



RAINWATER AND UNDERGROUND WATER MANAGEMENT

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## TECHNICAL INSIGHTS

# GEPS<sup>®</sup>

GROUNDWATER ENERGY PASSIVE SYSTEM



# EXLTERRA GROUNDWATER PASSIVE ENERGY SYSTEM

## TECHNICAL INSIGHTS FOR PROFESSIONALS

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EXLTERRA R&D and production, Hazel Park, Michigan, USA.



## EXLTERRA

### A VISION OF EXCELLENCE FOR THE EARTH

Founded by a researcher and an entrepreneur who share a passion for Earth, EXLTERRA is a company at the forefront of environmental technology.

Since 2013, we have filed numerous patents, demonstrated the value of our solutions and pushed the boundaries of innovation on three continents.

Every aspect of EXLTERRA's technology focuses on efficiency and sustainability; it stems from a deep understanding of nature's molecular working and surpasses traditional techniques.

Our present solutions target rainwater and underground water management (EXLTERRA GEPS), nutrient regeneration of the soil (EXLTERRA NEPS) and its decontamination (EXLTERRA NSPS).

We also build ground-breaking, ultralight drill rigs to install EXLTERRA products on the most fragile grounds, like golf greens for example.

At EXLTERRA, we are obsessed with challenging every principle, every idea and every detail systematically to make sure we come up with simpler, more practical and more efficient products for you.



*Scientist Andrew Niemczyk and entrepreneur Frank Muller in the Chernobyl Exclusion Zone in 2021 during the assessment of an EXLTERRA NSPS installation to decontaminate irradiated soil.*

“ Our mission is to understand and to use the forces of nature to improve the environment. ”

FRANK MULLER  
CEO

ANDREW NIEMCZYK  
CTO

MADE IN USA



## UNDERSTANDING EXLTERRA GEPS

### GROUNDWATER ENERGY PASSIVE SYSTEM

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EXLTERRA GEPS is a system that utilizes the pressure and hydrostatic forces to create a natural environment that pulls excess water into the ground.

An EXLTERRA GEPS unit is not a tube that drains water into the ground: it is a poly section that pulls water from around itself.

Each unit is a channel for moisture between soil layers; moisture that is forcibly restrained due to variables such as compaction, infiltration rate, and soil composition.

The real power of EXLTERRA GEPS comes from the pattern in which it is installed as a matrix of units planted beneath the soil at set depths and set distances from one another.

This pattern changes the influence ratio as EXLTERRA GEPS units interact with each other and no longer function as an individual unit, but as an energy passive system. The radius of influence changes due to the various lengths of the EXLTERRA GEPS units.

EXLTERRA GEPS greatly increases the infiltration rate as the units work together to move the excess moisture from surface soils down into the less saturated layers below.

Where the superficial soil is heavily compacted, the whole system may be complemented with EXLTERRA BSTR (boosters), smaller size units which are installed just beneath the surface to increase the efficacy of the underlying system.

#### EXLTERRA GEPS & EXLTERRA BSTR

**MATERIAL** – Like all other EXLTERRA poly sections, EXLTERRA GEPS and BSTR units are made of polyethylene, one of the most utilized plastics in the world, which is considered neutral for the environment.

Chemically inert so as not to degrade in the soil over time, EXLTERRA GEPS units and BSTR boosters withstand temperatures between -20°F to 170°F without losing their properties.

**DIMENSIONS** – EXLTERRA GEPS units are 5, 10, 20 and 40 feet long and their diameter is 1.26in. The EXLTERRA BSTR length is 18in for a diameter of 0.8in.

**STORAGE** – EXLTERRA GEPS and BSTR units must be stored so that they will not be exposed to UV rays and the sun.

UV rays and excessive heat would cause the plastic to twist the extrusion shape. Store the units flat at all times to avoid warping.

**TRANSPORTATION** – All EXLTERRA GEPS and BSTR units must be transported the same way they are stored, keeping them as flat and untwisted as possible, and avoiding UV rays.

**INSTALLATION** – EXLTERRA GEPS are installed 1 to 1.64ft below the surface and must be oriented clockwise from the top.

EXLTERRA BSTR are installed 1-2in below the surface. Orientation does not matter.



## WHY INSTALL EXLTERRA GEPS?

### INCREASING NATURAL INFILTRATION

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There are a variety of applications in which the installation of EXLTERRA GEPS is beneficial. The EXLTERRA GEPS system increases the natural infiltration rate into the soil where it is installed. The system creates hydrostatic stabilization by reducing pressure against underground foundations like basements, pools, etc.

EXLTERRA GEPS is also beneficial to areas with standing water, such as golf courses and sports fields, as again it increases the soil infiltration rate and eliminates excess water quickly.

Another application for EXLTERRA GEPS is soil stabilization. When an EXLTERRA GEPS system is placed in an area where the soil is not stable enough to be built on, the system will naturally distribute water into the soil, stabilizing it and increasing its bearing.

EXLTERRA GEPS is also very useful in water-depleted regions because it will naturally replenish aquifers when as a groundwater recharge system.



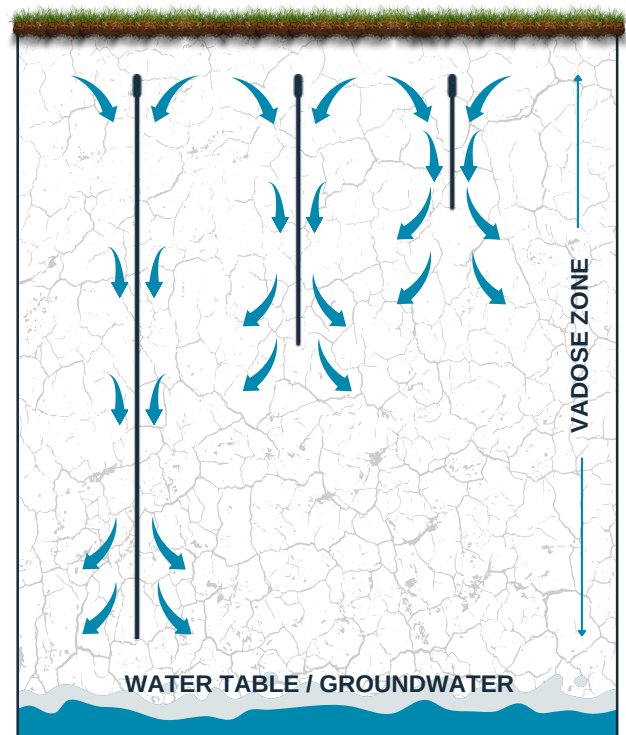
*Figure 1 – EXLTERRA GEPS section view and orientation as viewed from the top, with cap.*

## HOW EXLTERRA GEPS WORKS

### ACTIVATING NATURALLY OCCURRING FORCES

After a EXLTERRA GEPS unit is installed, it starts to activate as the following events take place:

- 1) The naturally occurring adhesive and cohesive forces pull water towards the EXLTERRA GEPS unit.
- 2) Soil particles absorb water molecules and expand, curving the blades on EXLTERRA GEPS units closed and fully compressing the unit, as shown in the image below.
- 3) When this is happening, the vacuum at the top of the EXLTERRA GEPS unit becomes more powerful, allowing water to flow down into the lower layers of the soil (vadose zone).
- 4) Water rises around the EXLTERRA GEPS unit, causing positive pressure at the bottom.
- 5) The natural infiltration occurs causing the water to enter the soil.
- 6) The vacuum, or negative pressure, gets stronger along this process, and attracts water towards the EXLTERRA GEPS unit from the area around it.



*Figure 3 – Vadose zone with EXLTERRA GEPS units installed below the ground surface.*



*Figure 2 – Moist soil pushes the blades on the closed EXLTERRA GEPS unit.*



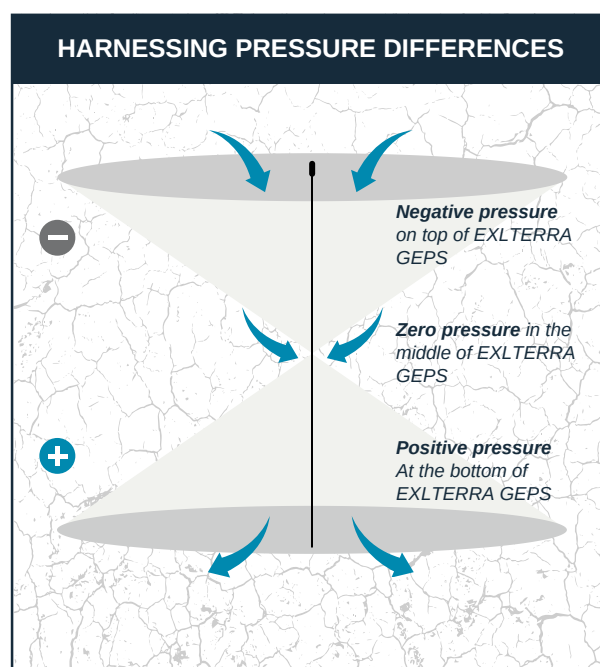
## HOW EXLTERRA GEPS WORKS

### ACTIVATING NATURALLY OCCURRING FORCES

7) The cycle of water attracted near the top of the unit and released around the bottom continues, causing a siphoning action, creating two cones opposite of each other with negative pressure at the top, positive pressure at the bottom, and zero pressure in the center of the length of the unit.

8) In the dry season, the unit opens up (figure 5) and water vapor rises naturally, releasing moisture into the soil, stabilizing its upper level, and so the same process continues to rebalance the system.

Figure 6 on the next page illustrates the water movement through untouched soil on the left, and the water movement through soil with EXLTERRA GEPS system installed on the right.



