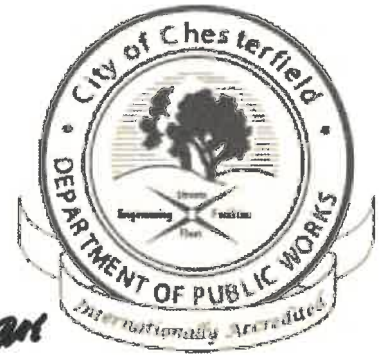


Memorandum

Department of Public Works



TO: Michael O. Geisel, P.E.
City Administrator

FROM: James A. Eckrich, Public Works Director *JAE*
Tom McCarthy, Parks Director *TM*

DATE: January 14, 2021

RE: Eberwein Park Trails

As you know, in 2011 the City of Chesterfield constructed improvements to Eberwein Park using a matching Municipal Parks Grant. These improvements included a dog park and aggregate trail system. The dog park has been a great addition to the City and is very popular with dogs and residents. An average of 410 dogs use the dog park each year.





The City of Chesterfield also constructed its first Community Garden at Eberwein park. The Community Garden was created in 2012 and is an exceptional amenity containing 53 plots.



Granny watching over the Eberwein Community Garden



An inside look at the Eberwein Garden

Other amenities in Eberwein Park include:

- A pond enhancement area with an educational signage component that explains pond life and creatures that benefit from the pond.
- A dock over-looking the pond.
- The original barn from the Eberwein Family Farmstead.
- Shuffle board courts.
- A native prairie that was developed in cooperation with the Missouri Department of Conservation.
- Pollinator gardens.
- A large open space for play, picnics and other activities.

While the improvements to Eberwein Park have been very popular, the aggregate trails have experienced a myriad of problems beginning with their original construction, primarily associated with erosion. The trail erosion has been investigated by several members of the Parks and Public Works Staff, and numerous substantial attempts have been made to correct the erosion. These have ranged from adding rock, grading swales, installing storm water collection facilities, and recompacting the trail itself. These corrective actions have been successful for short periods, but the erosion has inevitably returned. Unfortunately, the rain event in August of 2020 resulted in significant erosion throughout the park and the trail being closed in multiple locations.





Eastern loop east side of trail along Baxter Rd.



Western loop on northwest portion of trail



Western loop southwest side of trail



Western loop west side of the dog park



After reviewing the matter at length, we have concluded that there is simply no way to stop the trail erosion without redesigning the trails. The existing trails were constructed at too steep of a grade for a rock trail, with insufficient consideration for storm water drainage. The City could continue to clean up after every large storm event, remove piles of displaced rock, and recompact the trail. However, this is not the best use of City resources and will result in resident frustration as the trails are closed after every large rain event.

After the August 2020 rain event caused the closure of the trails, the City contracted with Horner and Shifrin to investigate the trail erosion and determine how the City could correct the trails. This has resulted in the attached Eberwein Park Erosion Conceptual Planning Report (Report). Within the Report Horner and Shifrin effectively details the problems of the existing trails and provides conceptual solutions for repairing the trail system, including costs.

After reviewing the Report and consulting with Horner and Shifrin, we believe the best way to proceed would be to re-route the trails in Eberwein Park, as described in Concept 2. This involves the complete reconstruction of the south loop by tying the current trail leading from the parking lot into a concrete sidewalk along Old Baxter Road. That sidewalk would then tie into a new trail system which would connect to a

reconfigured north loop. The new trail will be constructed with proper cross slope and drainage ditches to minimize the chances of future erosion. The preferred alignment is contained within Appendix A of the Report as Concept 2. The estimated cost of the proposed solution is \$850,000, including a twenty percent contingency.

The City Staff simply cannot make a recommendation at this time to allocate and spend \$850,000 for trails in Eberwein Park. That said, the existing condition is not acceptable and something should be done to address the closed trails, which are not only an eye-sore but dangerous to those residents who ignore the signage.

After careful consideration and debating the matter at length, the Parks Director and Public Works Director recommend that the City proceed incrementally to improve Eberwein Park. The first recommended action is to allocate \$70,000 for surveying and design services. This will allow the creation of plans, specifications, and a construction estimate for the trail improvements. Our recommendation is to allocate this funding as soon as practical so that a Request for Qualifications (RFQ) can be issued for design services. Once a design consultant is selected and a contract negotiated it will be brought to City Council for approval. If approved by Council, plans could be completed by the end of 2021.

If this course of action is approved, Parks Staff will begin Phase 1 of the remediation by removing deteriorated sections of trail. This will NOT impact the dog park, which can continue to be accessed from the Eberwein Park parking lot. However, the rest of the trail system within Eberwein Park will be mostly unusable. Then, beginning in 2022, City staff will plan to initiate a three-year project to reconstruct the Eberwein Park trail system by budgeting approximately \$200,000 per year. The work will proceed as follows:

2022) Phase 2: Reconstruction of the north loop. The loop will be rerouted from west of the dog area to east of the dog area. The MSD required water quality features will be corrected or re-designed as necessary.

2023) Phase 3: Construction of a new path / sidewalk along Old Baxter Road from the Eberwein Park parking lot to Baxter Road.

2024) Phase 4: Connection of a new path connecting the path / sidewalk constructed in 2023 to the north loop constructed in 2022.

If approved, the above-described course of action would result in a new and improved trail system within Eberwein Park. While it would be preferable to make these improvements within one bid package constructed as soon as possible, we believe this course of action is economically feasible. It will allow us to make as many improvements as possible using in-house labor and plan for a \$200,000 expenditure annually, likely from the Capital Projects Fund.

Should you have questions or need additional information, please let me know.

Action Recommended

It is our recommendation that the City of Chesterfield completely reconstruct and re-route the trail system in Eberwein Park over four years (2021-2024). This will necessitate a supplemental 2021 allocation of \$70,000 from the General Fund – Fund Reserves. If approved, Staff would begin by requesting proposals for design services, which could likely be completed in 2021. Concurrently, Parks Staff would begin removing the failed sections of trail. Trail improvements would then be budgeted at approximately \$200,000 per year over a three-year period.

This matter should be considered by the Parks, Recreation, and Arts Committee of City Council. If the Committee concurs with staff's recommendation it should vote to move the matter forward to City Council. If the Committee desires an alternate course of action it should advise Staff of such.

Please forward to Parks, Recreation and Arts Committee for review and direction.



2021-1-26

EBERWEIN TRAIL EROSION CONCEPTUAL PLANNING REPORT

1627 Old Baxter Road
Chesterfield, MO 63017

H&S Project No. 2021400

Prepared for:

City of Chesterfield, MO
690 West Chesterfield Parkway
Chesterfield, MO 63017



Prepared by:

April M. Giesmann, PE, CFM
E-2001004592

Horner & Shifrin, Inc.
101 Laura K Drive, Suite 101
O'Fallon, MO 63366
636-439-2393

December 15, 2020
Revised January 12, 2021



**City of Chesterfield
 Conceptual Planning Report
 Eberwein Trail Erosion**

Table of Contents

	<u>Page No.</u>
1. EXECUTIVE SUMMARY	1
2. PROJECT OVERVIEW	1
a. Project Location	1
b. Project Description.....	2
c. Purpose of Project	3
3. SITE INVESTIGATIONS	3
4. PERMITTING AND REGULATORY COORDINATION	6
5. HYDRAULIC ANALYSIS	6
6. IMPROVEMENT ALTERNATIVES	6
a. Trail Material.....	6
b. Grading Improvements and Addition of Drainage Swales	8
c. Storm Sewer Improvements	9
d. Alternate Path Locations.....	9
7. PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST	9
a. Current Path Locations.....	10
b. Alternate Path Locations.....	10
8. RECOMMENDATION SOLUTION	10

Appendices:

A – Conceptual Plans


B – Cost Estimates

C – Trail Material Product Information



CERTIFICATION

I hereby certify, as a Professional Engineer in the state of Missouri, that the information in the document was assembled under my direct personal charge. This report is not intended or represented to be suitable for reuse by the City of Chesterfield or other without specific verification or adaptation by the Engineer. This certification is made in accordance with the provisions of the laws and rules of the state of Missouri under Missouri Administrative Code.

 <p>APRIL M. GIESMANN, PE, CFM (E-2001004592)</p>	<p>City of chesterfield 690 West Chesterfield Parkway Chesterfield, Missouri 63017</p>
	<p>Horner & Shifrin, Inc. 101 Laura K Drive, Suite 400 O’Fallon, Missouri 63366 Phone: 636.439.2393 www.hornershifrin.com</p>
	<p>Date Prepared: January 12, 2021</p>
<p>Date: January 12, 2021</p>	<p>Addendum Date:</p>



1. EXECUTIVE SUMMARY

The City of Chesterfield contracted Horner & Shifrin, Inc. (H&S) to provide professional engineering services for evaluation and recommendation of erosion solutions for the existing gravel trail at Eberwein Park, located at 1627 Old Baxter Road in Chesterfield, Missouri. The trail has washed away during large rain events, and the City has provided barricades across portions of the existing trail to keep residents from using the park facilities. H&S was contracted to provide an analysis of the conditions and recommendations for improvements to restore the park trail that will minimize future erosion.

A summary of the conceptual recommendations as shown on the plans included in Appendix A and presented in this Conceptual Planning Report include:

- a. Improvements to the trail surface to lessen the chance for future erosion with the gravel replacement system in the alternative path locations,
- b. Construction of 10-foot-wide sidewalks along Old Baxter Road,
- c. Removal of portions of the existing trail system at high slope areas,
- d. Grading to provide drainage swales,
- e. Addition of storm sewer infrastructure to collect and convey the surface runoff before it can cause erosion of the trail, and
- f. Remediation of two existing bioretention basins damaged by erosion.

