



# 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.

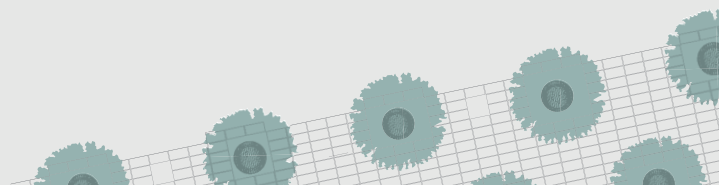
Our invention of the Silva Cell has created a revolution in how trees are planted in our urban environment. Cities are creating street tree soil volume standards and using Silva Cells to achieve them to mitigate the effects of climate change, while increasing shade and beauty.

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.

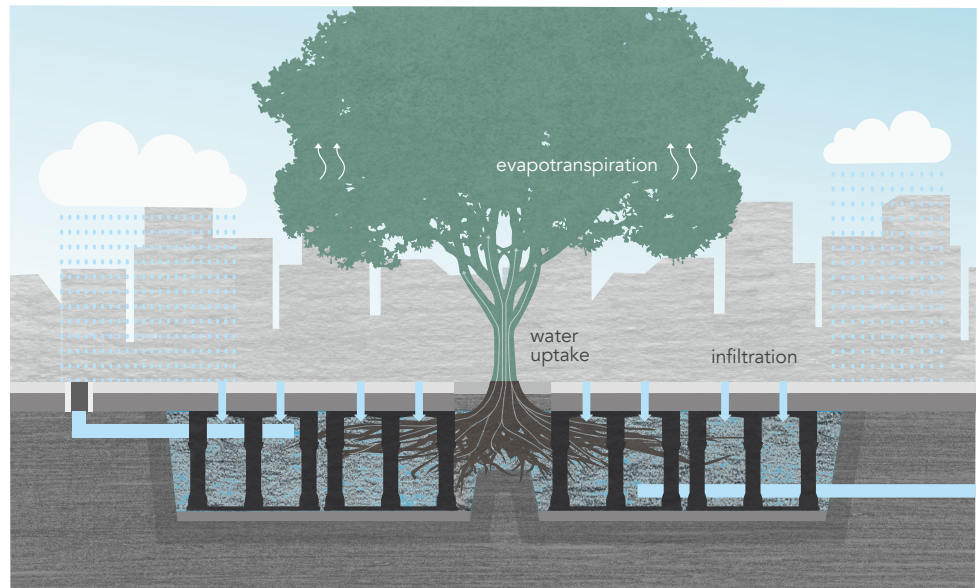
## The Difference is Design

- 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.

