PART 1 – GENERAL

PART 2 – PRODUCTS

PART 3 – EXECUTION

PART 1 - GENERAL

1.1	Related Sections	.1	Concrete	Section 03 30 00
		.2	Precast Concrete	Section 03 45 00
		.3	Topsoil Placement and Grading	Section 32 91 19
		.4	Trees, Shrubs and Groundcover Planting	Section 32 90 00
		.5	Concrete	Section S11 Part A
		.6	Walks, Curbs & Gutters	Section S11 Part B
		.7	Interlocking Concrete Pavers	Section S12

1.2 Reference Standards .1 CSA S6:19, Canadian Highway Bridge Design Code.

1.3 Submittals .1 Soil Cell Systems and surrounding pavement design must be complete by a professional engineer licensed to practice in the Province of Nova Scotia in accordance with the Supplementary specifications. The design of the sidewalk, soil cell system, the underlying material, and soils, are able to withstand vehicular loading pursuant to the current version of the Canadian Highway Bridge Design Code CSA S6:19.

.2 Manufacturers Certification:
- .1 Design Stage: Soil cell manufacturer's letter of review and approval of the project, plans, details and specifications for compliance with product installation requirements.
- .2 Post Installation: Manufactures approved inspection checklist in accordance with submittal procedures and certification the installation qualifies for warranty.

.3 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for all composite elements of soil cell system and include product characteristics, performance criteria, physical size, finish, and limitations.

.4 Shop Drawings:
- .1 Submit shop drawings to CSA A23.4 and CAN/CSA-A23.3 including:
- .2 Manufacturer’s site-specific soil cell layout in plan and section. Indicate on drawings:

.1 All composite elements of soil cell system.
.2 Construction details, material descriptions, finishes, installation details
.3 Methods of handling and erection.
.4 Grades and dimensions (indicate stepping or sloping conditions to achieve finished grades), and soil volumes as required.
.5 All details and drawings to be stamped by a Professional Engineer licensed in Nova Scotia
.6 Warranty the product satisfies all reasonably expected loading requirements in this location.

.3 Samples:
.1 Produce, deliver and erect where directed by the Engineer on project site, [1] full size sample of each type of support module and related products finish and quality for approval of the Engineer.

.3 Compaction Tests: A certified testing agency shall perform compaction testing on sub-grade and on each layer of fill to determine compliance with specified compaction. Determine method and frequency of testing in consultation with Engineer.

.4 Documentation: dated and georeferenced photos to be submitted to manufacturer and Engineer during each phase of installation. Work may not proceed until approval of previous phase has been provided by the Engineer.

1.4 Delivery, Storage, and Handling

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Replace defective or damaged materials with new.

1.5 Warranty

.1 Provide manufacturer warranty, 20 year minimum against defects in materials and workmanship.

PART 2 - PRODUCTS

2.1 Description .1 The Soil cell system shall have the flexibly to be assembled around existing structures, utilities and in tight constraints, specific to the site requirements and achieve the required soil and/or stormwater volume. The system shall be easily disassembled and reassembled to allow for utility repair within and below the system.

2.2 Materials .1 Soil cell system

Either of the following systems:

a. StrataVault 30 series as manufactured by City Green Urban Landscape Solutions
Telephone:778-533-7764
Website: www.citygreen.com

b. Silvacell as manufactured by Deeproot Canada Corp.
Telephone: 1 604-687-0899
Website: www.deeproot.com

c. Arborsystem – Urban Tree Planting System as manufactured by GreenBlue Urban
Telephone: 1-866-282-2743
Website: https://greenblue.com/ce

d. or equivalent systems as approved by the Engineer or their representative

The Structural Soil cells system shall meet all applicable manufacturer's specifications and recommendations including, but not limited to, the following components:

a. non-woven filter cloth;
b. tensile geogrid;
c. root deflector, structural cells, and decking;
d. air and watering system;
e. Infill Panel: Injection molded, polypropylene or polyethylene with nominal dimensions as per manufacturer;
f. Interlocking uprights and decks are assembled on-site to create modules which can be uniformly stacked in height, not to exceed 2m in height (per project design); and
g. The soil module system shall have the ability to be assembled as a complete, interlocked unit or as independent modules.