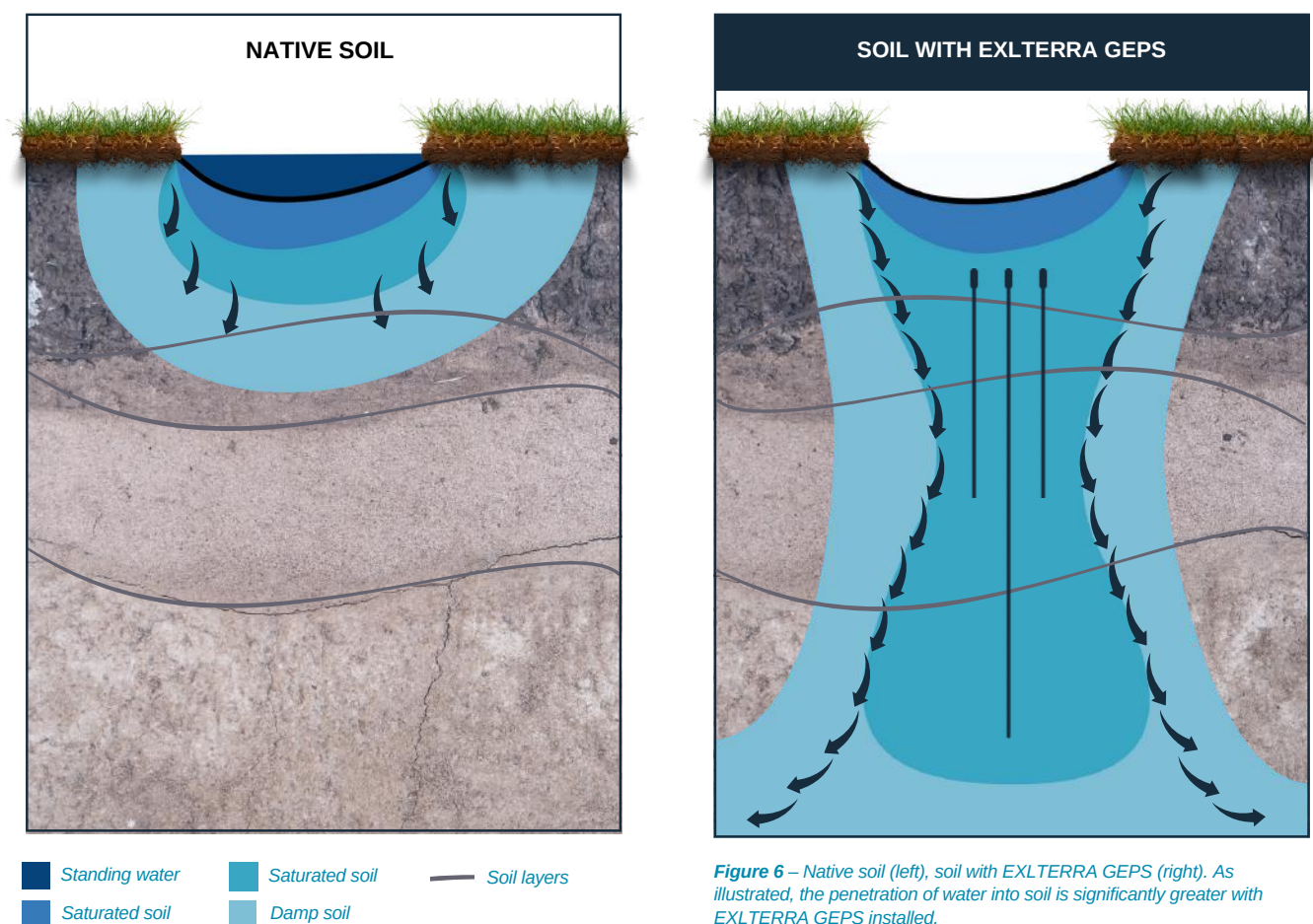
*Figure 4 – 5 inches EXLTERRA GEPS with the differences in pressure along the unit.*



*Figure 5 – Blades of a EXLTERRA GEPS unit opening when the soil is dry.*

## HOW EXLTERRA GEPS WORKS

### ACTIVATING NATURALLY OCCURRING FORCES



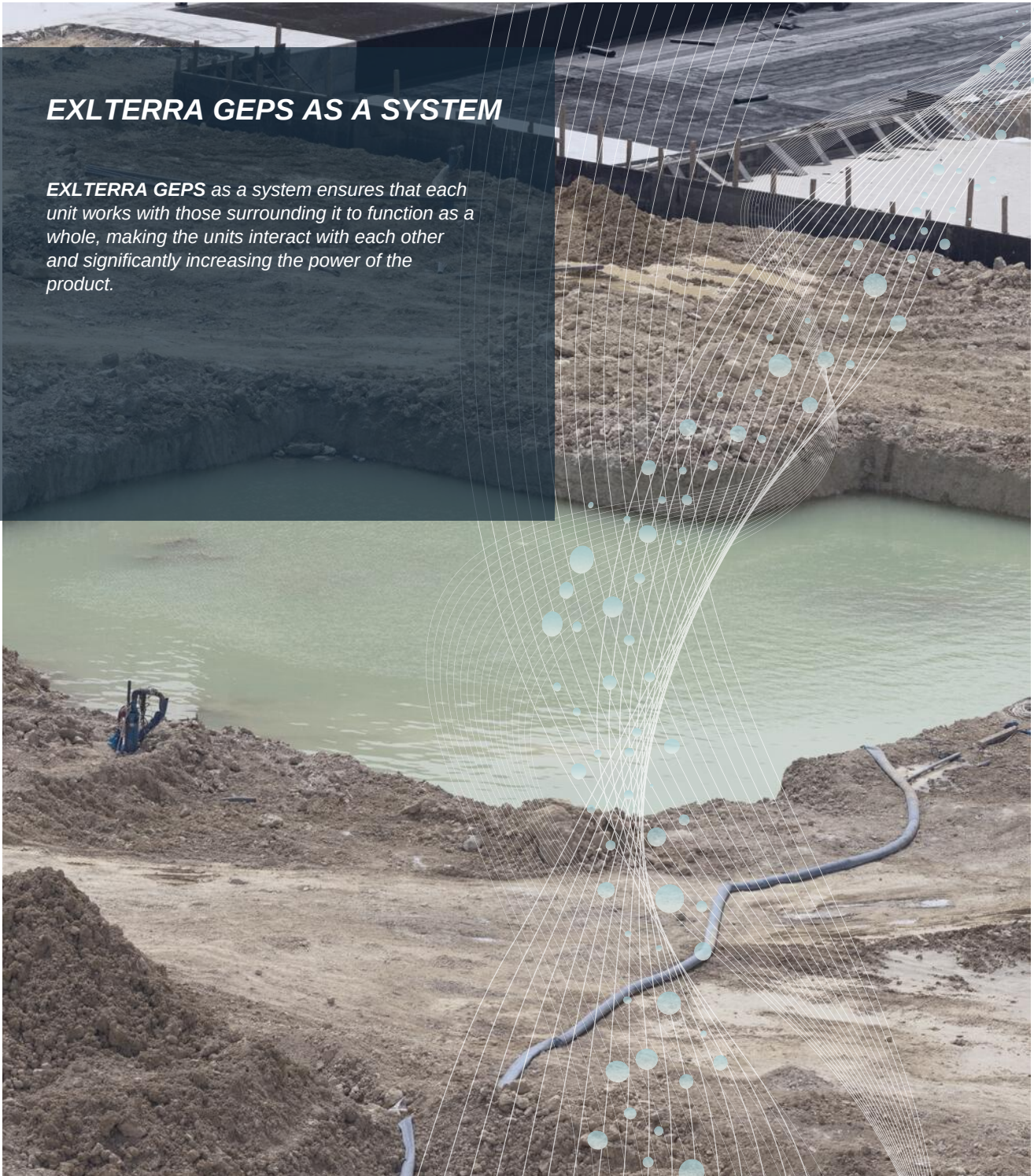
**Figure 6** – Native soil (left), soil with EXLTERRA GEPS (right). As illustrated, the penetration of water into soil is significantly greater with EXLTERRA GEPS installed.

Water reaches deeper levels in the soil with EXLTERRA GEPS, and it is filtered through the soil—preventing any contamination to reach into lower levels.



## EXLTERRA GEPS AS A SYSTEM

*EXLTERRA GEPS as a system ensures that each unit works with those surrounding it to function as a whole, making the units interact with each other and significantly increasing the power of the product.*









## EXLTERRA GEPS AS A SYSTEM

### INTERACTING NATURAL FORCES

When EXLTERRA GEPS is installed in a pattern, the forces of each unit interact with each other, increasing the power of the product, giving it the ability to naturally infiltrate water into soil at an increased rate. Installing EXLTERRA GEPS in a pattern causes each unit to work with the ones around it to function as a system.

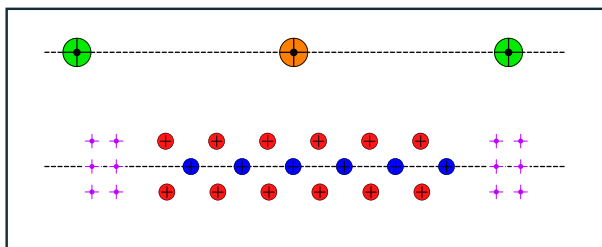


Figure 7 – An EXLTERRA GEPS pattern layouts to be compared with the image below.



Figure 8 – EXLTERRA GEPS color coding key for reference.