2. PROJECT OVERVIEW

a. PROJECT LOCATION

The City of Chesterfield is located in western St. Louis County, Missouri. Eberwein Park, an 18.6-acre City of Chesterfield-owned park, is situated at the northeast quadrant of Clarkson Road and Baxter Road, south of Highway 40/Interstate 64 and southeast of the Missouri River. See project site area on Figure 1 and Figure 2.

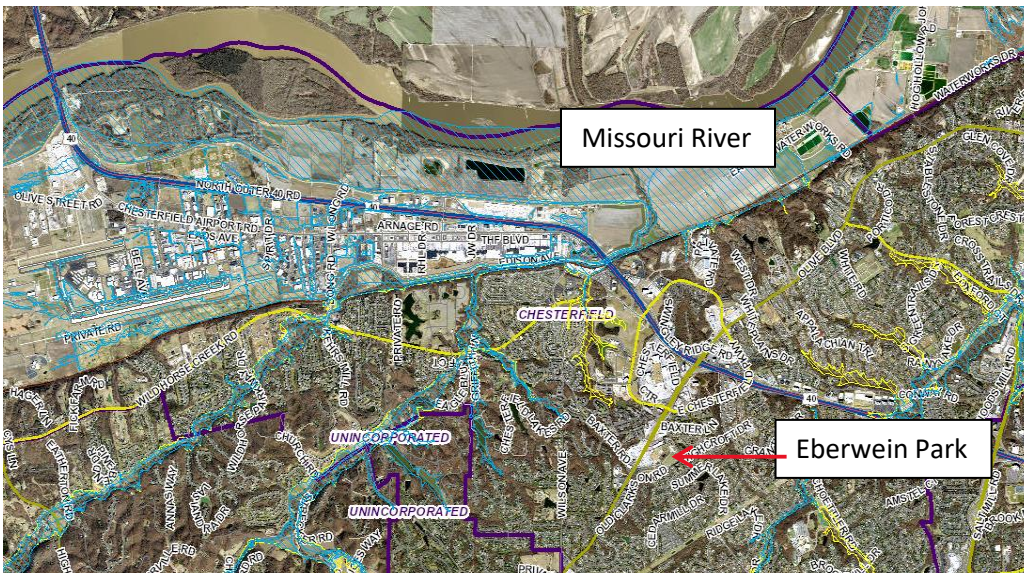


Figure 1 – Eberwein Park Location in Chesterfield, Missouri



Figure 2 – Eberwein Park near Clarkson Road and Baxter Road

Eberwein Park is adjacent to commercial properties on the north and west property lines of the park. Residential properties are adjacent to the park across Old Baxter Road to the northeast. Residents from these neighborhoods walk their dogs at the park. The park also has a parking lot accessible from Old Baxter Road for visitors arriving by vehicle.

b. PROJECT DESCRIPTION

The gravel trail at Eberwein Park is frequently used by pedestrians and their canine companions. There is a fenced Dog Park with benches and grass play areas. The approximately 12-foot-wide gravel trail system within the park is created by two 0.4-mile loops that cut the park in half – one on the north and one on the south. Between the two loops is a less than half-acre pond with a small dock, and an approximately 5-foot-wide dirt and mulch trail connects the two larger gravel trails on the west side of the pond. There is also a community garden between the two trail loops. The park is maintained by City of Chesterfield Parks and Recreation staff.

Stormwater generally flows from east to west across the park property at grades often exceeding 10 percent. Drainage channels are not common on either side of the existing ditch, and in some locations the trail becomes the drainage channel because the ground on both sides of the trail is higher. Four (4) bioretention basins are located on the west edge of the property, collecting stormwater from the northern



gravel loop trail. Stormwater from approximately half of the southern trail and a smaller portion of the northern trail drains to the pond between the trail loops.

c. PURPOSE OF PROJECT

The City has determined the trail is too hazardous to allow residents to use because of erosion and large ruts created by stormwater. City staff has attempted to stop the erosion by filling in the ruts with larger stones, adding geofabric, and regrading portions of the trail and surrounding grass area. This has not stopped the erosion. Therefore, the City has requested recommendations for trail improvements that may include grading, stormwater mitigation, changes in trail surfacing, and rerouting of the trail in an attempt to repair current erosion concerns and prevent future erosion potential.

The purpose of this Conceptual Planning Report is to identify and compare conceptual solutions for discussion with the City to meet their project needs. Conceptual designs also include conceptual level construction cost estimates to ensure the project will get properly funded in future City budget cycles.

3. SITE INVESTIGATIONS

In developing the Conceptual Planning Report, Horner & Shifrin, Inc. staff visited the site multiple times in September 2020 to observe the existing trail and surrounding improvements. Site notes are as follows:

1. The southern loop trail experiences substantial runoff from the grass area in the middle of the loop, and rutting is occurring on the southern side of the trail, and the rock material is washing downhill toward the pond. See Figure 3. City staff has tried to repair erosion by adding large stones along the trail.



Figure 3: North side of South Trail, facing west



Figure 4: West end of north leg of South Trail loop. Geofabric exposed after continued erosion.

2. An existing dirt and mulch path connects the North Trail and South Trail along the west side of an existing pond. Erosion does not seem to be a problem along the mulch trail; the trail is relatively high compared to surrounding grades, and minimal stormwater crosses the trail.

3. City staff has placed geofabric in rutted areas and placed larger stone in an attempt to minimize erosion. Erosion continues even after these efforts, as shown by the exposed geofabric material in Figure 4.



4. The stormwater generally flows from the southeast to the northwest of the South Trail loop. At the northwest corner, erosion of the trail is carrying the gravel material downhill toward the treed area that adjoins the commercial property to the west, as shown in Figure 5.
5. The City has installed storm sewer catch basins in several locations along both trails to try to prevent stormwater from running over the gravel trail.
6. A channel has been constructed along the western edge of the South Trail. The slopes of the trail are approximately 10 percent, and erosion is still occurring.
7. Significant erosion is occurring on both sides of the southern leg of the South Trail, as well as within the trail itself, as shown in Figure 7.



Figure 5 – Washout at the northwest corner of the Southern Trail



Figure 6 – South Trail, from the northwest corner, facing south. Baxter Road is on the right of the photo.



Figure 7 – South leg of South Trail, from the southwest corner, facing east. Old Baxter Road is on the right of the photo.

8. Both the North Trail and the South Trail have been barricaded to prevent pedestrians from using the trails where significant erosion has occurred.
9. The locations of the trail where there are significant adjacent ditches appear to have lessened erosion, although erosion also occurs where ditches are present. The erosion caused in these locations is likely because of the slope of the trail, not stormwater running across the trail.



10. Stormwater from the dog park drains to the southern leg of the North Trail. Ditches are not located along the northern side of the southern leg. Significant erosion is occurring along the entire south leg of the North Trail adjacent to the fenced dog park area.
11. The North Trail turns to the north and is relatively flat. Approximately 200 linear feet of this western leg of the North Trail is also higher ground than on both sides – there is a significant drop to the commercial property to the west, and there are bioretention basins at a lower elevation to the east. Therefore, this stretch of the North Trail has very little evidence of erosion. Toward the north end of this western leg, the slope increases and erosion is evident again. The bioretention basins on both sides of this northwest corner of the North Trail are filling with gravel from the trail, as shown in Figures 8 and 9.



Figure 8 – Bioretention basin as northwest corner of the North Trail, from western leg, facing north.



Figure 9 – Bioretention basin on the inside of the loop, between the fenced dog park and North Trail, from the western leg, facing southwest.

12. From the northwest corner of the property, the North Trail turns to the east and again increases in elevation to the east. Stormwater from the commercial property to the north discharges toward the trail, and the slope of the trail provides a drainage path along the southern (inside) side of the north leg. This is an area where both sides of the trail are higher than the trail and the trail appears to be the drainage channel, as shown in Figure 10.



Figure 10 – North leg of the North Trail, from western end, facing east.

13. From the top of the hill, the slope of the trail flattens out as the trail approaches the east end of the property; however, erosion still occurs because stormwater is discharging from higher ground across the trail. This area, too, appears to be a low spot between higher ground on either side of the trail, making the trail the drainage path. See Figures 11 and 12.



Figure 11 – Northeast corner of the North Trail, facing east, erosion occurring from stormwater draining from the north (left in photo).



Figure 12 – North leg of the North Trail, at eastern end near parking lot.

4. PERMITTING AND REGULATORY COORDINATION

Permitting and Regulatory requirements involve multiple agencies.

- 1) The park is owned by the City of Chesterfield. Therefore, no City permits will be required.
- 2) The Conceptual Improvements for this project will likely disturb more than one acre of the park. Therefore, a Land Disturbance Permit will be required by the Missouri Department of Natural Resources, and a Stormwater Pollution Prevention Plan (SWPPP) will be required.
- 3) The existing bioretention basins on site near the northern loop are permitted by MSD and must be maintained. Because one acre of land will be disturbed for this project, the Metropolitan St. Louis Sewer District (MSD) may require additional stormwater BMPs, such as an additional bioretention basin for work on the southern loop. Other BMPs can be considered, such as overland flow areas that must be maintained as buffer strips. MSD will require Maintenance Agreements and Reserved Areas for any BMPs required for the project. Additional stormwater review will be completed by MSD; however, all onsite stormwater inlets and pipes will be considered Private Under MSD Inspection (PUMI).

5. HYDRAULIC ANALYSIS

A hydraulic analysis has not been performed for this Conceptual Planning Report. A hydraulic analysis will be required for the drainage ditches proposed on both sides of the improved trail in the form of ditch calculations. Additional stormwater analysis will be necessary for inlet capacity and piped sewer capacity for areas where inlets and buried pipes are proposed.

