

# Memo

To: Joanne Fagan, MassDEP – BWSC  
Leticia Ruiz-Boyle, MassDEP – BWSC

From: Ileen Gladstone, P.E., LSP

c: Brendan Callahan, City of Peabody  
Catherine G. Johnson, P.G.  
Brian Kuchar, Horsley Witten  
Richard Claytor, Horsley Witten

Date: January 25, 2012

Re: Cap Design  
45 Walnut Street  
Peabody, Massachusetts  
DEP RTN: 3-26654  
GEI Project No. 08194-2

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On behalf of the City of Peabody, GEI Consultants, Inc. (GEI) requests of the Massachusetts Department of Environmental Protection (MassDEP) approval for an alternative cap design in connection with the Preferred Alternative for 45 Walnut Street in Peabody, Massachusetts (the Site). Information on cap materials and remedial alternatives reviewed for the Site were originally described in two documents:

- The Horsley Whitten Group “*Pre-Application Filing – 45 Walnut Street Park Redevelopment Project, Peabody, Massachusetts*” submitted to MassDEP on September 16, 2010.
- GEI’s “*Additional Remedial Alternative Information*” memorandum submitted to MassDEP on October 13, 2010.

Since the submission of these documents, the proposed Preferred Alternative has been modified. Details on the modification of the proposed Preferred Alternative are presented below.

## Background

The City of Peabody has proposed to build a park at the Site. A Conceptual Plan for the proposed park construction is attached. The Phase II Comprehensive Site Assessment (CSA) concluded that a risk to human health does currently exist at the Site due to the presence of contaminants in shallow soil in excess of the applicable MCP Method 1 S-1/GW-3 soil standards.

A cap will be constructed at the Site to eliminate the direct exposure to contaminated soil and facilitate the park construction. As the site is located within the floodplain of the North River, the cap needs to not only prevent park users from coming in contact with contaminated soils, but also must remain permeable to allow for infiltration and to accommodate flood storage capacity.

The City is undertaking the Downtown Flood Mitigation Project that is designed to alleviate some of the severe and frequent flooding that downtown Peabody currently experiences. The Site has been designated for storm water management improvements and is considered essential in providing flood storage. Therefore, there can be no net loss of flood storage capacity and so a three foot soil cap above the existing grade is not feasible.

It was also determined to be infeasible to excavate three feet of contaminated soil from the Site in order to import three feet of clean fill. The cost of soil excavation and disposal was estimated to be more than one million dollars.

The capping materials selected for the park design must meet the goals of being both permeable and protective and meet the following performance criteria:

- Encapsulation of the contaminated soil at the Site to prevent direct exposure
- Permeability to allow for storm water infiltration
- No net loss of flood water storage capacity at the Site.

### **Preferred Alternative**

The Preferred Alternative includes:

- Excavation of approximately one foot of soil across most of the 1.3 acre Site (approximately 2,100 yds<sup>3</sup> [3,100 tons]). A small portion of wetlands area will not be excavated, but will be fenced off to prevent exposure.
- Construction of a one-foot-thick cap which preserves the net flood storage capacity while eliminating exposure to contaminated soil beneath the cap. The cap is functionally impenetrable, requires low maintenance and is very durable.

A cross section of the cap is shown on Figure 1 and consists of:

- A geotextile and geogrid marker layer placed over the remaining native soil. The geotextile will prevent upward migration of contaminated soil into the clean fill and the geogrid will act as a barrier to physical penetration to the contaminated soil.
- Approximately one foot of clean fill.
- “Grassprotecta” as the upper barrier material, providing an impenetrable, permeable protective layer.
- Two to three additional inches of topsoil and finished grass surface.

### **Grassprotecta**

Grassprotecta is a product which consists of interwoven hard plastic cells, approximately 0.5 inches thick, connected in a flexible grid system. Grassprotecta is designed to be weight bearing and the grid system resists penetration. The material is installed as continuous sheets unrolled across the landscape and therefore it cannot be removed as individual sections or cells. Typical details of Grassprotecta are attached.

**Cap Evaluation: Accessibility of Soils**

The purpose of a cap is to prevent people from having “accessibility” to contaminated soil, as illustrated in Massachusetts Contingency Plan (MCP) Table 40.933(9): “Soil Category Selection Matrix—Human Exposure Potential.” In that table, three feet of soil is used as the default dividing line between soil that is considered “accessible” and soil that is considered “potentially accessible.” As planned and designed for the Site, the Grassprotecta and clean soil capping materials prevent human contact with contaminated soils at least as well as the default three feet of soil used in Table 40.933(9).

The cap includes a geo-grid with geo-textile as an underlying base layer, providing a barrier to penetration and preventing infiltration of contaminated soils upward into the clean fill. Above this layer are sub base materials (clean fill soils) which will serve as a physical barrier to penetration. The Grassprotecta will serve as a barrier to cap penetration; the grid forms a protective layer which is able to be implanted with grass, but which cannot be penetrated by a park user and would not be subject to settling, sagging, or other issues associated with a plain soil cap. The potential for erosion at this Site in particular is one which must be carefully considered, as this Site is prone to flooding.