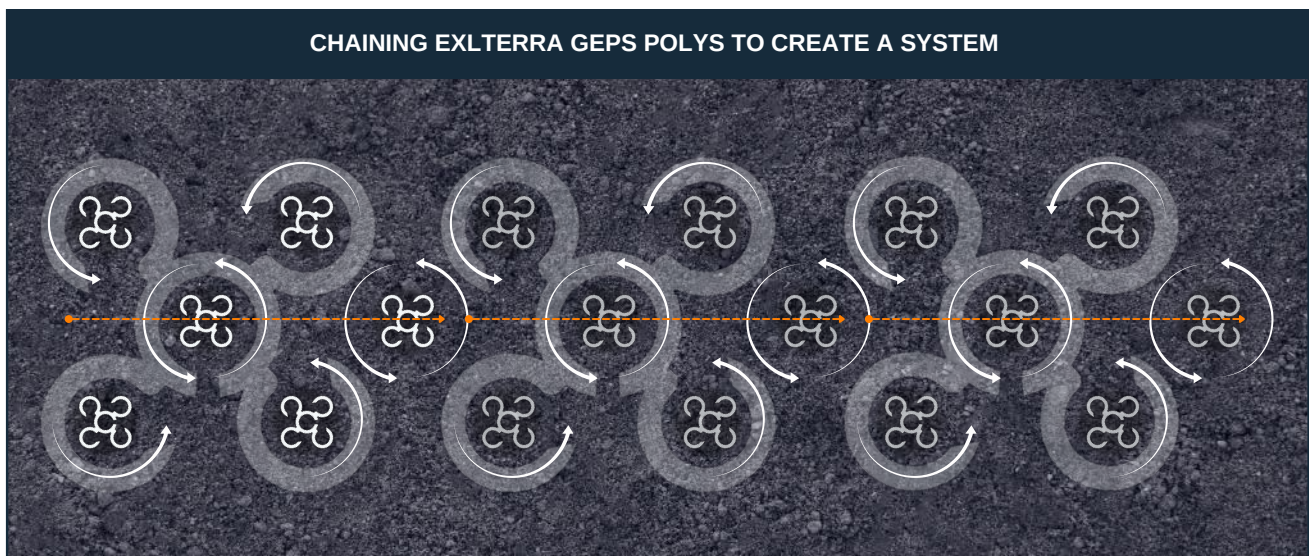


Figure 9 – Illustration showing how combining multiple EXLTERRA GEPS polys (shown here without their cap) creates a chain and makes them interact to multiply the GEPS section shape and create a larger “virtual” system. One link, used alone as a system or together with other links to create a chain, is always six polys minimum (5+1).

## EXLTERRA GEPS AS A SYSTEM

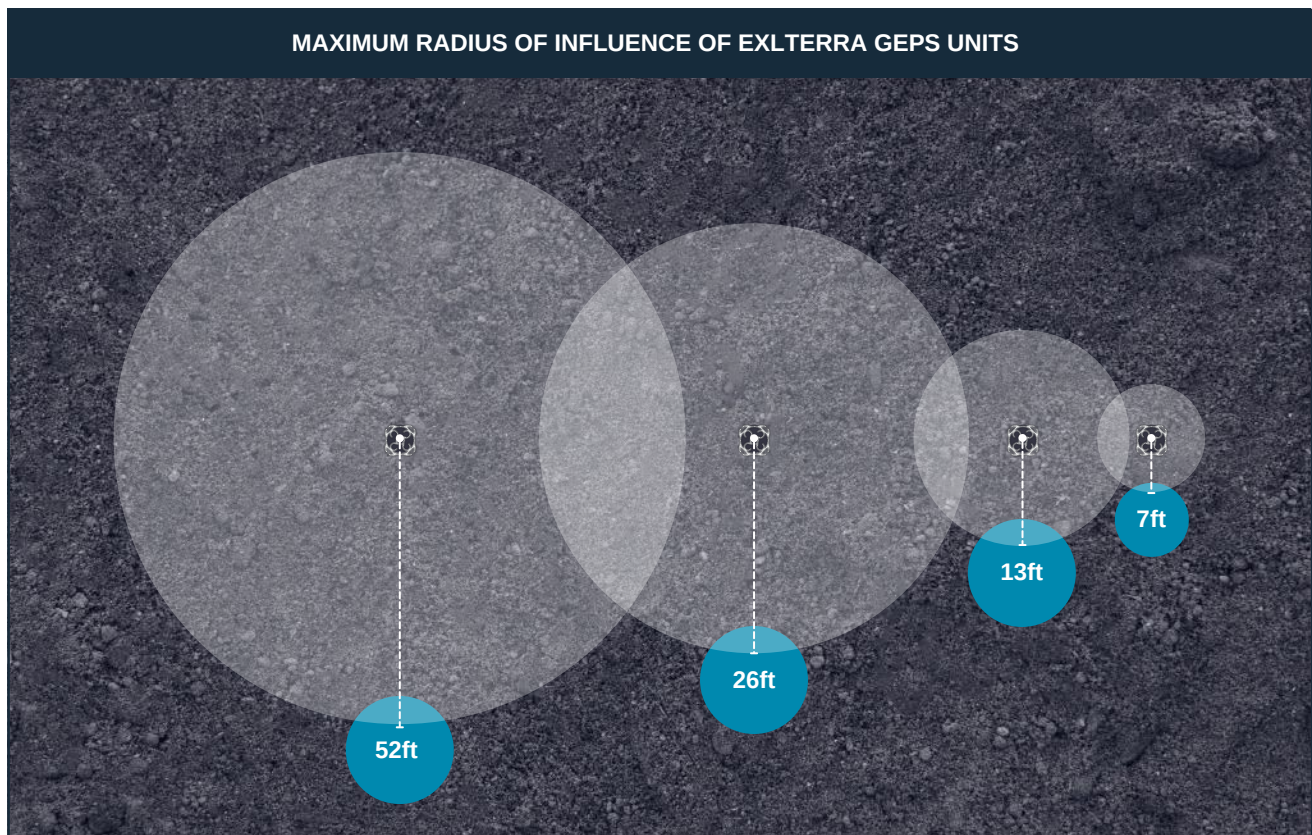
### AREA AND VOLUME OF INFLUENCE OF AN EXLTERRA GEPS UNIT

EXLTERRA GEPS has a large radius of influence that extends from the center of the unit. The image below illustrates the area of influence each EXLTERRA GEPS unit will have on the earth's surface after multiple years of installation. The radius of influence is roughly 52, 26, 13 and 7ft for EXLTERRA GEPS with a length of 40, 20, 10 and 5ft respectively.

**Figure 10** – The maximum radius of influence after multiple years of installation each EXLTERRA GEPS unit has on the surrounding earth. The radius is not constant throughout the entire length of the unit, the maximum influence occurs at the top and the bottom of the unit.

Once the system fully activated, the volume of influence on the area surrounding each EXLTERRA GEPS unit projects downwards under the surface as a cone with the point at the mid length of the EXLTERRA GEPS, and a second inverted cone that extends to the end of the length of the EXLTERRA GEPS. The figure below illustrates the influence each EXLTERRA GEPS unit has on the surrounding soil when installed.

Note: The EXLTERRA GEPS system gets stronger as more units are installed, and the amount of EXLTERRA GEPS needed per square unit of area decreases when the total area of installation is increased.



## EXLTERRA GEPS AS A SYSTEM

### AREA AND VOLUME OF INFLUENCE OF AN EXLTERRA GEPS UNIT

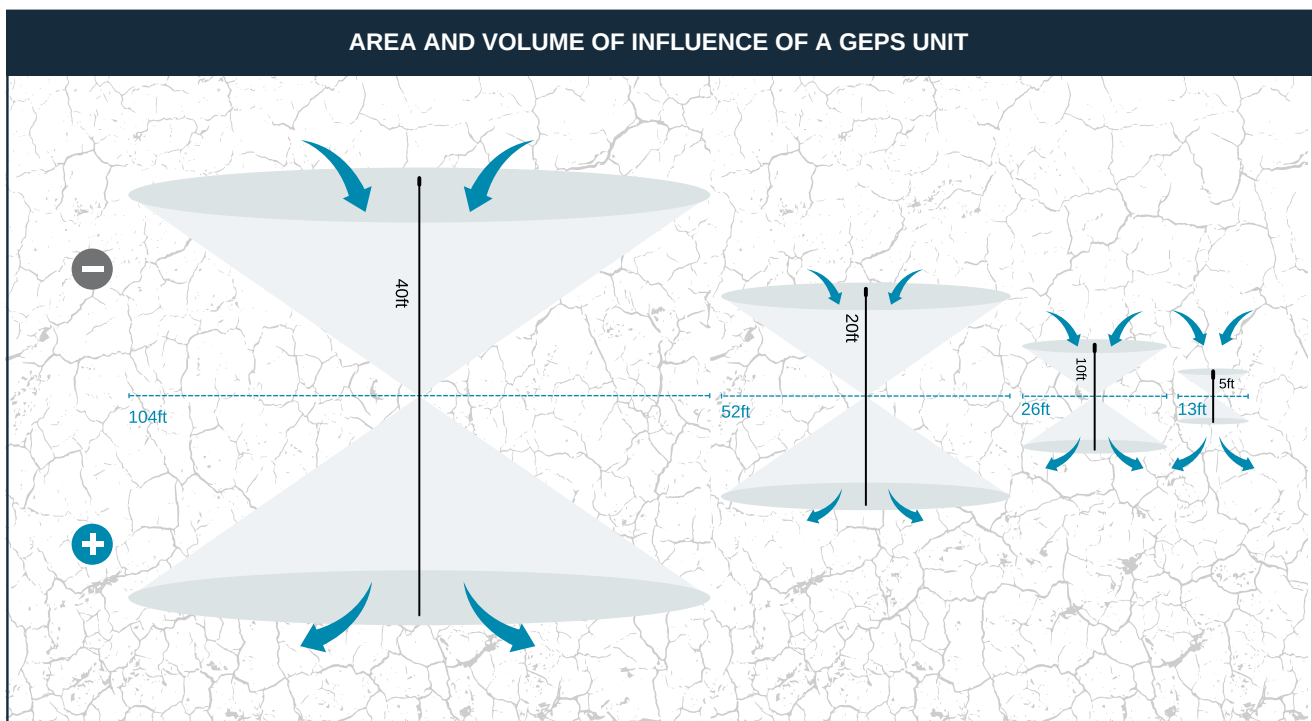


Figure 11 – The influence EXLTERRA GEPS has on the surrounding area when installed.