6. IMPROVEMENT ALTERNATIVES

a. TRAIL MATERIAL

The City discussed providing options for different material for the trail. The Parks Department has added material and recompacted the gravel, but the erosion continues. The City suggested hard surfaces, such as

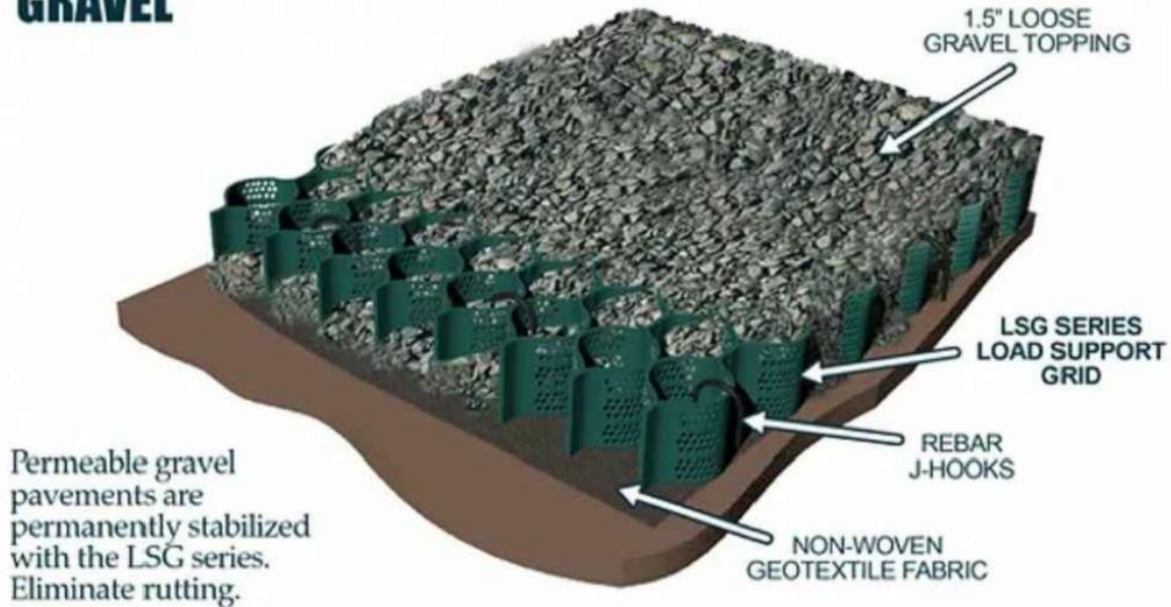


concrete and asphalt; but they were concerned about erosion occurring outside of the pavement footprint and also increased construction costs. Additionally, the use of asphalt would provide a very hot surface during the summer months and the City was concerned that residents with pets may complain. Therefore, H&S researched alternative materials for the trail that would be low-maintenance and easy on canine paws.

LSG Series

Cell-Tek Geosynthetics manufactures a product called Load Support Grid or “LSG Series” that is a cell configuration. The system confines materials and prevents lateral movement away from the applied load. The system prevents the lateral displacement of infill materials which eliminates rutting and wash-boarding usually associated with gravel pavements. Applications for this product include driveways, parking lots, access roads, trails/pathways, and more. The cells are laid over non-woven geotextile fabric, anchored into the ground, and then filled with loose gravel. This would provide a similar surface type and texture to what is currently in place at Eberwein Park, but it would provide stability for long-term use. The system can also have a binder included with the gravel material to prevent washout on steeper slopes. H&S obtained pricing of the Cell-Tek system to compare to more traditional sidewalk materials.

GRAVEL



Gravelpave²

Gravelpave² is a similar product to the Cell-Tek product and has a compressive strength higher than concrete. The product can support the weight of vehicles, but it is lightweight. Similar to LSG Series, the product comes in flexible rolls to allow for quick and easy installation. The Gravelpave² product literature states it cannot be used for areas where the grade exceeds 8%, as they have determined that the stone fill will migrate during storm events, requiring more maintenance effort by the owner. However, for steeper grades, using a binder in the Gravelpave² fill will prevent the stone from migrating. The binder most commonly used is Portland Cement, but other options are available. By thoroughly mixing the surface fill with a 10% mix of Portland Cement by volume, this will adhere the stone pieces to each other and will eliminate fill migration during a storm event.



The Grasspave² Advantages

- Design Flexibility
- High Compressive Strength (15,940psi)
- Easy, Quick Installation
- 92% Void Space
- All Weather
- Reduces CO₂ and Toxin Filtration
- Long Life Span (60+) Years
- Environmental Beautification



Traditional Concrete

Concrete sidewalk is an alternative for the rutted trails. Because of the steeper slopes in some areas of the trail, it is recommended to use dowels to tie the slabs together. Dowels would also help decrease settlement difference of slabs to avoid tripping hazards at displaced joints. The cost estimate provided in this report uses a 6-inch Portland Cement Concrete over a 4-inch rock base. The increase over 4-inch concrete pavement will provide more weight to keep the slabs in place, and also provide additional strength for maintenance vehicle traffic. The 4-inch rock base provides additional drainage for the pavement to prevent freeze-thaw and other movement of the pavement.

b. GRADING IMPROVEMENTS AND ADDITION OF DRAINAGE SWALES

Many locations of the trail are unintentionally being used as drainage paths, because the trail is the low-lying area between higher grassed areas. In order to decrease the chances of erosion for any type of trail surface, significant grading is recommended. The plans in Appendix A include two grading suggestions – swales and raising the trail. Raising the trail and creating drainage swales on both sides of the trail provide added protection against erosion. It moves the drainage path off of the trail surface. Raising the trail keeps the trail from being the low-lying area and creating drainage swales on both sides gives stormwater a preferred path.

The stormwater on the eastern fourth of the South Trail discharges to Old Baxter Road to the east. City personnel stated the residents on Old Baxter Road are concerned about additional runoff from the park discharging onto their property and adding more runoff to the lake in the common ground at 15600 Oak



Post Lane. In an attempt to lessen the runoff to the adjoining neighborhood, a swale is proposed to discharge that stormwater currently flowing to the east and direct it to the pond within Eberwein Park.

It is suggested to add rock lining or erosion control mats in the flat bottom ditches along the edges of the trail to prevent the erosion problem from moving to a different location.

c. STORM SEWER IMPROVEMENTS

City personnel have installed small catch basins and underground pipes in an attempt to collect stormwater before it can accumulate and cause erosion on the trail. Proposed conceptual stormwater measures would add more storm sewer structures with larger pipes to adequately collect and convey the stormwater from the drainage swales and other important locations where stormwater is collecting. These sewers would be private sewers and would not require any easements to be conveyed to MSD. See sewer locations on the Conceptual plans in Appendix A.

d. ALTERNATE PATH LOCATIONS

As an alternative solution to replacing the gravel paths in their current locations, much of the existing path network that is experiencing significant erosion may be removed from the trail network within the park. The northern loop may be truncated at the entrance to the dog park on the south side, and the trail west of the dog park entrance can be removed and vegetation reestablished. An alternate path can be constructed on the east side of the dog park connecting the northern leg with the southern leg, as shown in the Conceptual Plans in Appendix A.

The south loop may also be modified with the same intent. Much of the existing path can be removed, and a 10-foot-wide sidewalk can be constructed along the north side of Old Baxter Road that will connect to the existing 5-foot-wide sidewalk on the east side of the park and at the southwest corner of the park at Baxter Road, as shown on the Conceptual Plans in Appendix A. From that sidewalk, a replacement trail (constructed of any of the material options previously discussed) can be built on the west leg of the southern loop that would continue across the berm on the west side of the pond and connect to the northern loop near the dog park entrance. As with the northern loop, the remainder of the existing trail system can be removed and revegetated. This alternative will likely require small modular block retaining walls along the north side of the sidewalk, and may impact five of the six utility poles and overhead utility lines located along the north side of Old Baxter Road. Accessible ramps will be required at the intersection of Old Baxter Road and Highcroft Drive.

7. PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST

The reconstruction of the paths in their current location and in the alternate locations were evaluated based on probable construction costs. All alternatives include remediation of the existing bioretention basins that have been damaged due to erosion of granular and soil material washing into the basins at the west end of the northern trail loop. These basins will require maintenance to return them to their originally designed condition.

Grading quantities are approximate only because topographic survey has not been obtained. MSD topographic maps were used for a general idea of slopes and existing contours.



All estimates of probable construction costs include a 20% contingency and design services for boundary and topographic surveying, engineering, construction staking, construction inspections, and material testing were estimated for budgetary purposes. Those fees are as follows:

- Boundary and topographic survey of 18.5-acre park - \$10,000
- Engineering - \$55,000
- Construction Staking - \$5,000
- Construction Inspection and material testing - \$40,000

These budgetary items are based on assumptions made at this time and can be further defined upon design completion. They do not include items such as public utility relocations or easements. If the alternate path locations are chosen, which included the 10-foot-wide sidewalk along Old Baxter Road, a \$50,000 utility allowance should be included in the budget for potential power pole relocation in the event the utility company does not pay for the relocation outside of the existing right-of-way.

a. CURRENT PATH LOCATIONS

The opinion of probable construction cost to replace the existing trail with the Cell-Tek system or Gravelpave² system are very similar. Both products should include a binder material for steep grades. Probable costs for the trail improvements, grading modifications, and storm sewer improvements is \$699,000. This cost for either gravel replacement system assumes all new gravel will be placed, because the necessary grading will require the path to be higher. It may be possible for the gravel to be reused, but this is not assumed the case for this estimate.

