	76,600 lbs	42,200 lbs	84,800 lbs
	HS-20	34,900 lbs	69,800 lbs	53,500 lbs	107,000 lbs	39,500 lbs	79,000 lbs	45,200 lbs	90,400 lbs
3X	H-20	28,200 lbs	56,400 lbs	43,500 lbs	87,000 lbs	32,600 lbs	65,200 lbs	36,000 lbs	72,000 lbs
	HS-20	29,700 lbs	59,400 lbs	45,500 lbs	91,000 lbs	33,600 lbs	67,200 lbs	38,400 lbs	76,800 lbs

### UTILITIES



The Silva Cell provides the utmost in project flexibility, able to integrate utilities throughout the system.

# PROJECTS AND APPLICATIONS

Using Silva Cells in plazas creates a powerful visual landscape, providing shade, harmony and beauty.



University of North Carolina,  
Chapel Hill, NC



Native Bald Cypress Trees shown 5 years  
after planting.

The iconic museum houses a powerful underground storm-water capture and reuse system provided by the Silva Cell, while simultaneously providing the soil volume needed to grow beautiful trees.



Metropolitan Museum of Art,  
New York, NY

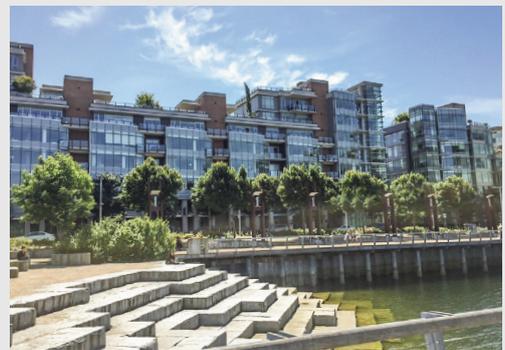


Trees shown 5 years after planting.

Waterfront promenades in formerly industrial areas are a perfect match for Silva Cell, as in this example from the former Olympic village site for the 2010 Olympic games.



Southeast False Creek Promenade,  
Vancouver, BC Canada



Trees shown 8 years after planting.

*"North Carolina State University chose to use the Silva Cells and DeepRoot.... For right-of-way applications and from a design and implementation perspective, the Silva Cell is the most flexible and integrated suspended pavement system available." - Jonathon Page, Extension Associate at NCSU*

*"We used Silva Cells as a stormwater quality BMP (best management practice) in order to comply with the Regional Water Quality Control Board storm drain requirements and to provide pollutant-control and flow-control functions... Silva Cells made the most sense because they provide all the stormwater benefit that we need, don't take up surface area, and are great for the proposed trees."*

*- David Wiener, Michael Baker International*

# THE DIFFERENCE IS DESIGN

The Silva Cell is a modular suspended pavement system that uses soil volumes to support large tree growth and provide powerful on-site stormwater management through absorption, evapotranspiration, and interception. Meet regional soil volume and stormwater requirements, and utilize the Silva Cell as a stormwater BMP that leverages soil and trees to provide:

- Water quality/pollutant control
- Peak overflow reduction/flow control
- Low/no maintenance
- Any type of soil
- Grow big trees

Our clients say it best: "Silva Cells were used for their ability to achieve water quality treatment goals as well as to grow large and mature trees. Nature-based systems are, by far, the best ones available to us," - Russell Barth, Senior Water Resources Engineer, ISL Engineering

**Uptown Normal Redevelopment, Normal, IL**  
Trees shown 8 years after planting.



**Howard Street, Manchester, UK**  
Trees shown 3 years after planting.



The award-winning projects shown here harness the power of the Silva Cell to integrate trees, soil and stormwater, creating a powerful Green Infrastructure tool.

The Difference is Design. As the creator and innovator of suspended paving systems, the depth of our experience, product knowledge and system integration is what makes the Silva Cell the most widely used suspended paving system.



**DeepRoot Green Infrastructure, LLC**  
101 Montgomery Street, Suite 2850  
San Francisco, CA 94104  
info@deeproot.com  
www.deeproot.com  
www.silvacell.com

**DeepRoot Canada Corp.**  
Suite 341 - 550 West Broadway  
Vancouver, BC V5Z 0E9  
mjames@deeproot.com  
www.deeproot.com  
www.silvacell.com

**DeepRoot Urban Solutions, Ltd.**  
6 Dorset Street  
London, UK W1U 6QL  
steve@deeproot.com  
www.deeproot.com  
www.silvacell.com