- |  |  |
|--|--|
|  EXLTERRA GEPS 5ft  |  EXLTERRA GEPS 20ft |
|  EXLTERRA GEPS 10ft |  EXLTERRA GEPS 40ft |
|  EXLTERRA BSTR 18in |  |

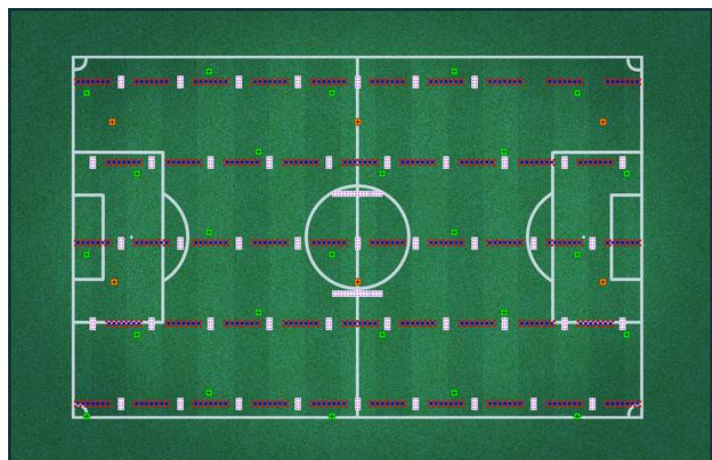
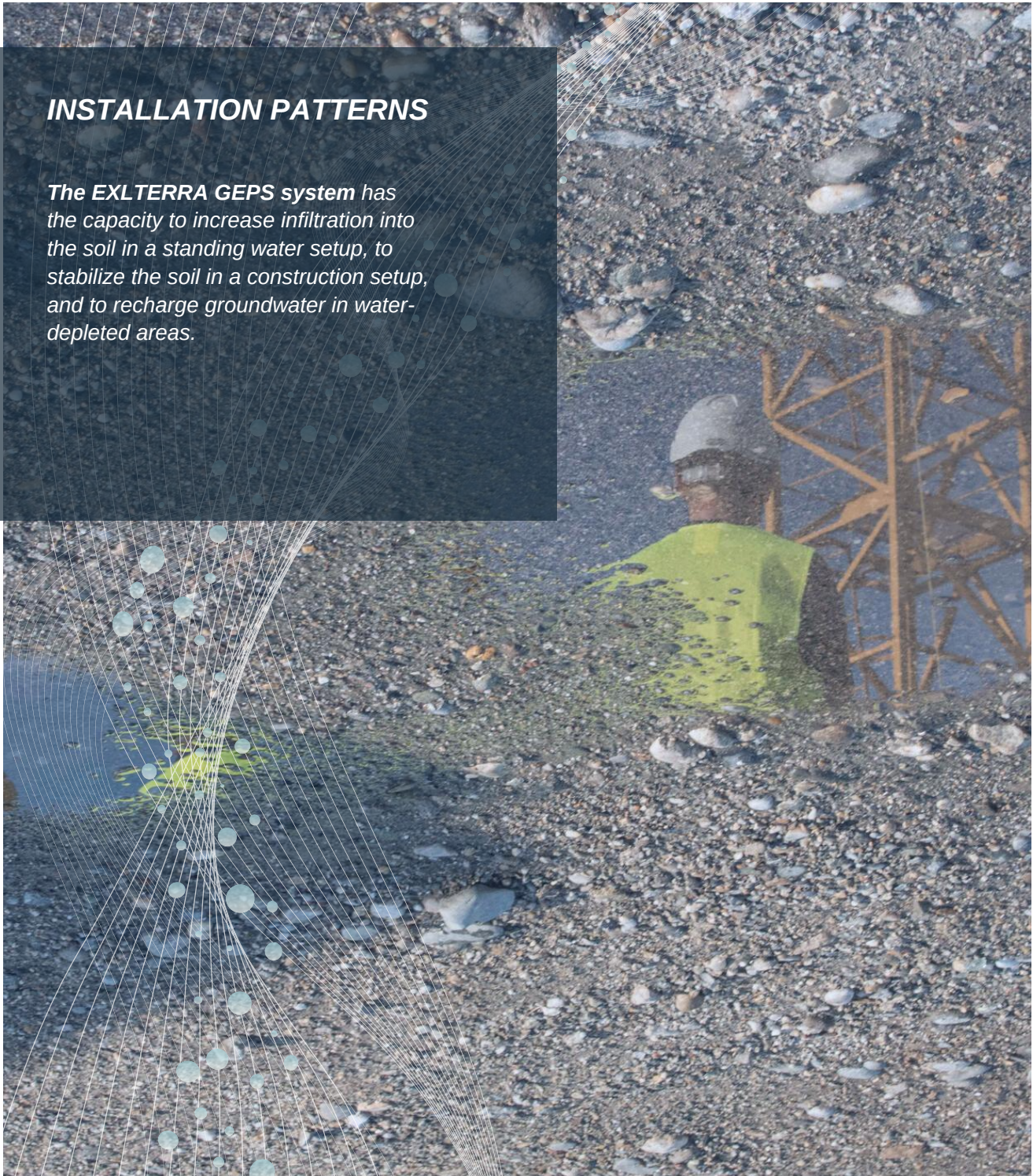


Figure 12 – Example of an EXLTERRA GEPS layout on a soccer field.



## INSTALLATION PATTERNS

*The EXLTERRA GEPS system has the capacity to increase infiltration into the soil in a standing water setup, to stabilize the soil in a construction setup, and to recharge groundwater in water-depleted areas.*



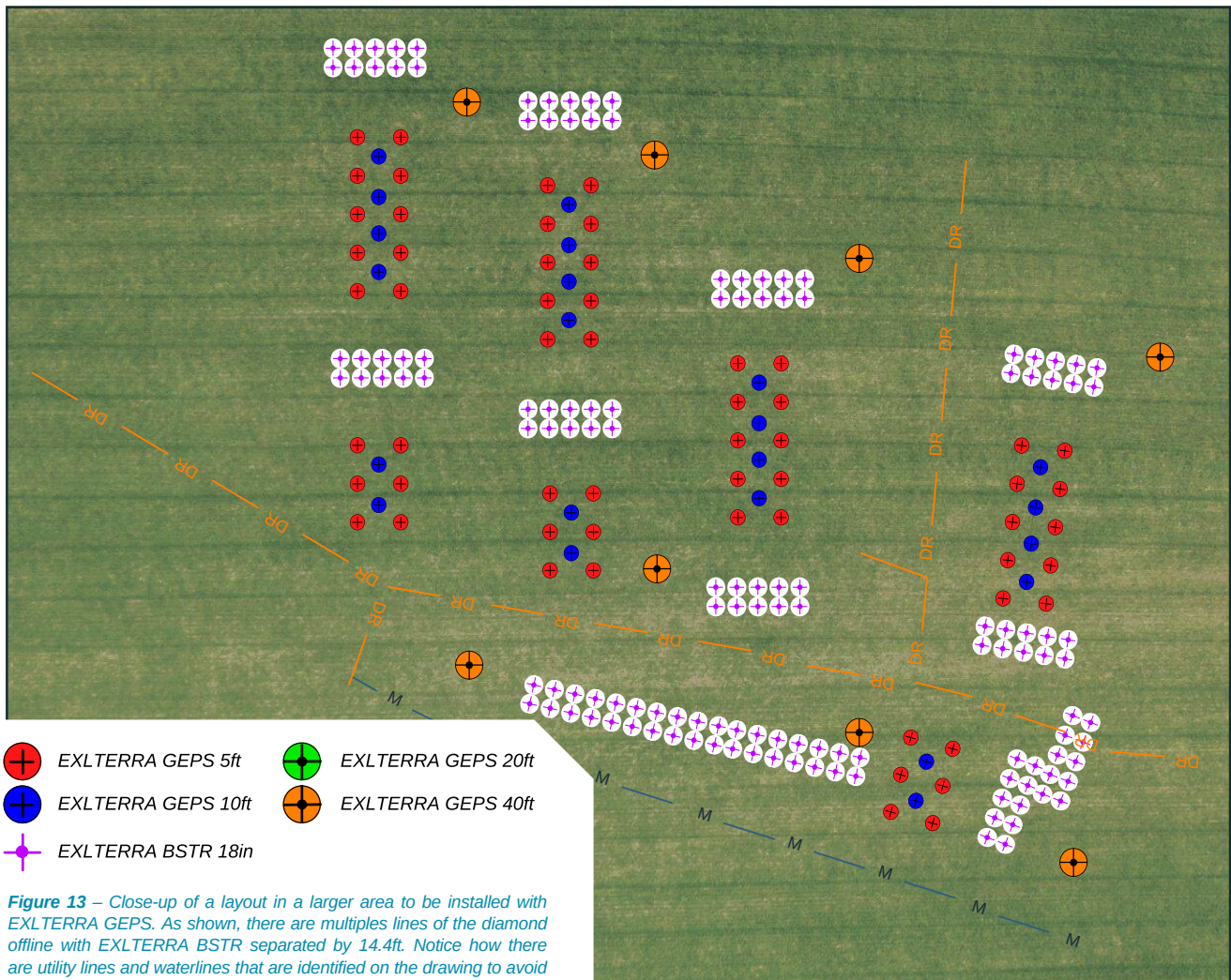


## 1) FOR INFILTRATION

### EXLTERRA GEPS INSTALLATION PATTERNS

The EXLTERRA GEPS system has the unique ability to increase ground infiltration when patterns are used for areas with standing water. Some common examples are sports fields (golf, football, baseball), playgrounds, parks, gardens, airports, roadsides or sidewalks, where water accumulates from runoff and rain.

The objective is to increase the speed at which water will naturally be absorbed by the ground by disposing EXLTERRA GEPS on the area of standing water. Below are some examples of completed EXLTERRA GEPS layouts for infiltration.



**Figure 13** – Close-up of a layout in a larger area to be installed with EXLTERRA GEPS. As shown, there are multiples lines of the diamond offline with EXLTERRA BSTR separated by 14.4ft. Notice how there are utility lines and waterlines that are identified on the drawing to avoid placing EXLTERRA GEPS.

## 1) FOR INFILTRATION

### EXLTERRA GEPS INSTALLATION PATTERNS



**Figure 14** – An infiltration layout for a larger area of land that needs three lines of EXLTERRA GEPS.

Unlike the pattern in figure 20, this layout uses the 20ft and 40ft inline with a diamond pattern, which is possible when the layout comprises no more than two EXLTERRA GEPS lines on each side of a central one.

**Figure 15** – A concave green on a golf course utilizing the pattern of diamond with EXLTERRA BSTR inline.

This is a smaller area, so the 20ft and 40ft EXLTERRA GEPS are inline with the diamond pattern.

As shown, the distance from the EXLTERRA GEPS line to the limits of the area is only 20ft, illustrating there is no need for multiple GEPS lines.

The 40ft EXLTERRA GEPS are on the ends of the line because when there is only one EXLTERRA GEPS line for infiltration, the infiltration is increased when 40ft units are in the middle.