The opinion of probable construction cost for the 6-inch-thick concrete sidewalks in its current location, including the above grading modifications and storm sewer improvements, is \$855,000.

b. ALTERNATE PATH LOCATIONS

Opinions of probable construction costs were also determined to reconstruct the trail along the alternate paths, which includes 10-foot-wide concrete sidewalks along Old Baxter Road for both gravel replacement options. To provide the 12-foot trail in the new locations with the Cell-Tek or Gravelpave² systems, construct a new path east of the dog park, connect the loops near the pond, and reestablish vegetation on locations of the existing trail to be removed, the probable construction cost is \$849,000.

The opinion of probable construction cost for the concrete sidewalks along Old Baxter Road and 12-foot-wide concrete trail connections in the alternate path locations, including construction of a new path east of the dog park, connection of the loops near the pond, and reestablishing vegetation at locations of the existing trail to be removed, is \$943,000.

Details of the cost estimates are included in Appendix B.

8. RECOMMENDED SOLUTION

The estimated probable construction costs for the provided alternatives vary by as much as \$244,000. The reconstruction of the gravel path in the current location is \$150,000 less expensive than providing the alternative alignment with the same gravel-stabilizing system. Replacing the entire trail system with



concrete is \$88,000 less than constructing concrete paths in the alternative locations and creating sidewalks along Old Baxter Road, eliminating a large portion of the existing loop paths.

Recreating the gravel trail in the same locations requires the trail to be raised and stormwater ditches to be created on both sides to reduce erosion of the trail. There is a chance that erosion may still happen along the edges of the stabilized gravel trail. Reducing the length of the trail will also reduce the potential for erosion in many of the steepest areas of the trail. Therefore, it is recommended to construct the alternative location for the trail, utilizing 10-foot-wide sidewalks along the public right-of-way, and reconstruct portions of the existing trail with the gravel stabilizing products presented herein.

The recommendations for improvements as shown on the plans included in Appendix A and presented in this Conceptual Planning Report include:

- a. Improvements to the trail surface to lessen the chance for future erosion with the gravel replacement system in the alternative path locations,
- b. Construction of 10-foot-wide sidewalks along Old Baxter Road,
- c. Removal of portions of the existing trail system at high slope areas,
- d. Grading to provide drainage swales,
- e. Addition of storm sewer infrastructure to collect and convey the surface runoff before it can cause erosion of the trail, and
- f. Remediation of two existing bioretention basins damaged by erosion.

The anticipated probable construction cost of these improvements is \$849,000, which includes surveying, engineering, and construction inspection services. This cost also assumes a \$50,000 utility relocation allowance for potential relocation of the utility poles on the north side of Old Baxter Road.

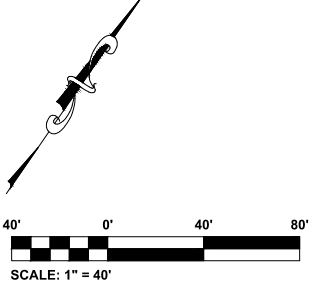
APPENDIX A

CONCEPTUAL PLANS

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MATCHLINE (SEE SHEET C1.02)



MSD PROJECT #:

MSD BASEMAP: 19S

DATE: 01.12.2021

DESIGNED: JMU/AMG
 DRAWN: MNH
 CHECKED: AMG

JOB NO. 2021400

SHEET 1 OF 6

C1.01

HORNER SHIFRIN
 101 LAURA K DRIVE, STE. 101 OTTAWA, MO 64306-3991
 DISCIPLINE: PROFESSIONAL ENGINEERING
 CERTIFICATE OF AUTHORITY: 000159
 EXPIRATION DATE: DECEMBER 31, 2019

PRELIMINARY
 NOT FOR CONSTRUCTION

Name: APRIL M. GIESMANN
 License No.: E-2001094592
 Expiration Date: 12-31-2021

NO.	DATE	REVISION

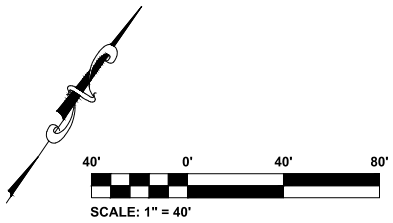
CITY OF CHESTERFIELD
 EBERWEIN PARK TRAIL RECONSTRUCTION
 1627 OLD BAXTER ROAD, CHESTERFIELD, MO, 63017

SOUTH TRAIL CONCEPT 1

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 OPERATOR: MNH/ENBERG



MATCHLINE (SEE SHEET C1.01)

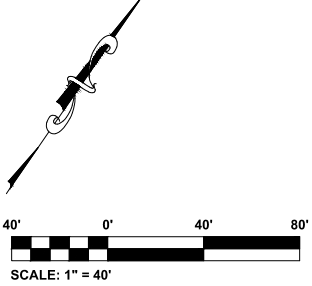


<p>HORNER SHIFRIN</p> <p>101 LAURA K DRIVE, STE. 101 OTTALON, MO 63366-3991 DISCIPLINE: PROFESSIONAL ENGINEERING CERTIFICATE OF AUTHORITY: 0001159 EXPIRATION DATE: DECEMBER 31, 2019</p>	<p>PRELIMINARY NOT FOR CONSTRUCTION</p>	Name: APRIL M. GIESMANN License No. E-200104552 Expiration Date: 12-31-2021
		NO.
<p>CITY OF CHESTERFIELD EBERWEIN PARK TRAIL RECONSTRUCTION 1627 OLD BAXTER ROAD, CHESTERFIELD, MO, 63017</p>		
<p>NORTH TRAIL CONCEPT 1</p>		
MSD PROJECT #:	DATE: 01.12.2021	DESIGNED: JMU/AMG
MSD BASEMAP: 19S	DRAWN: MNH	CHECKED: AMG
	JOB NO. 2021400	
	SHEET 2 OF 6	
	C1.02	

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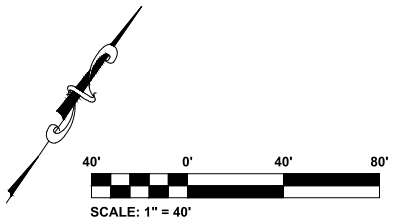


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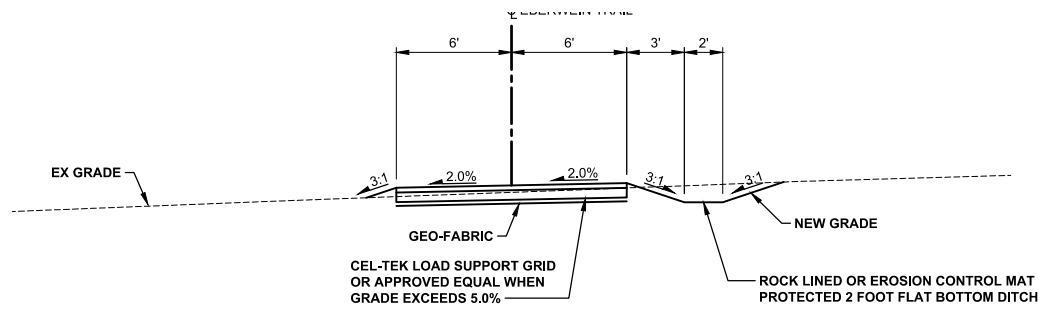


PRELIMINARY NOT FOR CONSTRUCTION							
<p>HORNER SHIFRIN 101 LAURA K DRIVE, STE. 101 OTTAWA, MO 63366-3991 DISCIPLINE: PROFESSIONAL ENGINEERING CERTIFICATE OF AUTHORITY: 000159 EXPIRATION DATE: DECEMBER 31, 2019</p>							
<p>CITY OF CHESTERFIELD EBERWEIN PARK TRAIL RECONSTRUCTION 1627 OLD BAXTER ROAD, CHESTERFIELD, MO, 63017</p>							
SOUTH TRAIL CONCEPT 2							
<p>MSD BASEMAP: 19S MSD PROJECT #:</p>							
DATE: 01.12.2021							
DESIGNED: JMU/AMG							
DRAWN: MNH							
CHECKED: AMG							
JOB NO. 2021400							
SHEET 3 OF 6							
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							REVISION
							DATE
							NO.
							EXPIRATION DATE

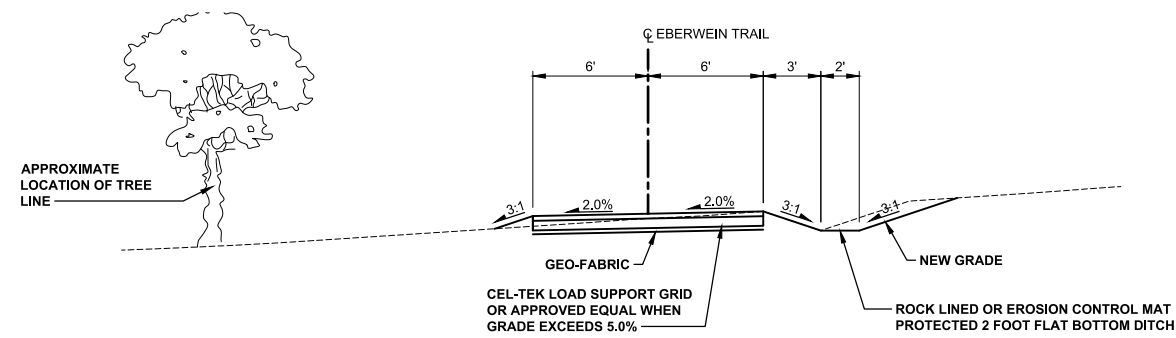
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 OPERATOR: MNH/ENBERG