.2 Tree Grates (as required)

a. Thames Tree Grate 1200 with inlet manufactured by Green Blue Urban Ltd

Grate Size:1200mm x 1200mm (min)
Vehicle Rating: Class B (min)
Material: Corten / Weathered Steel
Accessibility: Meets requirements of CSA B651 Accessible Design for the Built Environment and Heel Proof (<6.25 mm)

b. or equivalent as approved by the Engineer or their representative.

.3 Inlet Port Covers

a. RootRain Hyrdogrille Irrigation / Aeration / Inspection inlet manufactured by Green Blue Urban Ltd
Cover Size:120mm ⌀
Vehicle Rating: Class B (min)
Material: Weathering Steel
Accessibility: Meets requirements of CSA B651 Accessible Design for the Built Environment and Heel Proof (<6.25 mm)

b. or equivalent as approved by the Engineer or their representative"

PART 3 – Execution

3.1 General Conditions .1 Soil cells and related products shall be installed by a qualified Contractor with experience successfully installing structural soil cells on at least two (2) prior projects with contact information for references on those prior projects.

- Contractor will be required to complete a training session provided by the manufacture. Training session to be completed by all field supervisors and key personnel involved in the installation.
- Contractor shall utilize the same field supervisor through the project unless a substitution is submitted and approved by the Engineer.
- Otherwise, coordinate the installation with the product manufacturer, to have the manufacturer on-site during product installation.

.2 Locate underground utilities before proceeding with excavation.

- Clearance and cover measurements for underground utilities to be observed by Contractor and noted on as-built drawings.

.3 Review manufacturer's installation procedures and coordinate installation with other work affected, such as grading, excavation, utilities, construction access, erosion control and other associated works.

.4 Each soil cell or stack of soil cells shall be structurally independent such that a single stack, or group of stacks, may be removed to facilitate future utility connections or repairs. If connections are required, the connections must have ability to break during access for maintenance or repair activities.

.5 Cold weather installation or assembly of modules should not be undertaken when temperatures are below 4° C.

.6 Tree Pit Depths: Confirm excavation depths with reference to finished surface elevations. Allow for granular base course layer and, where applicable, drainage layer.

.7 Assembled modules may be walked on, but vehicular traffic is prohibited until properly backfilled and covered per Manufacturer's recommendations. Protect personnel and the installation against damage with highly visible construction tape, fencing, or other means until construction is complete.

3.2 Excavation Below Grade

.1 Excavation required for the installation of all pipes and structures shall be made to the depths and widths indicated on the Drawings (a minimum of 300 mm beyond all sides of the structural soil cell components for proper backfill). The Contractor shall ensure that the bottom of the excavation is firm and dry and, in all respects, acceptable to the Engineer.

.2 All objectionable material identified by the Engineer encountered within the limits indicated shall be removed and disposed of by the Contractor.

.3 In excavation faces, all loose or protruding rocks shall be secured or otherwise removed to finished grade. All cut slopes shall be uniformly dressed to the slope, cross-section and alignment shown on the Drawings or as directed by the Engineer.

.4 Furnish, install, monitor, and maintain excavation supports (e.g., shoring, sheeting, bracing, trench boxes, etc.) as required by to meet applicable safety requirements. Support the sides of excavation, to prevent any movement which could in any way reduce the width of the excavation below that necessary for proper construction and protect the

installed soil cell system and adjacent structures from undermining, settlement, or other damage.

3.3 Sub-Grade Preparation and Grading

.1 Sub-grade shall be unfrozen, level, and free of lumps or debris with no standing water, mud, or muck. Do not use frozen materials or materials mixed or coated with ice or frost. A minimum 9,764.86 kilograms per square meter (2,000 pounds per square foot) bearing capacity is required unless otherwise specified in project documents.

.2 If Contractor fails to maintain the sub-grade properly, the Contractor shall remove the unsuitable material. If the bottom of any portion of the excavation is removed below the limits shown on the Drawings, it shall be restored per the Engineer to the elevation shown in the Drawings. Compacted native earthen fill is not acceptable.