## 1) FOR INFILTRATION

### EXLTERRA GEPS INSTALLATION PATTERNS



- |   |                    |   |                    |
|---|--------------------|---|--------------------|
|  | EXLTERRA GEPS 5ft  |  | EXLTERRA GEPS 20ft |
|  | EXLTERRA GEPS 10ft |  | EXLTERRA GEPS 40ft |
|  | EXLTERRA BSTR 18in |   |                    |

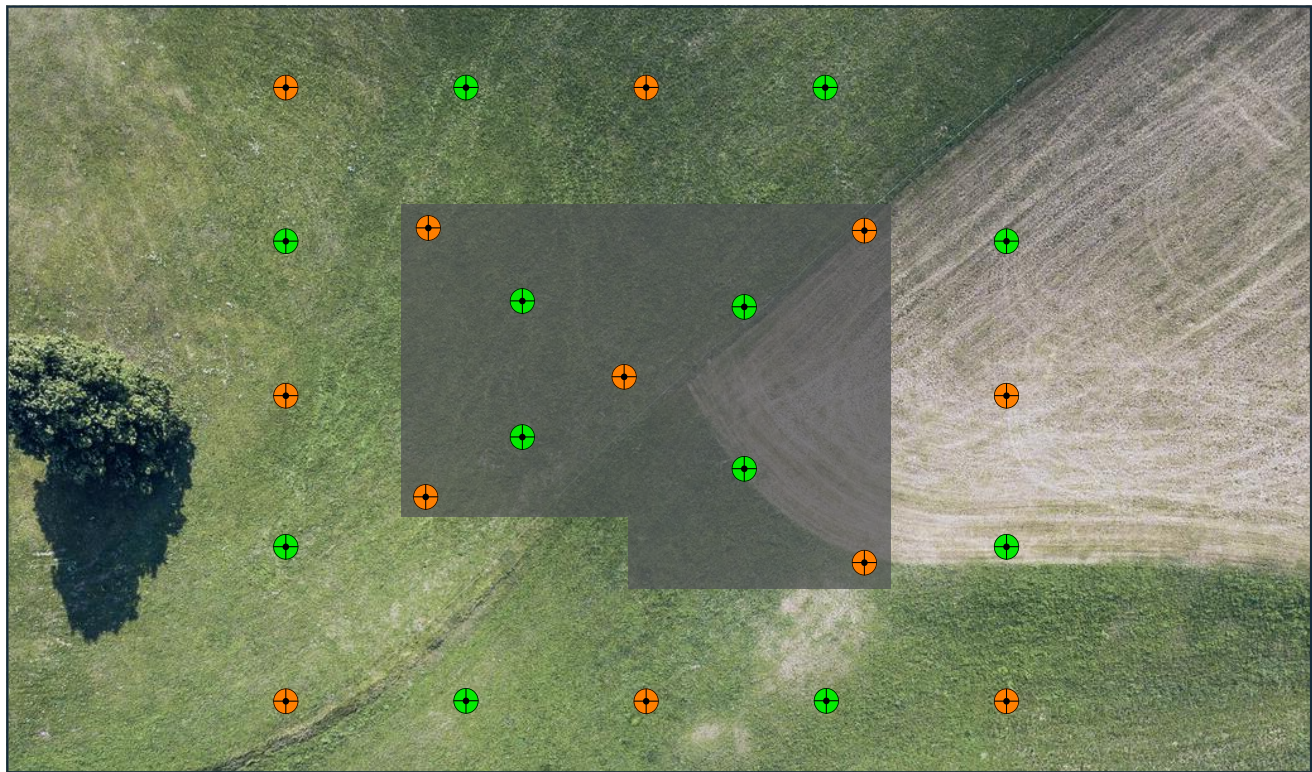
**Figure 16** – A golf course bunker with EXLTERRA BSTR offline. EXLTERRA BSTR are on both sides of the EXLTERRA GEPS line because the water flow is entering the EXLTERRA GEPS line from two directions.

## 2) FOR SOIL STABILIZATION

### EXLTERRA GEPS INSTALLATION PATTERNS

Soil stabilizing patterns are used for areas that will be built upon. The purpose is to stabilize the ground for construction with 40 and 20ft EXLTERRA GEPS units around and under the future foundations area.

EXLTERRA GEPS also addresses clay shrinkage and swelling by controlling the underground humidity level in the soil. The inline pattern is used for soil stabilization, and it is placed around the future foundations. In addition, 20ft and 40ft EXLTERRA GEPS are to be installed 3.3ft below the surface of the future foundation in a diagonal pattern as shown below.

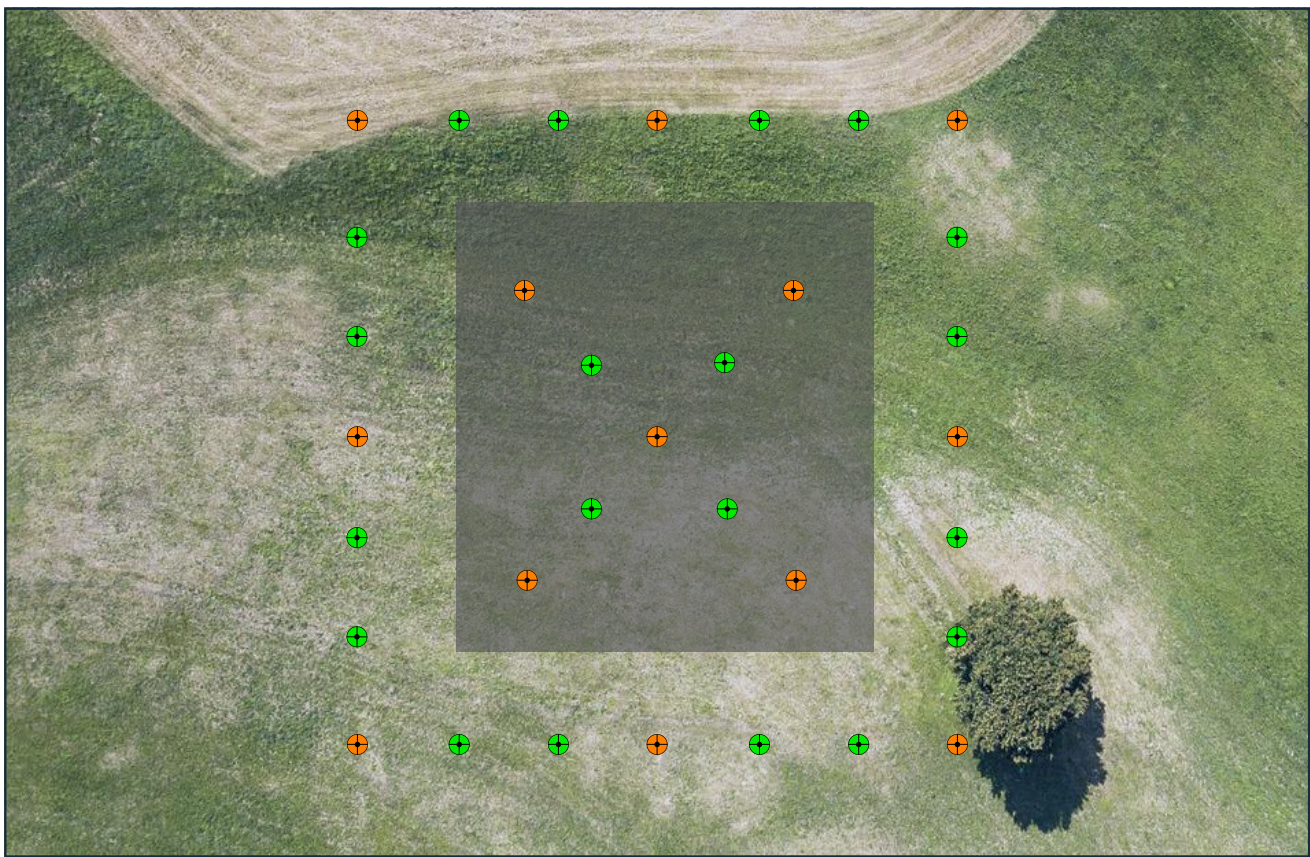


**Figure 17** – EXLTERRA GEPS being utilized to stabilize the soil for the area that will be built upon. The inline pattern is used. Notice how the tolerances on EXLTERRA GEPS placement around a foundation are still applied for a future building. 40ft EXLTERRA GEPS are placed at the corners on the area around the foundation and directly at the center and corners under the foundation.



## 2) FOR SOIL STABILIZATION

### EXLTERRA GEPS INSTALLATION PATTERNS



**Figure 18** – Another soil stabilization layout example. Due to the tolerances, there are two 20ft in between the 40ft EXLTERRA GEPS.