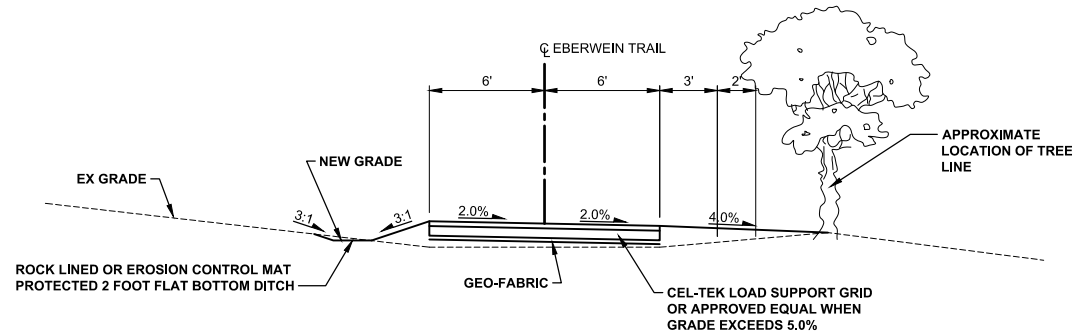
<p>HORNER SHIFRIN <small>101 LAURA K DRIVE, STE. 101 OTTAWAN, MO 65366-3991 DISCIPLINE: PROFESSIONAL ENGINEERING CERTIFICATE OF AUTHORITY: 000159 EXPIRATION DATE: DECEMBER 31, 2019</small></p>	<p style="color: red; text-align: center;">PRELIMINARY NOT FOR CONSTRUCTION</p> <p><small>Name: APRIL M. GIESMANN License No. E-200104552 Expiration Date: 12-31-2021</small></p>
<p>CITY OF CHESTERFIELD EBERWEIN PARK TRAIL RECONSTRUCTION 1627 OLD BAXTER ROAD, CHESTERFIELD, MO, 63017</p> <p style="text-align: right;">NORTH TRAIL CONCEPT 2</p>	
<p>MSD BASEMAP: 19S MSD PROJECT #:</p>	<p>DATE: 01.12.2021</p>
<p>DESIGNED: JMU/AMG DRAWN: MNH CHECKED: AMG</p>	<p>JOB NO. 2021400</p>
<p>SHEET 3 OF 6</p> <p style="text-align: center; font-size: 1.2em;">C2.01</p>	<p style="text-align: right;">NO. DATE REVISION</p>



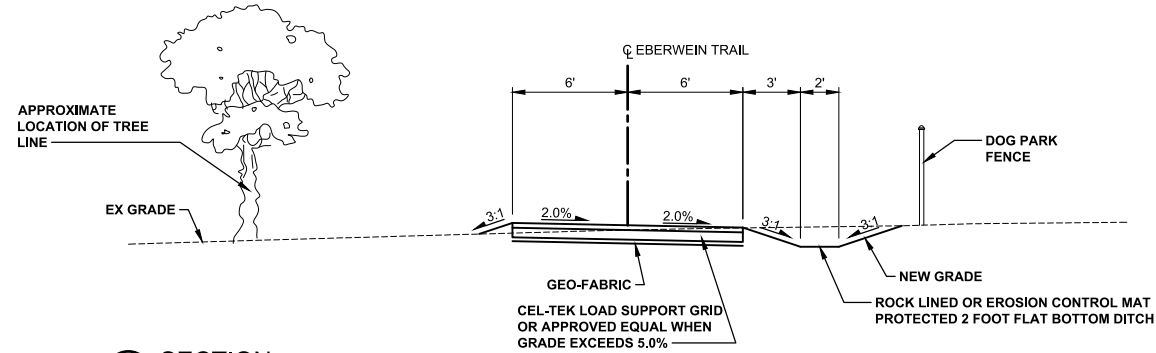
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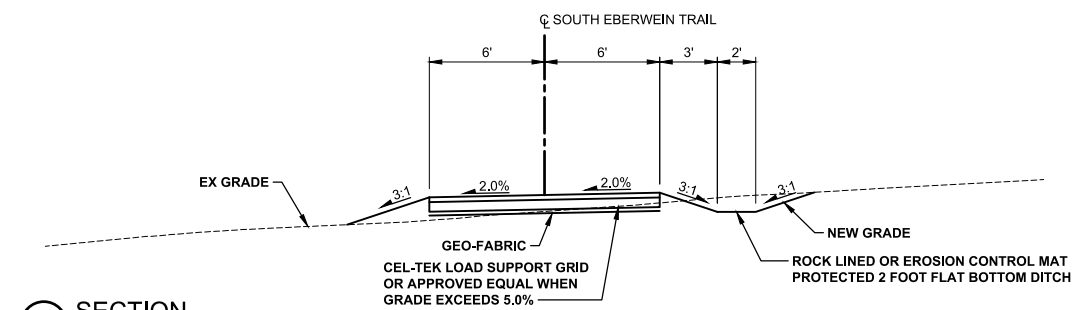
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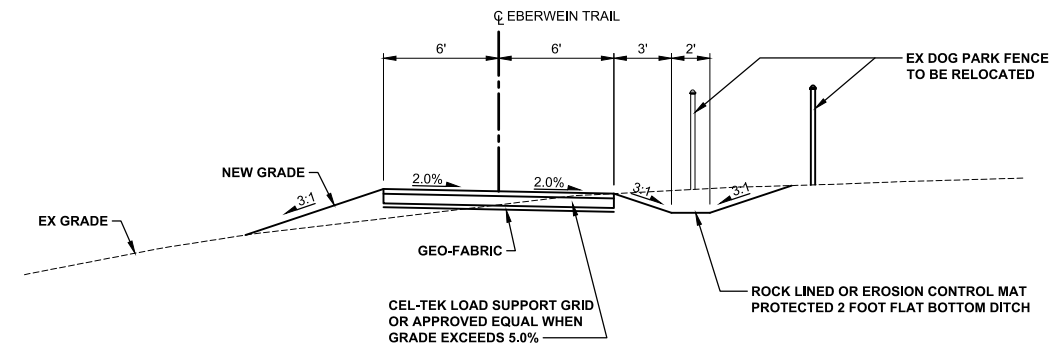
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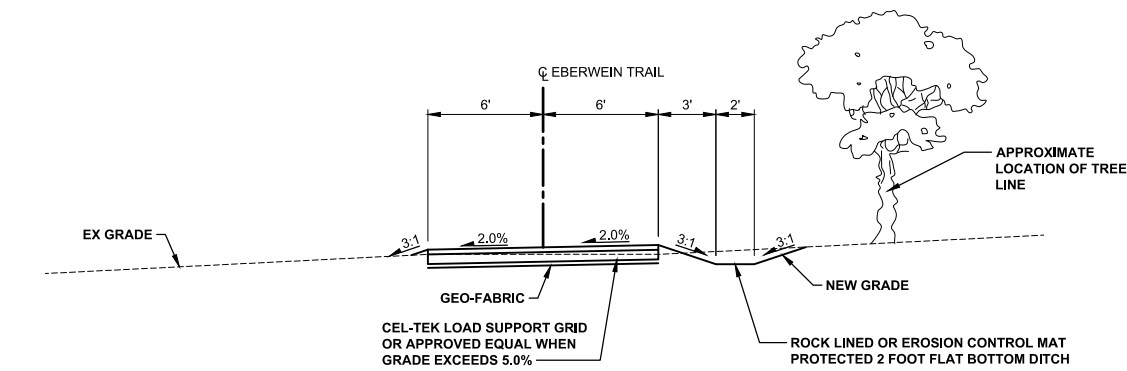
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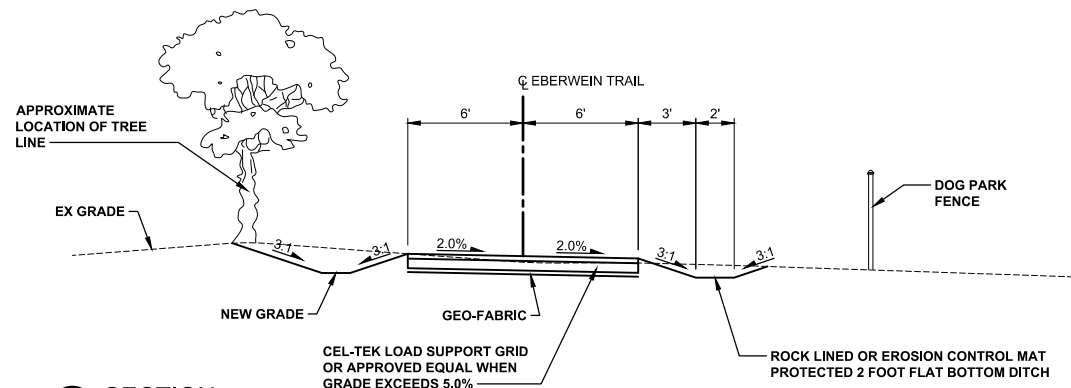
3 SECTION
SCALE: N.T.S.