.3 If in the opinion of Engineer or authorized representative, the sub-grade, at or below the normal grade of the excavation as indicated on the Drawings, is unsuitable for construction; it shall be removed to such depth and width as the Engineer may direct and be replaced with suitable material as directed by the Engineer.

3.4 Subdrain Piping

.1 Place subdrain piping as indicated on the Drawings.

.2 Subdrain is required unless native soils infiltration rate is shown to be greater than 15 mm/hr by Guelph Permeameter test or other testing method approved by the Engineer.

.3 Install subdrain piping and cleanouts as indicated on the Drawings. Cleanout caps should be flushed with surface and labelled clearly and durably.

.4 Subdrain piping to be 150mm (min. diam.) perforated PVC pipe with filter sock

.5 Subdrain piping shall be sloped toward the outlet at a minimum 1% slope.

.6 Cleanout spacing shall not exceed 30m.

.7 Angled pipe connections must exceed 90 degrees. No 90-degree joints are permitted.

.8 Where the soil cell system subdrain is to connect to the Halifax Water storm drainage system, the connection design shall be submitted to and approved by Halifax Water.

.9 Prior to backfilling subdrain system must be inspected and approved by Halifax Water & the Engineer.

3.5 Sub-Base

.1 Install leveling bed to depths shown on drawings across the footprint of the structure. Granulars shall be compacted to provide a flat surface; free from lumps, debris or any other sharp materials. Base may have up to a 5% slope.

.2 Base shall be compacted to 95% Proctor Density minimum, or as specified by the Engineer.

.3 If recommended in the geotechnical report or by the Engineer, reinforcement geogrid fabric shall be placed within the base.

- If required, the reinforcement geogrid fabric shall be placed on top of 50 mm of aggregate and covered with 50 mm of aggregate. Reinforcement geogrid fabric panels shall be overlapped a minimum 300 mm, or as recommended by manufacturer.

3.6 Soil Cell System

.1 The installation procedure outlined in this section shall be followed by the Contractor. In the event of any discrepancy between the following installation procedure and the Manufacturer's Installation Guidelines, the Engineer reserves the right to contact the Manufacturer's Representative for guidance prior to the continuation of the installation. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

.2 Layout tree pit locations and dimensions using a soluble paint, chalk, or string to outline the footprint of the soil cell system. Prior to the installation of soil module panels, confirm tree pit dimensions and mark location of trees. Rectify discrepancies and errors. Ensure squareness prior to module placement. Obtain engineers approval of layout before proceeding with excavation.

.3 Install structural soil cell modules in strict accordance with manufacturer's written instructions and installation diagrams. Prior to placement, check each module for damage. Reject cracked, chipped and otherwise damaged modules. Ensure that panels in contact with granular base course are firmly seated, with no rocking. Ensure that panels are mechanically interconnected both horizontally and, if applicable, vertically.

.4 Upon completion of the placement, wrap the sides of the system with root and moisture barrier, or geogrid/fabric to prevent material migration into the soil module system.

Avoid damage to moisture barrier or geogrid/fabric during placement. If damage occurs, repair that portion per manufacturer specifications. Locations of all such repairs shall be noted on as-built drawings.

3.7 Utilities Within Soil Cell Modules

.1 The Contractor shall coordinate interface or spanning of utilities with the Engineer. This may require special treatments, barriers, and details.

3.8 Soil Filling

.1 Obtain Engineer's approval prior to filling the soil cell modules with soil. Install soil after soil modules are fully assembled and piping systems and barriers are in place.

.2 Except as shown otherwise on the Drawings, all void spaces shall be completely filled with soil. Place soil using an excavator bucket and spread by hand with rakes or shovels.

.3 Keep outer trench free of soil.

.4 Soil shall be compacted in lifts of 200 mm to 300mm during placement and compacted by walking over layers or utilizing a hand-held roller designed specifically for this use and approved by the Manufacturer. Note: the top panel is also an aeration deck allowing soil to be filled to top of upright panels.