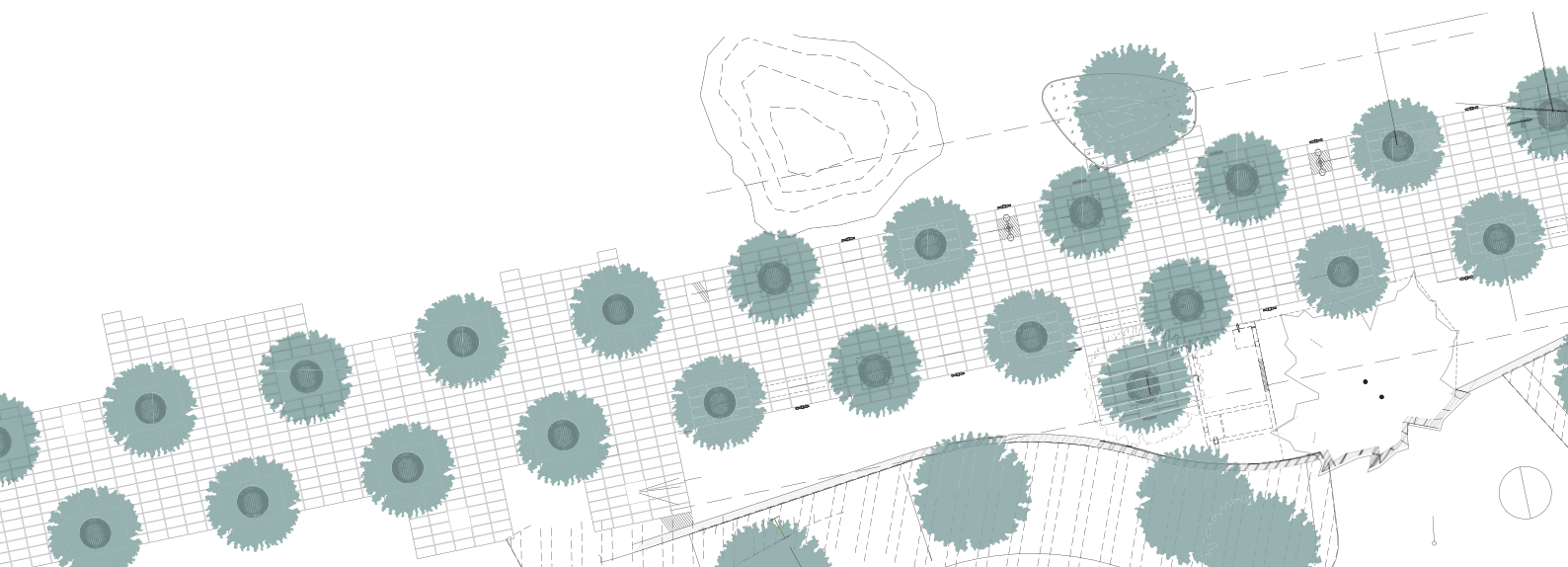
## Water Quality Benefits

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

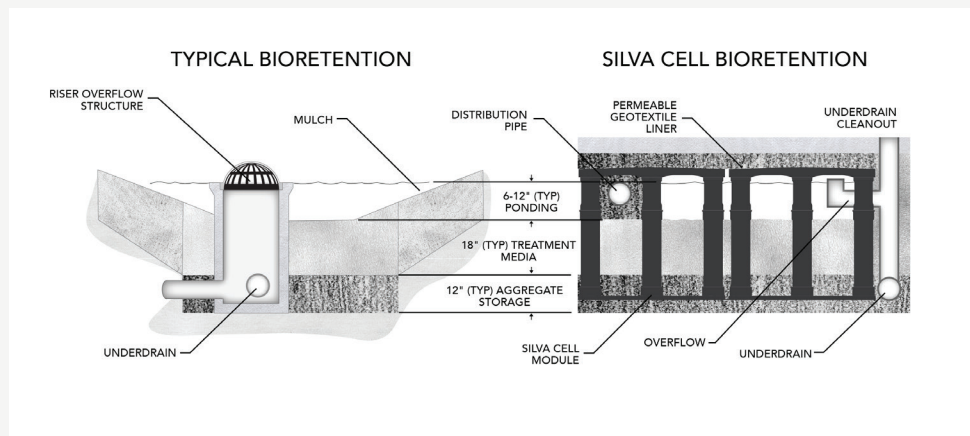
Bioretention is an incredible tool for low-impact development, keeping water where it falls so that it can be cleaned, cooled, and recharged. Open bioretention presents challenges in dense urban areas, where land values and maintenance requirements are high. This is where underground bioretention with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

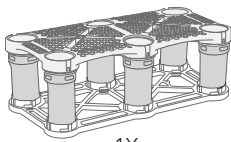
Water quality benefits: For all of the pollutants monitored, the Silva Cell systems performed better or about the same as the mean for bioretention systems in peer reviewed literature (Page et al 2015).



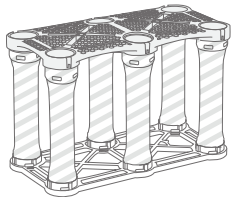
*"The aim of the Howard Street project is to demonstrate and quantify how, in an urban context, Green Infrastructure such as street trees can provide a natural solution to managing surface water runoff and addressing diffuse pollution. It is hoped that the findings from this project can be used to encourage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

# PRODUCT DETAILS

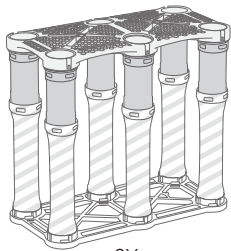
The Silva Cell is composed of a base, posts, and a deck. Each unit is 48" long x 24" wide. The assembled cells transfer paving loads vertically downward to a compacted sub-base through the posts.



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

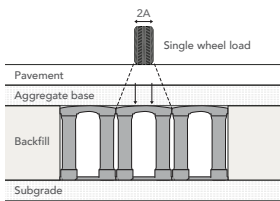


- 32,000 lbs maximum per axle
- 16,000 lbs maximum per wheel
- Tire contact area is 14.25" radius

## 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<br>1" sand base<br>12" of aggregate | Wheel      | Axis       | 4" of asphalt<br>12" of aggregate | Wheel      | Axis       | 4" of concrete<br>4" of aggregate | Wheel      |
| 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

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



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



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

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.



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