- |   |                    |   |                    |
|---|--------------------|---|--------------------|
|  | EXLTERRA GEPS 5ft  |  | EXLTERRA GEPS 20ft |
|  | EXLTERRA GEPS 10ft |  | EXLTERRA GEPS 40ft |
|  | EXLTERRA BSTR 18in |   |                    |

### 3) FOR GROUNDWATER RECHARGE

#### EXLTERRA GEPS INSTALLATION PATTERNS

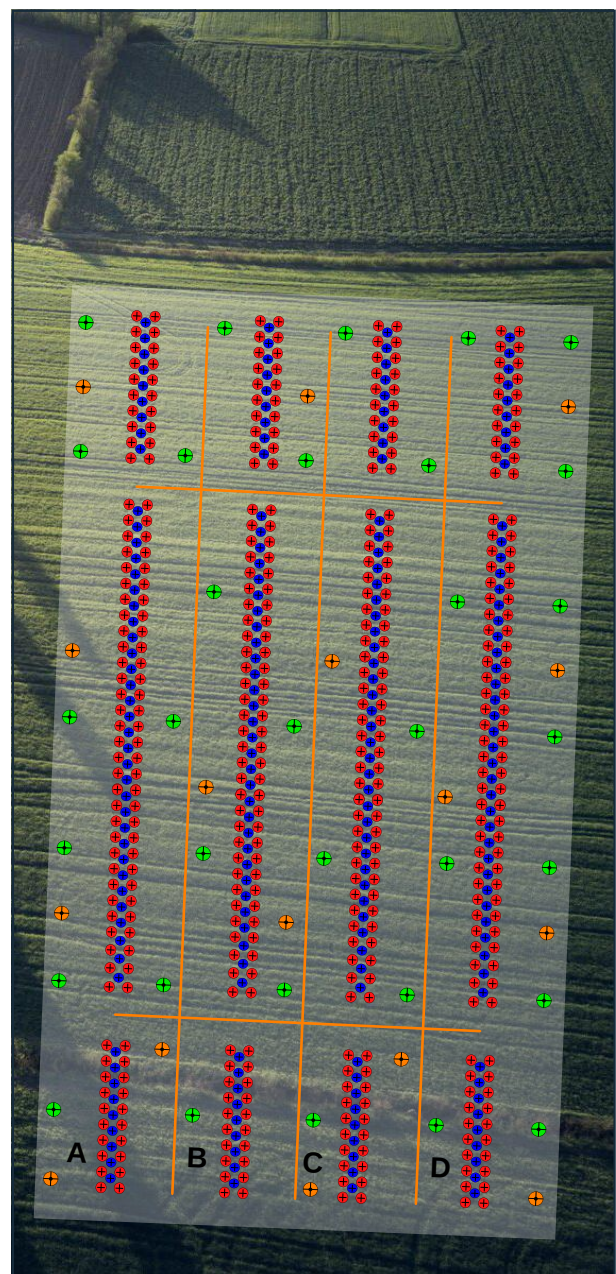
Another solution EXLTERRA GEPS provides is groundwater recharge to depleted areas. When the soil becomes too dry, it is increasingly difficult for the water to absorb into the lower soil levels, therefore the soil will remain dry, and the problem will become greater.

For example, India suffers water shortages due to a long dry period followed by a period of monsoon. During the dry period, the soil becomes dehydrated and compact, so much so that when the monsoon occurs, the soil is unable to absorb the water properly, leading to high runoff, causing flooding.

Another impact of the high runoff due to dry soil is unreplenished wells and aquifers. With EXLTERRA GEPS the soil is then able to increase infiltration into the sub layers (vadose zone), to replenish aquifers, to stabilize the soil and to keep it moist all year long.

The patterns used for groundwater recharge are diamonds offline, without EXLTERRA BSTR, placed in multiple lines. Groundwater recharge is used for flooded agricultural areas. EXLTERRA BSTR are not used in this situation as they would be too close to the surface for agricultural use.

**Figure 19** – Example of an EXLTERRA GEPS layout for groundwater recharge.





### 3) FOR GROUNDWATER RECHARGE

#### EXLTERRA GEPS INSTALLATION PATTERNS

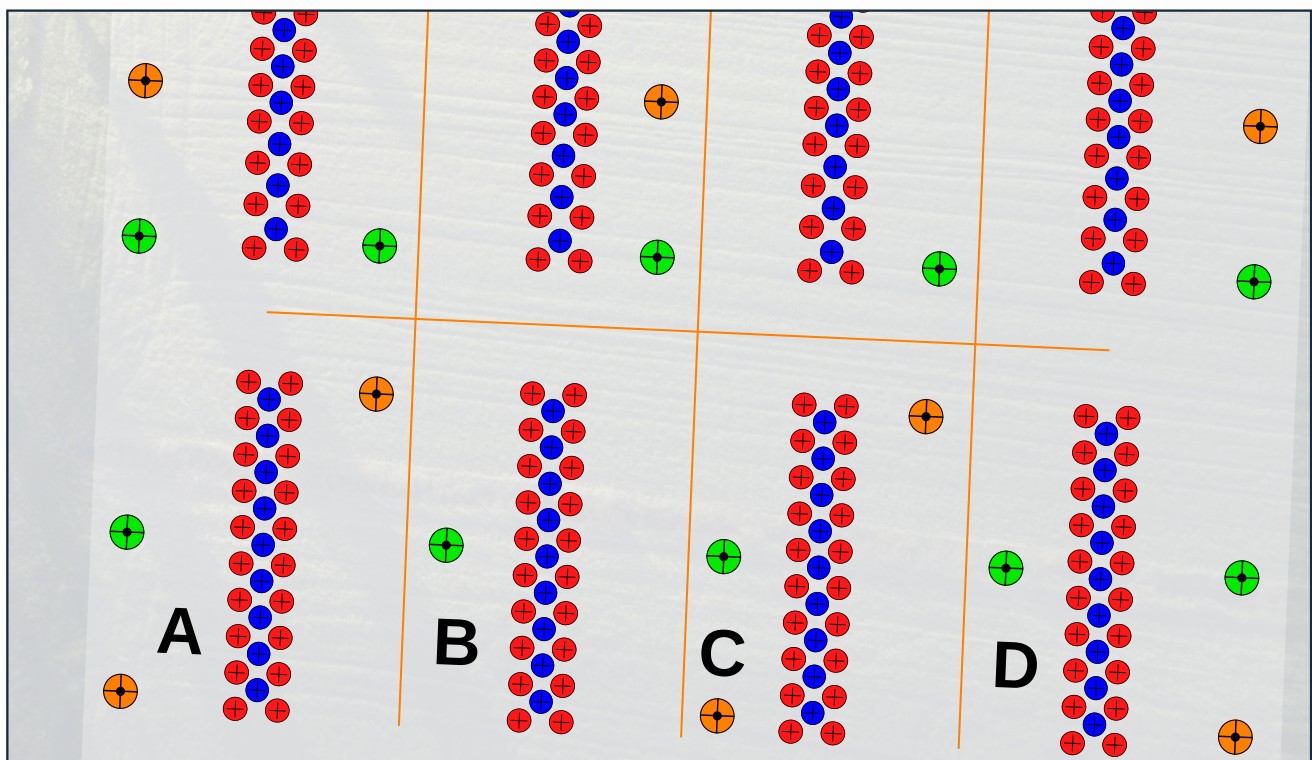





Figure 20 – Close-up of a groundwater recharge pattern design.

- |   |                    |   |                    |
|---|--------------------|---|--------------------|
|  | EXLTERRA GEPS 5ft  |  | EXLTERRA GEPS 20ft |
|  | EXLTERRA GEPS 10ft |  | EXLTERRA GEPS 40ft |
|  | EXLTERRA BSTR 18in |   |                    |





## EXLTERRA GEPS INSTALLATION

### GUIDELINES AND INSTRUCTIONS

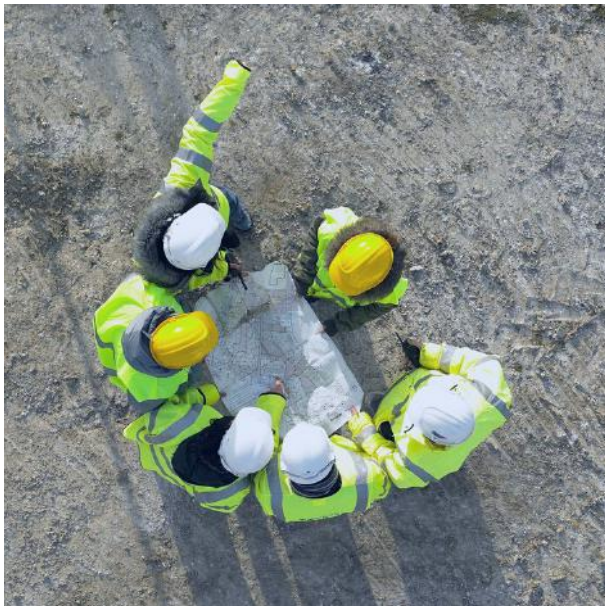
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There are certain guidelines that must be followed when placing EXLTERRA GEPS units around a building or a house, therefore it is important to have knowledge of the depth of the foundation EXLTERRA GEPS will be installed around, as well as the area of the foundation. It is also important to take note of the elevation surrounding the foundation.

If the slope is less than three degrees, the inline pattern should be applied. If the slope is between three and seven degrees, the water flow is significant, and diamond pattern EXLTERRA GEPS with BSTR is used.

If the angle of elevation is greater than seven degrees, EXLTERRA GEPS units may not be placed there as the pressure from the water flow is too high and could potentially cause water to be pushed above ground.

In this situation, one must identify the area nearest to the foundation where the slope is less than three degrees and apply a diamond pattern with EXLTERRA BSTR.



#### GEPS INSTALLATION GUIDELINES

- 1) EXLTERRA GEPS must be installed 1 to 1.64ft below the soil's surface.
- 2) EXLTERRA GEPS must be installed a minimum of 3.3ft below slab for soil stabilization.
- 3) The bottom of the EXLTERRA GEPS units around the foundation must outreach 4ft below the footing of the foundation at the minimum.
- 4) EXLTERRA GEPS must be oriented clockwise from the top view.
- 5) EXLTERRA GEPS must be at a minimum distance of 6.6ft from the foundation.\*
- 6) EXLTERRA GEPS must NOT be installed on a slope that exceeds 7°.\*\*

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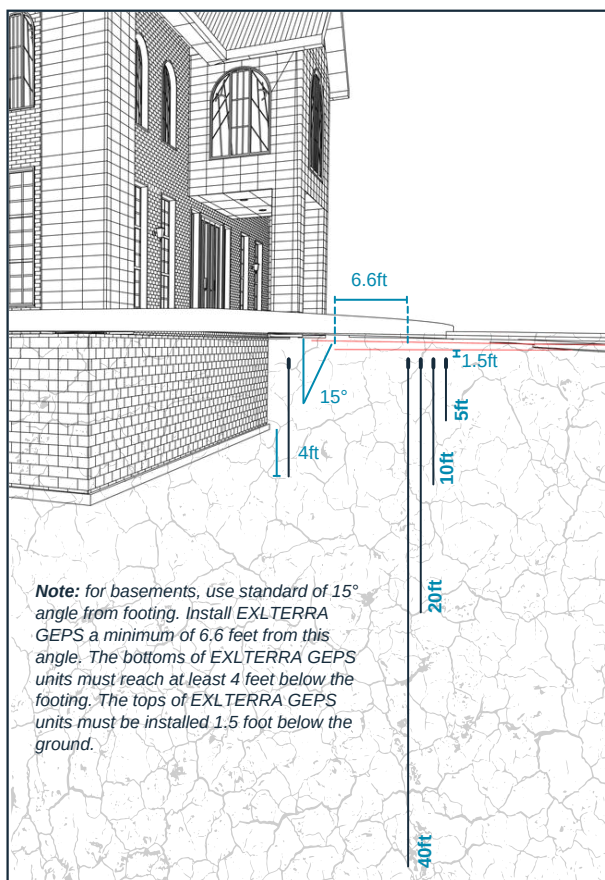
\*For basement installation, a standard of 15° angle extending from bottom of footing to foundation must be used.