**Conclusion**

It is our opinion that Grassprotecta, combined with the base of geotextile, geogrid, and one foot of clean soil would act as a suitable barrier to prevent accessibility to contaminated soil and eliminate human exposure potential. This alternative would also increase the overall net permeability for the Site by replacing paved and concrete areas with permeable cap materials.

MWS/CGJ/IG:jam

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## **Attachments**

Meadow grass

Perennials to attract butterflies and birds

Boulders for informal play

Benches

Game tables

RR tracks

Canal

Existing wetland to remain

Decorative fencing with interpretive signage and children's artwork

Open Lawn

Performance area, stage and seating (library story time)

Ramped decking

Proposed Easement

Rain garden

Screen planting

Screen planting

New fence

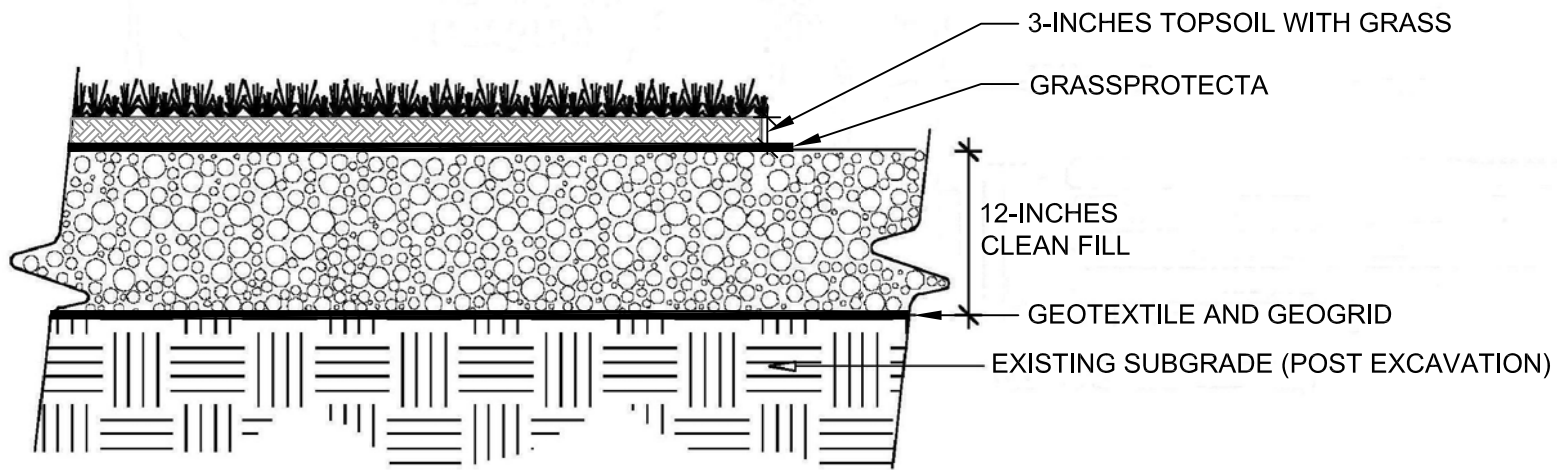
Canal

Wallis Street

Walnut Street

N





**GRASSPROTECTA DETAIL**

Not To Scale

**NOTES:**

1. DETAIL IMAGE PROVIDED BY STRUCTURES, INC. DATED 10/05.

45 Walnut Street  
Peabody, Massachusetts

City of Peabody  
Peabody, Massachusetts



Project 08194-2

GRASSPROTECTA  
CAP DETAIL

January 2012

Fig. 1

# Grassprotecta®

## SPECIFICATION & INSTALLATION GUIDANCE



Boddingtons' GrassProtecta® is a tough, flexible and long lasting extruded polyethylene mesh. Available in two grades (Standard & Heavy) and supplied in two roll sizes (2m x 20m & 1m x 10m). GrassProtecta® can be effectively employed over stable ground by simply unrolling and anchoring adjacent and successive lengths using either metal or plastic fixing pins. After a suitable period of time, the grass will grow through the mesh and reach a convenient height to be mown. The area quickly adopts a natural appearance with the grass plants intertwined with the mesh to provide permanent protection against wear. Installation is best carried out during the growing season to allow a strong interlock between the mesh and the sward, although GrassProtecta® can be installed throughout the year as appropriate.