7 SECTION
SCALE: N.T.S.



4 SECTION
SCALE: N.T.S.



8 SECTION
SCALE: N.T.S.

NO.	DATE	REVISION

PRELIMINARY
NOT FOR CONSTRUCTION

Name: APRIL M. GIESMANN
License No.: E-200104552
Expiration Date: 12-31-2021

HORNER SHIFRIN

101 LAURA K DRIVE, STE. 101 OTTAWA, MO 65365-3991
DISCIPLINE: PROFESSIONAL ENGINEERING
CERTIFICATE OF AUTHORITY: 0007159
EXPIRATION DATE: DECEMBER 31, 2019

CITY OF CHESTERFIELD
EBERWEIN PARK TRAIL RECONSTRUCTION
1627 OLD BAXTER ROAD, CHESTERFIELD, MO, 63017

TYPICAL SECTIONS

MSD BASEMAP: 19S MSD PROJECT #:

DATE: 01.12.2021

DESIGNED: JMU/AMG
DRAWN: MNH
CHECKED: AMG

JOB NO. 2021400

SHEET 5 OF 6

C1.03

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APPENDIX B

COST ESTIMATES



ENGINEER'S CONCEPTUAL ESTIMATE OF COST - CONCEPT 1

Chesterfield Eberwein Trail Erosion
 CHESTERFIELD, MISSOURI
 HORNER & SHIFRIN PROJECT # 2021400

DATE: 1/12/2021
 EST. BY: JMU/NAS
 CHK. BY: AMG

ITEM NUMBER	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	MSD CLASS C EXCAVATION	597	CY	\$ 28.00	\$ 16,716.00
2	EARTHWORK	704	CY	\$ 15.00	\$ 10,560.00
3	CEL-TEK LOAD SUPPORT GRID 3 + BINDER (INCLUDES CELL-TEK LSG 3, J-HOOKS, GEOTEXTILE FABRIC, AND 5 INCHES OF UNCOMPACTED 3/4" - 1" GRAVEL)	4273	SY	\$ 65.00	\$ 277,745.00
4	RELOCATE FENCE	226	LF	\$ 30.00	\$ 6,780.00
5	ADS INLET	3	EA	\$ 2,500.00	\$ 7,500.00
6	FLARED END SECTION	5	EA	\$ 1,500.00	\$ 7,500.00
7	HDPE PIPE	300	LF	\$ 80.00	\$ 24,000.00
8	EROSION CONTROL MATS	1068	SY	\$ 12.00	\$ 12,816.00
9	EROSION CONTROL	1	LS	\$ 12,800.00	\$ 12,800.00
10	SEEDING	2135	SY	\$ 2.50	\$ 5,337.50
11	RECONSTRUCTION OF BIORETENTION BASIN	2	LS	\$ 10,000.00	\$ 20,000.00
SUBTOTAL:					\$ 401,754.50
	MOBILIZATION (8%)	1	LS	\$ 32,140.36	\$ 32,140.36
	PROTECTION AND RESTORATION (14%)	1	LS	\$ 56,245.63	\$ 56,245.63
CONSTRUCTION ESTIMATE					\$ 490,140.49
	CONTINGENCY (20%)	1	LS	\$ 98,028.10	\$ 98,028.10
SUBTOTAL:					\$ 588,168.59
PROJECT TOTAL CONSTRUCTION ESTIMATE:					\$ 589,000.00
	APPROXIMATE ENGINEERING, SURVEYING, CA, TESTING	1	LS	\$ 110,000.00	\$ 110,000.00
PROJECT TOTAL CONSTRUCTION ESTIMATE:					\$ 699,000.00

BID ALTERNATE #1

REMOVE CELL-TEK PAVEMENT STRUCTURE AND REPLACE WITH 6" CONCRETE SURFACE

ITEM NUMBER	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
3	CEL-TEK LOAD SUPPORT GRID 3 + BINDER (INCLUDES CELL-TEK LSG 3, J-HOOKS, GEOTEXTILE FABRIC, AND 5 INCHES OF UNCOMPACTED 3/4" - 1" GRAVEL)	-4273	SY	\$ 65.00	\$ (277,745.00)
3 ALT	6" PCC PAVEMENT (INCLUDES 6" PCC, 4" AGGREGATE BASE, DOWELS)	4273	SY	\$ 90.00	\$ 384,570.00
BID ALTERNATE DIFFERENCE:					\$ 106,825.00
BID ALTERNATE SUBTOTAL:					\$ 508,579.50
	MOBILIZATION (8%)	1	LS	\$ 40,686.36	\$ 40,686.36
	PROTECTION AND RESTORATION (14%)	1	LS	\$ 71,201.13	\$ 71,201.13
CONSTRUCTION ESTIMATE					\$ 620,466.99
	CONTINGENCY (20%)	1	LS	\$ 124,093.40	\$ 124,093.40
SUBTOTAL:					\$ 744,560.39
PROJECT TOTAL CONSTRUCTION ESTIMATE:					\$ 745,000.00
	APPROXIMATE ENGINEERING, SURVEYING, CA, TESTING	1	LS	\$ 110,000.00	\$ 110,000.00
PROJECT TOTAL CONSTRUCTION ESTIMATE:					\$ 855,000.00

HORNER SHIFRIN

ENGINEER'S CONCEPTUAL ESTIMATE OF COST - CONCEPT 2

Chesterfield Eberwein Trail Erosion
CHESTERFIELD, MISSOURI
 HORNER & SHIFRIN PROJECT # 2021400

DATE: 1/12/2021
 EST. BY: JMU/NAS
 CHK. BY: AMG

ITEM NUMBER	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	MSD CLASS C EXCAVATION	777	CY	\$ 28.00	\$ 21,756.00
2	EARTHWORK	2275	CY	\$ 15.00	\$ 34,125.00
3	CEL-TEK LOAD SUPPORT GRID 3 + BINDER (INCLUDES CELL-TEK LSG 3, J-HOOKS, GEOTEXTILE FABRIC, AND 5 INCHES OF UNCOMPACTED 3/4" - 1" GRAVEL)	2563	SY	\$ 65.00	\$ 166,595.00
4	6" CONCRETE SIDEWALK	1044	SY	\$ 90.00	\$ 93,970.00
5	ADS INLET	3	EA	\$ 2,500.00	\$ 7,500.00
6	FLARED END SECTION	6	EA	\$ 1,500.00	\$ 9,000.00
7	HDPE PIPE	360	LF	\$ 80.00	\$ 28,800.00
8	EROSION CONTROL MATS	1951	SY	\$ 12.00	\$ 23,412.00
9	EROSION CONTROL	1	LS	\$ 12,000.00	\$ 12,000.00
10	SEEDING	3115	SY	\$ 2.50	\$ 7,787.50
11	MODULAR BLOCK RETAINING WALL	1290	SF	\$ 35.00	\$ 45,150.00
12	RECONSTRUCTION OF BIORETENTION BASIN	2	LS	\$ 10,000.00	\$ 20,000.00
SUBTOTAL:					\$ 470,095.50
	MOBILIZATION (8%)	1	LS	\$ 37,607.64	\$ 37,607.64
	PROTECTION AND RESTORATION (14%)	1	LS	\$ 65,813.37	\$ 65,813.37
CONSTRUCTION ESTIMATE					\$ 573,516.51
	CONTINGENCY (20%)	1	LS	\$ 114,703.30	\$ 114,703.30
SUBTOTAL:					\$ 688,219.81
PROJECT TOTAL CONSTRUCTION ESTIMATE:					\$ 689,000.00
	APPROXIMATE ENGINEERING, SURVEYING, CA, TESTING	1	LS	\$ 110,000.00	\$ 110,000.00
	UTILITY ALLOWANCE	1	LS	\$ 50,000.00	\$ 50,000.00
PROJECT TOTAL CONSTRUCTION ESTIMATE:					\$ 849,000.00

BID ALTERNATE #1

REMOVE CELL-TEK PAVEMENT STRUCTURE AND REPLACE WITH 6" CONCRETE SURFACE

ITEM NUMBER	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
3	CEL-TEK LOAD SUPPORT GRID 3 + BINDER (INCLUDES CELL-TEK LSG 3, J-HOOKS, GEOTEXTILE FABRIC, AND 5 INCHES OF UNCOMPACTED 3/4" - 1" GRAVEL)	-2563	SY	\$ 65.00	\$ (166,595.00)
3 ALT	6" PCC PAVEMENT (INCLUDES 6" PCC, 4" AGGREGATE BASE, DOWELS)	2563	SY	\$ 90.00	\$ 230,670.00
					\$ -
BID ALTERNATE DIFFERENCE:					\$ 64,075.00
BID ALTERNATE SUBTOTAL:					\$ 534,170.50
	MOBILIZATION (8%)	1	LS	\$ 42,733.64	\$ 42,733.64
	PROTECTION AND RESTORATION (14%)	1	LS	\$ 74,783.87	\$ 74,783.87
CONSTRUCTION ESTIMATE					\$ 651,688.01
	CONTINGENCY (20%)	1	LS	\$ 130,337.60	\$ 130,337.60
SUBTOTAL:					\$ 782,025.61
BID ALTERNATE #1 PROJECT TOTAL CONSTRUCTION ESTIMATE:					\$ 783,000.00
	APPROXIMATE ENGINEERING, SURVEYING, CA, TESTING	1	LS	\$ 110,000.00	\$ 110,000.00
	UTILITY ALLOWANCE	1	LS	\$ 50,000.00	\$ 50,000.00
BID ALTERNATE #1 PROJECT TOTAL CONSTRUCTION ESTIMATE:					\$ 943,000.00

APPENDIX C

TRAIL MATERIAL PRODUCT INFORMATION

LSG SERIES[®]

LOAD SUPPORT GRID

"Saves money and lasts a lifetime!"



LSG SERIES STABILIZER GRID provides superior support to your pavement system. The system confines materials and prevents lateral movement away from the applied load. The stabilizer grid acts as a large mat, by spreading the load over an extended area while increasing the load bearing capacity of the pavement surface.