Adhere to guideline #3 above from the extension of the angle.

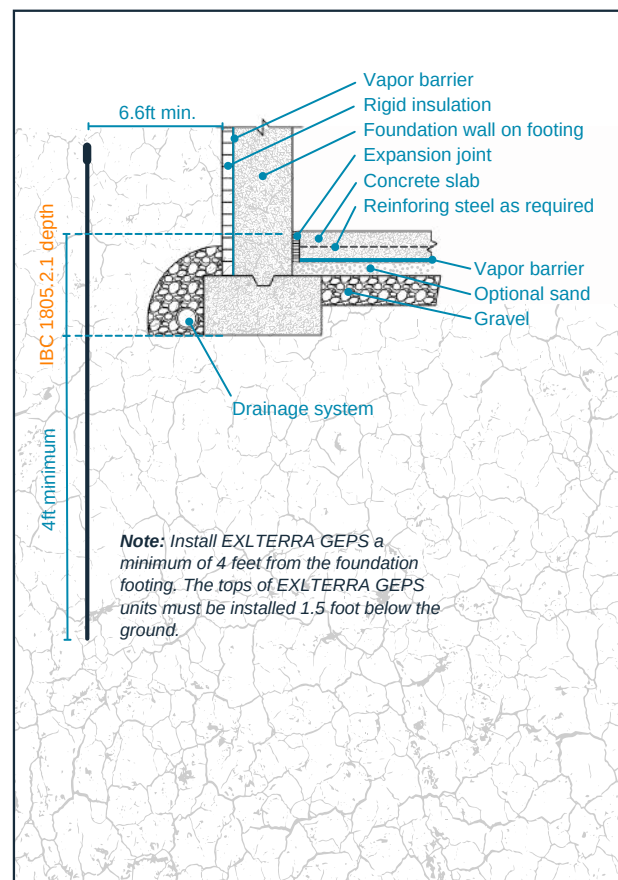
\*\*For hydrostatic stabilization, avoid inline patterns if the slope exceeds 3°.

## EXLTERRA GEPS INSTALLATION

### GUIDELINES AND INSTRUCTIONS



**Figure 22** – Illustration to scale showing the length of EXLTERRA GEPS and EXLTERRA BSTR units compared to a suburban home. Notice the 15° angle extending from the footing.



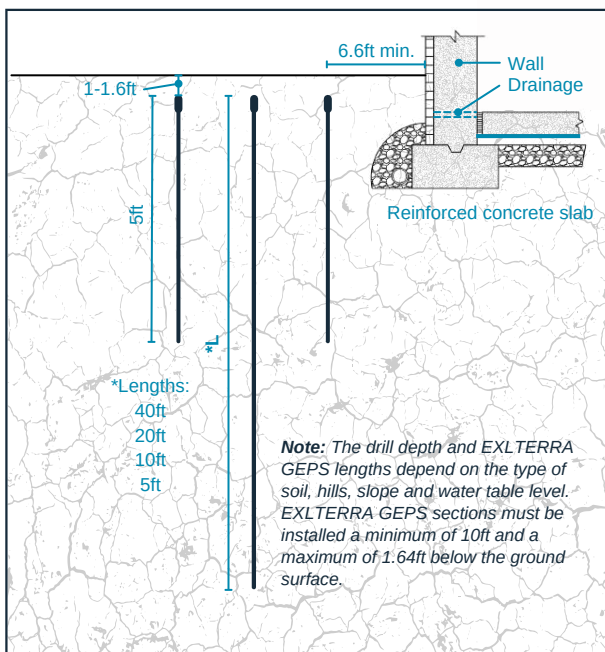
**Figure 23** – Cross section example of EXLTERRA GEPS installed near foundation with International Building Code references.

**NOTES:** International Building Code 1805.2, depth of footings. The minimum depth of footing below the undisturbed ground surface shall be 12 inches. Where applicable, the depth of footings shall also conform to section 1805.2.1 through 1805.2.3.

All concrete footings must be designed with adequate size to distribute the load to the soil, and be placed beneath the maximum frost penetration depth, or insulated to prevent frost penetration.

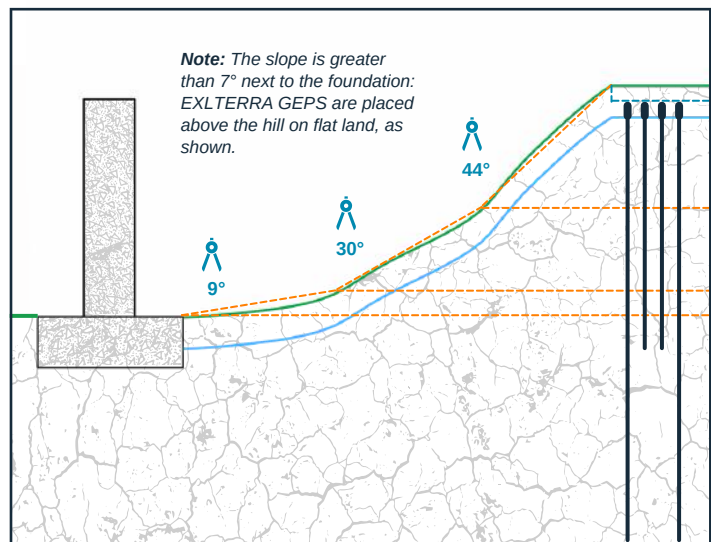


## EXLTERRA GEPS INSTALLATION GUIDELINES AND INSTRUCTIONS



**Figure 24** – Cross section of EXLTERRA GEPS installed below the surface near a foundation.

**Figure 25** – EXLTERRA GEPS is typically placed minimum of 6.6 feet from the foundation walls. If the slope exceeds 7° at this location, EXLTERRA GEPS is installed on the flat surface above the hill.



# EXLTERRA GEPS INSTALLATION

## GUIDELINES AND INSTRUCTIONS

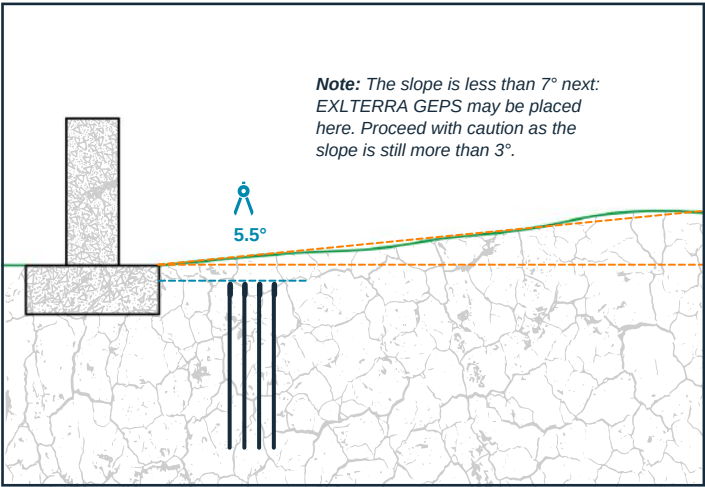
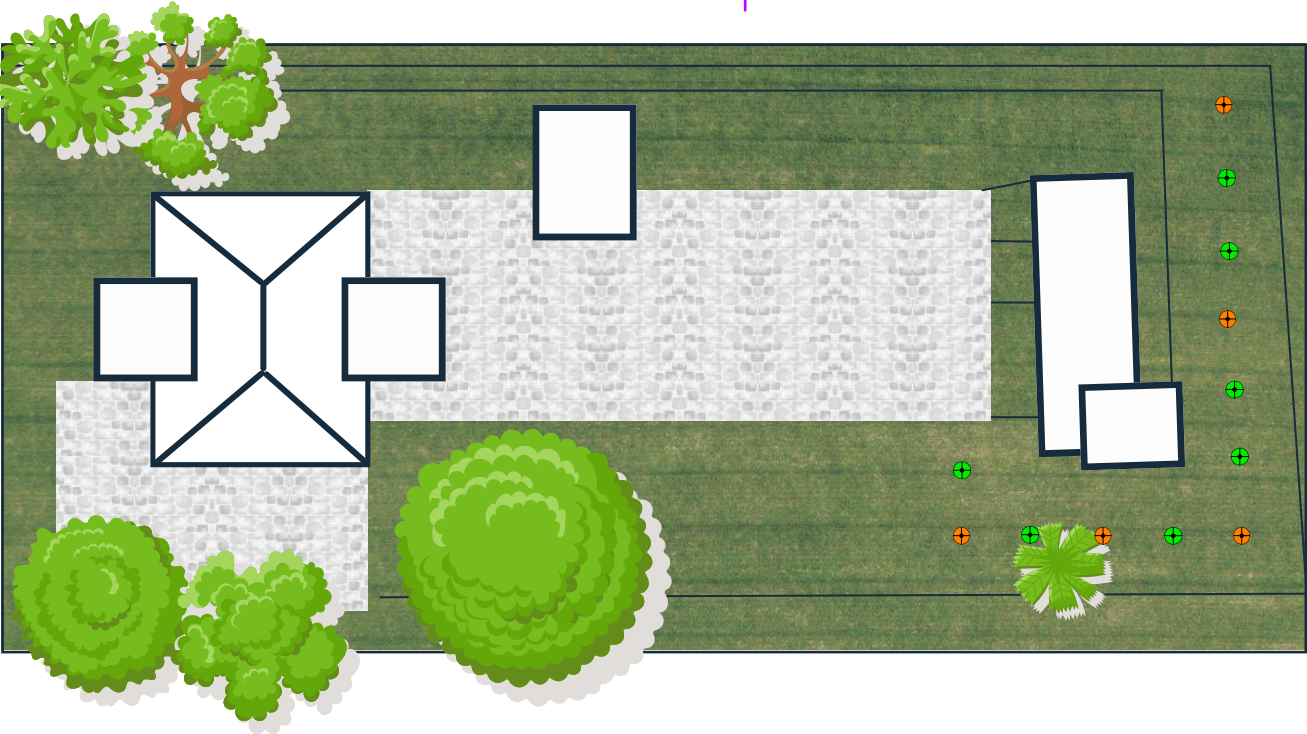


Figure 26 – Where the slope is less than 7° next to the foundation, EXLTERRA GEPS may be placed, but precautions in layout design must be taken if the slope is greater than 3°.