3.9 Aeration/Irrigation and Inspection Piping

.1 Where required, place aeration/irrigation piping in accordance with the Drawings and soil cell manufacturer's specifications.

.2 Pipe to be placed level and reach entire tree pit.

.3 Perforations to face bottom of tree pit.

.4 Connect pipe to irrigation port at surface. Port cover shall be grated to allow aeration.

.5 There should be a minimum of one inlet per tree to a maximum spacing of 30m.

.6 Angled pipe connections must exceed 90 degrees. No 90-degree pipe connections are permitted.

3.10 Root Barriers and Root and Moisture Barriers

.1 Install ribbed root barriers and root & moisture barriers per manufacturer specifications. Overlap barrier joints 200mm and tape both sides of joint. Locations of barrier joints to be marked on as-built drawings. Top edge of barriers shall be level with adjacent construction. Ensure

that earth surfaces in contact with barriers are flat and free of sharp edges, debris and stones to avoid puncturing barriers. Install ribbed root barriers with ribs facing inward.

3.11 Backfilling

.1 Place backfill materials around the perimeter of the soil cell system in maximum 300mm lifts. Each lift shall be placed around the entire perimeter such that each lift is no more than 600 mm higher than the side backfill along any other location on the perimeter of the soil cell system. No fill shall be placed over top of modules until the side backfill has been completed and approved by the Engineer.

.2 Each lift shall be compacted at the specified moisture content to a minimum of 95% of the Standard Proctor Density or? until no further densification is observed (for self-compacting stone materials). The side lifts must be compacted with walk-behind compaction equipment. Even when “self-compacting” backfill materials are selected; a walk behind vibratory compactor must be used.

.3 Take care to ensure that the compaction process does not allow the machinery to contact the installed soil cell system due to the potential for damage to the root and moisture barrier or geogrid/fabric and structural soil cells.

.4 Continue backfilling the perimeter until it is backfilled to within 300 mm of the top of the structural soil cells.

3.12 Installation of Geogrid

.1 Where required, install the geogrid with integrated non-woven geotextile on top of the soil cell system per soil cell system manufacturer’s specifications allowing it to extend 300 mm vertical down the sides of the modules, and 300 mm horizontal away from the decking. Overlap geogrid with integrated non-woven geotextile a minimum 200 mm or according to geogrid manufacturer specifications.

3.13 Aggregate Base Course

.1 Continue backfilling the perimeter and top of the assembled modules in 150 mm lifts, until specified depth is reached. Each lift shall be compacted at the specified moisture content to a minimum of 95% of the Standard Proctor Density.

.2 Ensure that all unrelated construction traffic is kept away from the limits of excavation until the project is complete and final surface materials are in place. No non-installation related loading should be allowed over the soil cell system until the surface treatment is constructed.

3.14 Tree Pit Openings

.1 Confirm exact location of tree pit openings. Cut geogrid layer and fold back to expose opening. Position perimeter formwork for tree grate (as required).

.2 Line tree pit opening with root barrier where required with ribs facing inward. Extend root barrier down to top of soil modules and up to level of finished surface. Lap root barrier joints 200mm and tape both sides of joint or according to root barrier manufacturer specifications.

3.15 Tree Grates

.1 Where specified, install tree grates according to the manufacturer's instructions.

.2 Tree pit openings shall have a minimum dimension of 1200 mm x 1200 mm and be constructed with a concrete shelf to accommodate tree grate. Tree grates and supporting structures shall be sized to cover the tree opening without encroachment into the minimum tree opening.

.3 Tree grate opening shall be a minimum of 600 mm^2 (square or round).

4. Trees must be centered within the tree grate openings.

5. Tree grates shall be installed to be flush with surrounding pavement.

3.16 Cleaning

.1 Obtain approval of cleaning methods from the Engineer before cleaning any soiled surfaces.

.2 Final Cleaning: upon completion of installation of soil cell system remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 11 - Cleaning.

3.17 Protection

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by surface treatment, sidewalk, and precast or cast-in-place concrete curb installation.

****** END OF SECTION 32 94 50 ******