### INSTALLATION METHODS

#### A. EXISTING GRASSED AREA

1. Ensure the surface is relatively flat and well drained. Cut the grass short and remove clippings. Fill any shallow depressions on the grassed surface with a 70:30 blend of sharp sand and good quality topsoil - level and firm. Seed may be applied at this stage or later to avoid disturbance whilst laying the mesh.
2. It is advisable to unroll the mesh rolls and leave for a minimum of one hour. This helps the mesh regain its natural flatness.
3. Lay the mesh directly onto the existing surface and fix one edge using metal U-pins or plastic pegs, pulling the mesh taut. For external edges we advise fixing every 300mm-500mm to ensure there are no raised edges. Ensure the mesh lies flat to surface.
4. Along the middle of each roll, fix every 1m-2m as required.
5. Butt adjacent rolls together (no overlapping).
6. Secure the butt joins by using the fixing pins/pegs every 500mm (each metal U-pin can join both edges). Fix the middle of the the new roll every 1m-2m as required. Repeat this process, using additional pins/pegs to secure any raised areas or where any bridging or rippling of the rolls is evident.
7. When you are satisfied that the mesh is laid flat and secure, a brushing of good quality sandy topsoil over the mesh may be required for any low areas, but this is not essential.
8. Any areas that have been levelled with sandy topsoil can be seeded at this stage.
9. Best results are obtained by not using the area until the grass has grown through the mesh apertures. This usually takes 4-8 weeks in the growing season. The area can be trafficked immediately, but grass will benefit from traffic restriction during establishment if practical to do so. If the product is used too early before the grass has had time to grow through, the mesh can become slippery in wet conditions.
10. Once the grass has grown through, initial mowing can be carried out but set blades to cut fairly high so that contact with the mesh is not made. When the grass is established and the plants are entwined with the mesh, the grass can be cut normally (This may take up to 3 cuts).
11. If any raised areas appear after the initial installation, these can be addressed by using additional U-pins / plastic pegs.

#### B. NEWLY SOWN LANDSCAPED AREAS

1. The soil surface should be well consolidated, reasonably level and cleared of debris. Any existing depressions should be infilled with a mixture of sharp sand and top soil and thoroughly consolidated.
2. Prepare the surface as a lightly tilted and consolidated seedbed.
3. Continue with points 2-11 as above.



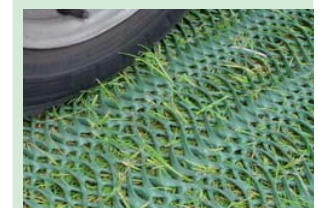
Mesh unrolled



Secured with U-pins



Mesh 'Butt' joined using U-pins



Mesh after installation



After installation - grass grows through quickly

# Grassprotecta®

## GRASSPROTECTA® PRODUCT SPECIFICATIONS

PHYSICAL CHARACTERISTICS:				
	STANDARD 1.2kg/m <sup>2</sup>		HEAVY 2kg/m <sup>2</sup>	
Structure	Oscillated		Oscillated	
Polymer	HDPE (80% Virgin, 20% Recycled)		HDPE (80% Virgin, 20% Recycled)	
Colour	Green		Green	
UV Stabilised	Yes		Yes	
NOMINAL DIMENSIONS:				
Roll Width	2m	1m	2m	1m
Roll Length	20m	10m	20m	10m
Roll Weight	48kg	12kg	80kg	20kg
Weight per liner metre	2.4kg	1.2kg	4kg	2kg
Weight per square metre	1.2kg/m <sup>2</sup>		2kg/m <sup>2</sup>	
Thickness	11mm		14mm	
Mesh Aperture (Diamond:Oval)	3:1 ratio		3:1 ratio	
TECHNICAL CHARACTERISTICS:				
Measurement	Method	Results	Results	Results
Tensile strength (MD)	ISO 10319	12kN/m	16kN/m	16kN/m
Yield point elongation (MD)		30%	35%	35%
Residual thickness @ 500 kPa	ASTM D1621	45%	60%	60%
Slip risk PTV value	BS7976: 1-3	>40 (low slip)	>40 (low slip)	>40 (low slip)
APPLICATIONS:				
Vehicle access routes, Overflow car parks, Pedestrian and disabled access, Golf buggy paths, Footpaths, Caravan/boat access, Light aircraft taxiways/parking Slope stabilisation and occasional HGV access (determined by ground conditions)				

## GRASSPROTECTA® PINS & PEGS

Product	U-Pin	Pegs - Black	Pegs - Yellow	Washers - Yellow
Material	Steel	Plastic	Plastic	Plastic
Size	170mm x 70mm x 6mm dia.	140mm long	140mm long	58mm diameter
Outer	50 pack	100 pack	100 pack	100 pack



- Suitability and selection of appropriate GrassProtecta® pegs will be at the clients discretion according to the site soil type, condition and depth.

**Notes:**

- Where weak and / or waterlogged ground conditions exist, these must be improved prior to placement of GrassProtecta®. For occasional use by HGV's, a sub-base may be required.
- Advice on suitability for specific applications is available from Boddingtons Ltd's technical team.
- GrassProtecta® can become slippery when wet (before the grass has had a chance to grow through). Boddingtons strongly recommend that all newly installed mesh is cordoned off and signage erected to advise of any potential slip hazards.

*Please note that the information above is given as a guide only. Boddingtons cannot be liable for damage caused by incorrect installation of this product. Final determination of the suitability of any information or material for the use contemplated and the manner of its use is the sole responsibility of the user and the user must assume all risk and responsibility in connection therewith.*

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