Figure 27 – Example of an EXLTERRA GEPS pattern for a residential lot.





## SCOPE OF APPLICATIONS

***EXLTERRA GEPS** is a game-changer for constructions and renovations: it brings groundwater issues under control in a uniquely effective way. **EXLTERRA GEPS** prevents costly delays and bad surprises due to bad weather, bad soil infiltration or replenishment, and other hydrostatic pressure problems.*

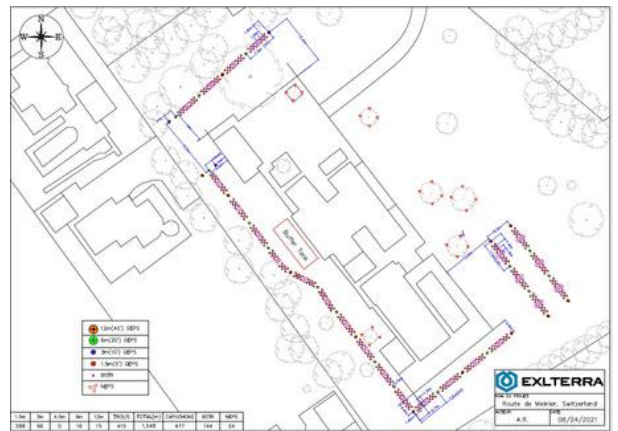




## RENOVATIONS & PROPERTY IMPROVEMENTS

### SCOPE OF APPLICATIONS

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LOC.	NO.	PROF.	NO.	LOC.	PROF.	PROF.	PROF.	PROF.	PROF.
100	10	10	10	10	10	10	10	10	10



## REDUCTION OF PERMEABLE SURFACES

### SCOPE OF APPLICATIONS

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## SPORTS & LEISURE INFRASTRUCTURES

### SCOPE OF APPLICATIONS

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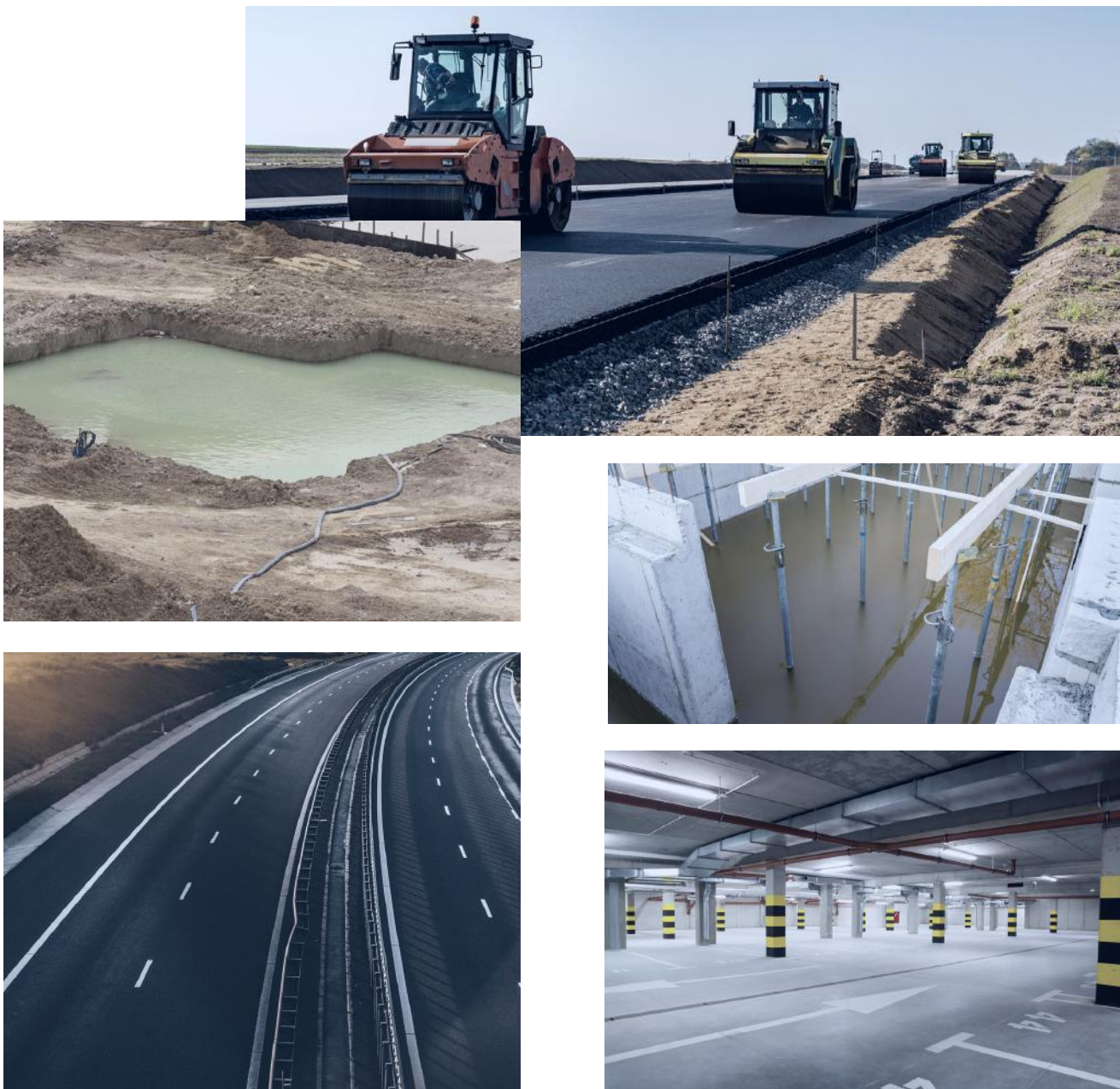


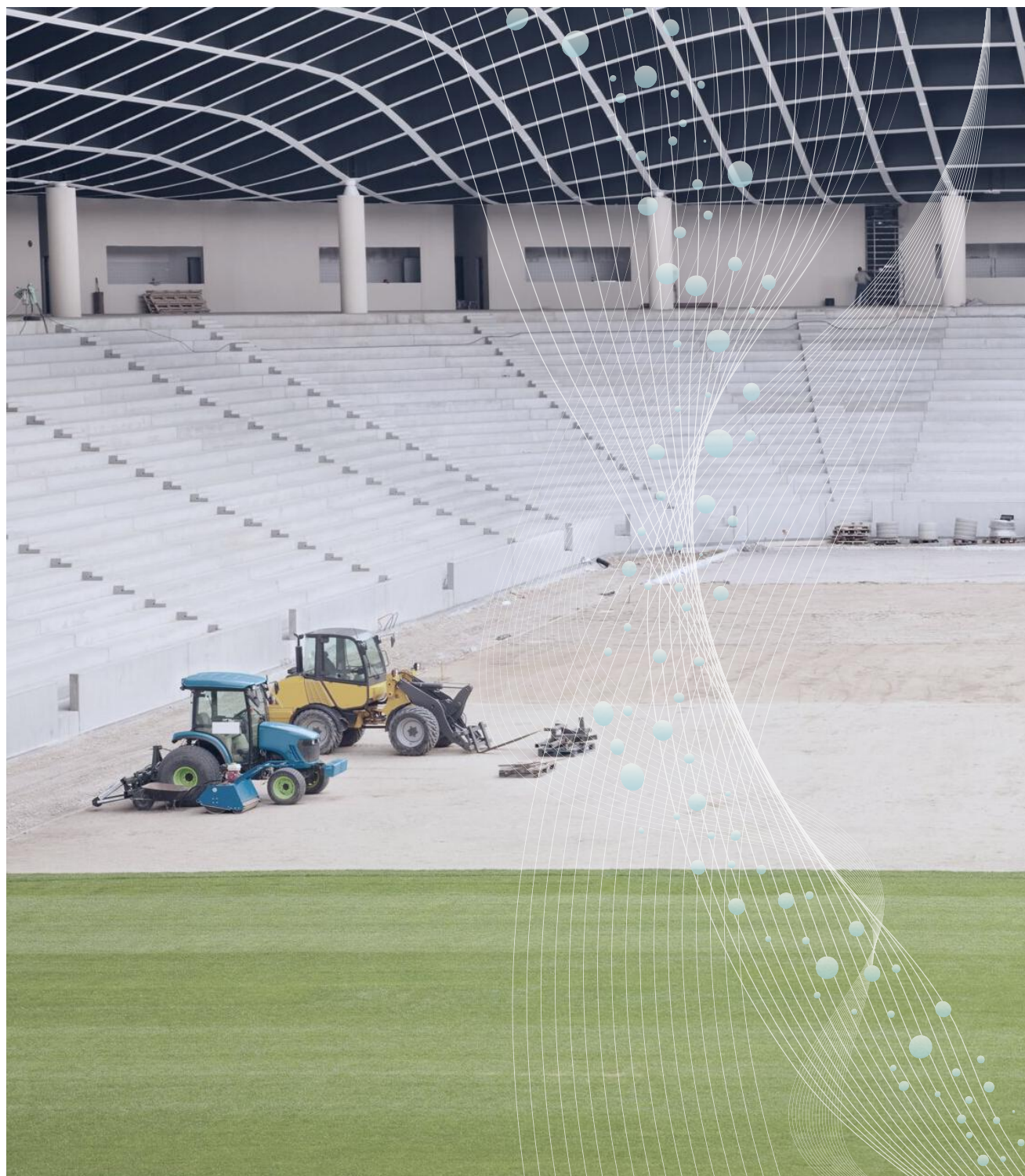


## CIVIL ENGINEERING

### SCOPE OF APPLICATIONS

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