APPLICATIONS INCLUDE:

Gravel | Grassy Paving

- Driveways
- Municipal and private roads
- Access roads
- Parking lots | Parking pads
- Fire access lanes
- Overflow parking

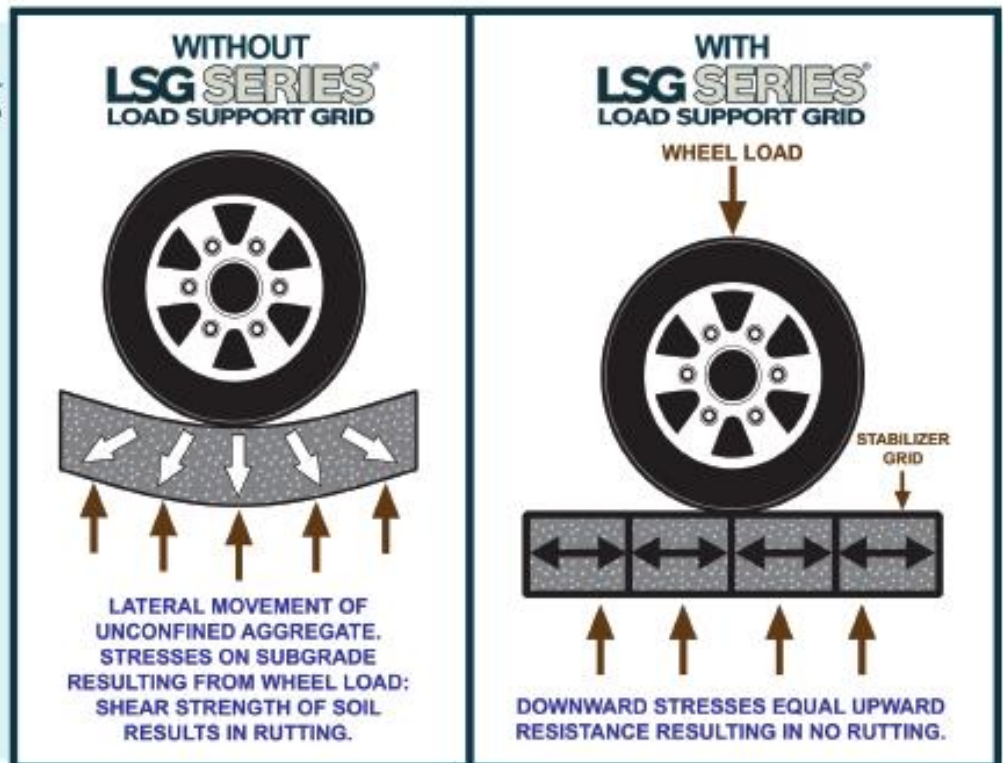
Pavers

- Pathways
- Patios
- Driveways

Gravel-Lok[®] (Bonded Gravel)

Mud Management (farms, horse paddocks)

Green Roofs

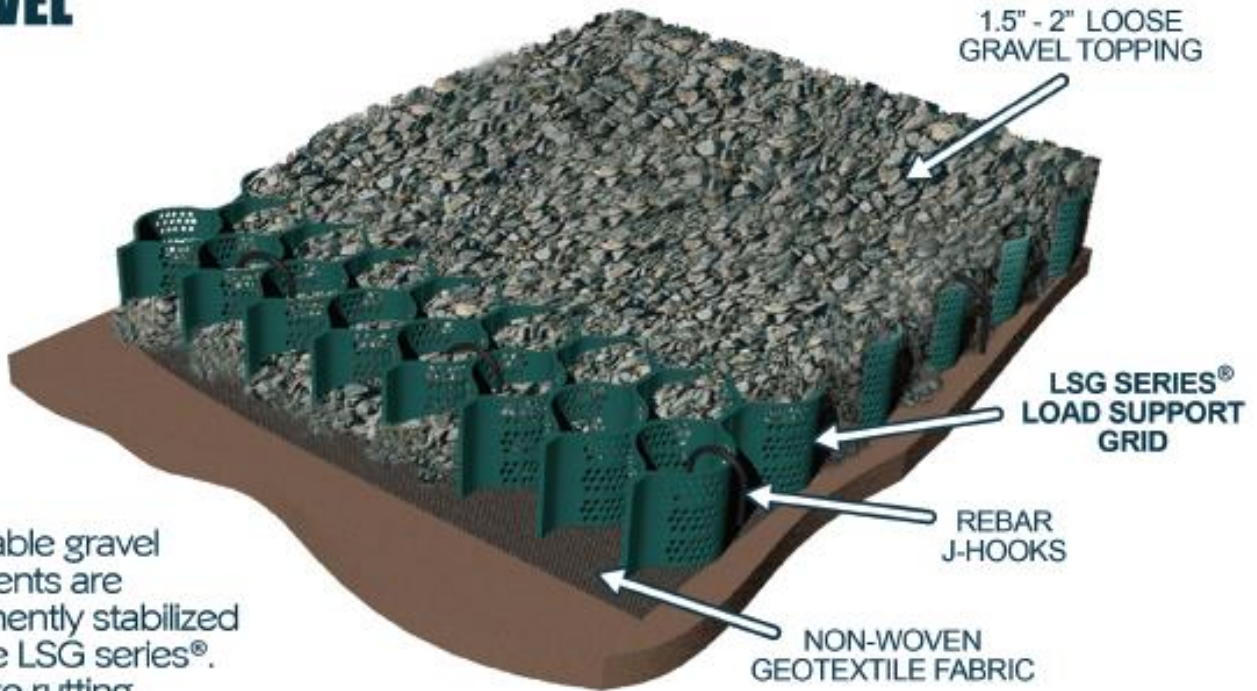


Reduce Stormwater Runoff • Reduce Base Thickness • Reduce Subgrade Stress
Reduce Installation Costs • Reduce Maintenance • Increase Strength
Increase Load Support • Increase Pavement Life • Increase Performance

LSG SERIES[®]

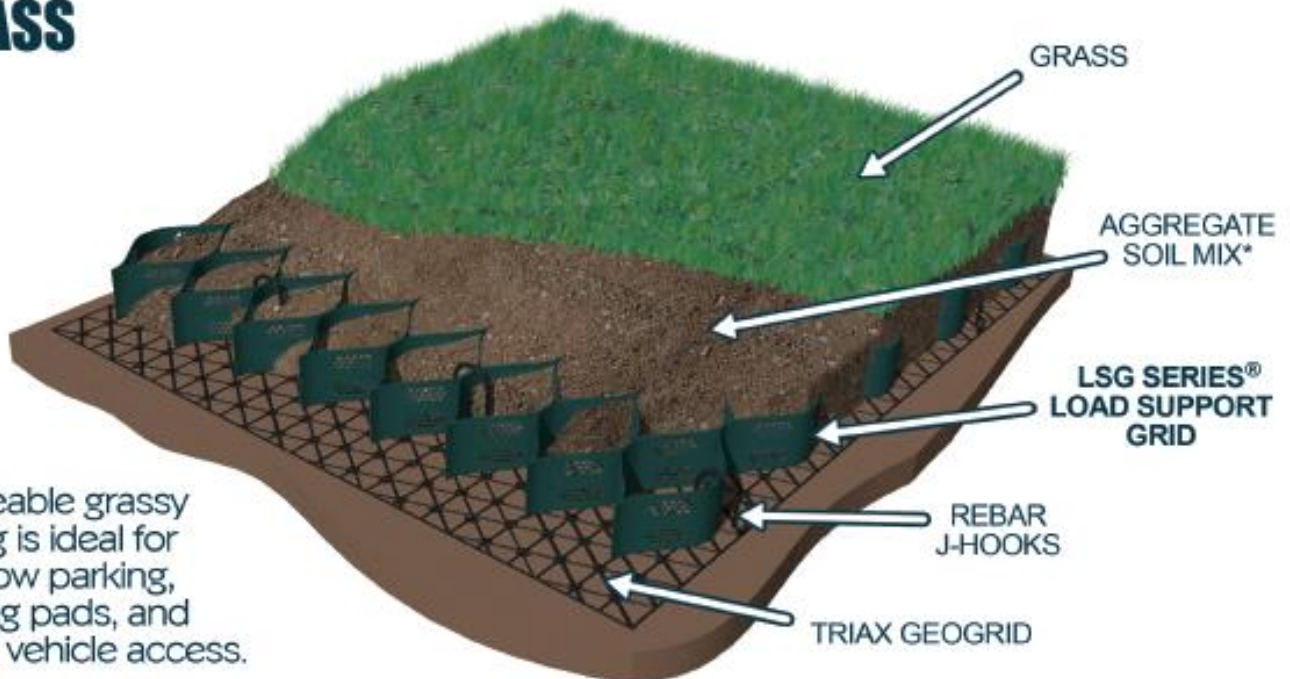
LOAD SUPPORT GRID

GRAVEL



Permeable gravel pavements are permanently stabilized with the LSG series[®]. Eliminate rutting.

GRASS

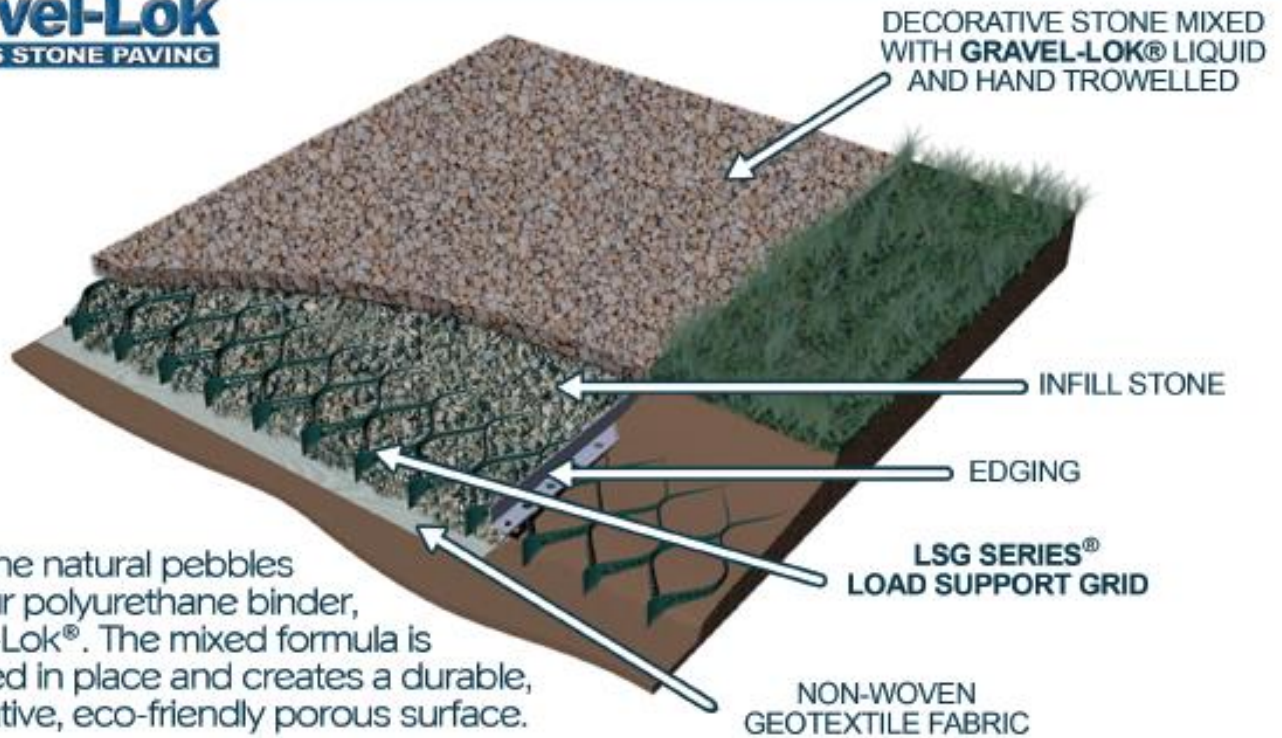


Permeable grassy paving is ideal for overflow parking, parking pads, and heavy vehicle access.

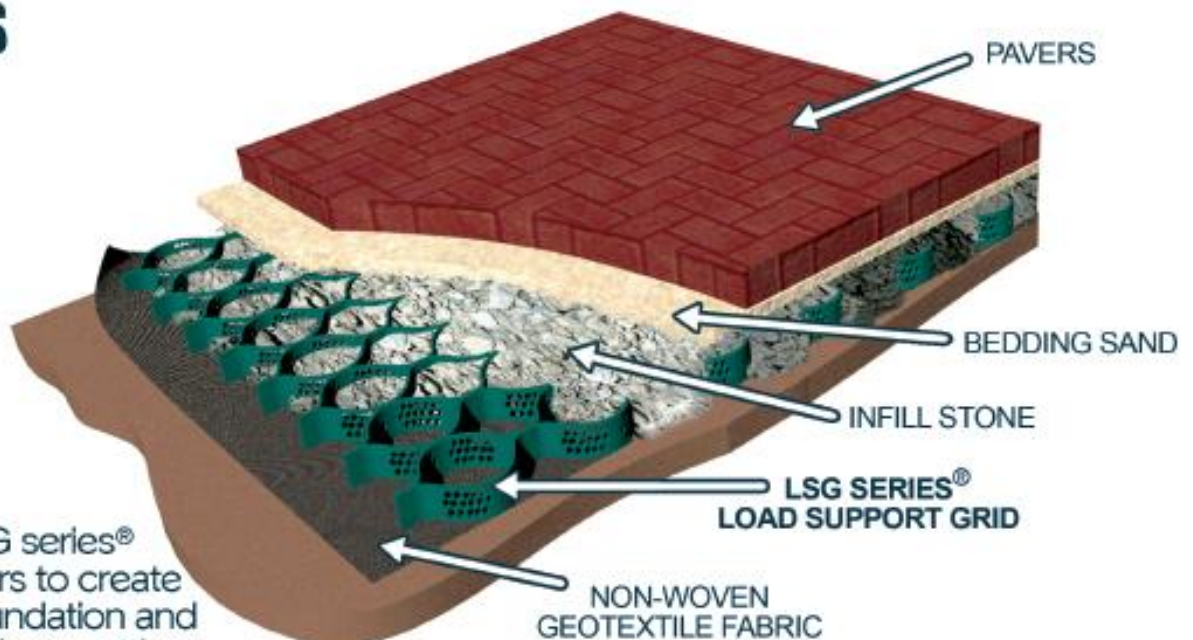
*Aggregates and soil are mixed for load support and root growth. Ratio varies. Call for details.

"Makes a great foundation for any surface!"

Gravel-Lok POROUS STONE PAVING



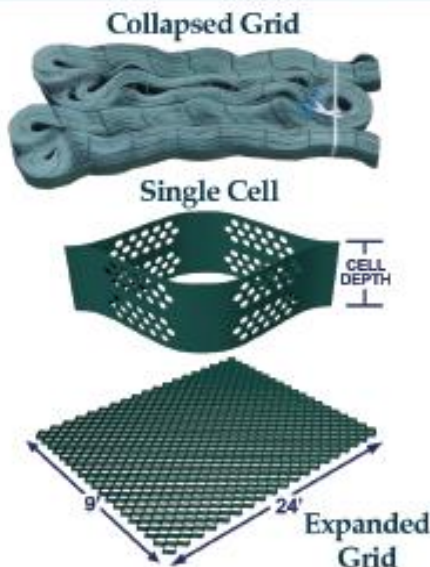
PAVERS



TYPICAL INSTALLATION of LSG SERIES as base foundation for Gravel-lok or pavers.
 For non-bonded gravel or grassy paving, see website for installation - www.celltekdirect.com

<p>Excavate</p>  <p>1</p>	<p>Install Geotextile Fabric</p>  <p>2</p>	<p>Install Expansion Spikes</p>  <p>3</p>
<p>Expand LSG Stabilizer Grid</p>  <p>4</p>	<p>Staple One Grid To Another</p>  <p>5</p>	<p>Infill Cells</p>  <p>6</p>
<p>Completely Fill Cells</p>  <p>7</p>	<p>Overfill Cells & Tamp</p>  <p>8</p>	<p>Install Surface Layer</p>  <p>9</p>

PRODUCTS	CELL DEPTH	DIMENSIONS	AREA/ UNIT	UNITS/ PALLET	TRAFFIC	LOAD DETAILS	APPLICATIONS
LSG-3	3"	9' x 24'	215 SF	24	Pedestrian	8000 lb. Axle Loads: 18kN	Pedestrian Traffic, Walkways, Pathways
LSG-4	4"	9' x 24'	215 SF	18	Cars & Pickup Trucks	H10 Loading 40,000 lb. Axle Loads 75kN	Driveways, Access Roads, Overflow Parking
LSG-6	6"	9' x 24'	215 SF	12	Heavy Trucks & Fire Access	H20 Loading 80,000 lb. Axle Loads 145kN	Ports, Boat Ramps, Access Roads, Driveways, Commercial Applications



PROPERTIES	TEST METHOD	TEST VALUE
Material Composition	ASTM D1505	Polymer, Virgin HDPE Density: 0.9574 g/cm ³
Nominal Sheet Thickness	ASTM D 5199	1.45 mm
Environmental Stress Cracking	ASTM D1693	> 4500 Hrs.
Stabilizer	ASTM E 682	Hindered amine light stabilizer (HALS) 1.0% by weight
Short Term Seam Peel Strength		3" (75mm) 1065N 4" (100mm) 1542N 6" (150mm) 2170N

WWW.CELLTEKDIRECT.COM

E-mail: info@celltekdirect.com Tel: 888-851-0051 Fax: 410-721-3844

CELL-TEK[®]
Geosynthetics LLC

809 Barkwood Court • Suite M • Linthicum, Maryland 21090



The Original Porous Gravel Paving

Made From 100% Recycled Plastic

Created by a Landscape Architect, GravelPave² has been the Designers' trusted choice for low maintenance porous paving since 1991. With a remarkable compressive strength, 5 times that of concrete, (15,940 psi) GravelPave² can support the weight of virtually any vehicle. The lightweight and flexible rolls allow for

quick and easy installation while the ability to cut with pruning shears offers design versatility. GravelPave² is now available in Granite – a new color designed to blend seamlessly with almost any aggregate. Also available in black and custom colors.

Pave Better Solutions

Gravelpave² is a 100% recycled plastic ring-on-grid structure designed to support unlimited traffic. With great flexibility and a high compressive strength, Gravelpave² is a practical and sustainable option for any low speed area. Gravelpave²'s fabric backing acts as a vegetation barrier, a dust inhibitor, provides true containment and will never come off or disintegrate. A 92% void space allows for rapid stormwater drainage and filtration of environmental toxins through bioremediation.

Using the US-made steel pins and washers included in every order, one person can install 430-sf of product in forty-five minutes. Our easy-to-install rolls can be

trimmed with pruning shears and even slightly bent to create curves and customize any layouts.

Made in the USA

Applications

- Fire Lanes, Utility and Emergency Access Roads
- Parking Lots
- Driveways
- Outdoor Event Spaces
- Paths and Walkways (ADA Compliant)
- Ramps, Docks and Loading Areas
- Airplane Taxiing Areas
- Helicopter Landing Pads

The Gravelpave² Advantages

- Design Flexibility
- High Compressive Strength (15,940psi)
- Easy, Quick Installation
- 92% Void Space
- All Weather
- Toxin filtration
- Unlimited Traffic for Low Speed Areas
- Low Maintenance/Long Lifespan (60+ years)
- Available in Custom Colors

