

POROUS CONCRETE MATERIAL

POROUS CONCRETE IS A CEMENTITIOUS MATERIAL ENGINEERED WITH AN INTERCONNECTED VOID STRUCTURE THAT ALLOWS WATER TO PASS VERTICALLY THROUGH THE MATERIAL WHILE MAINTAINING STRUCTURAL CAPACITY. THE MATERIAL IS SUITABLE FOR MANUFACTURING A RANGE OF PRECAST OR CAST-IN-PLACE PRODUCTS, INCLUDING PAVERS, PANELS, SLABS, AND OTHER FORMED ELEMENTS INTENDED FOR STORMWATER AND DRAINAGE-RELATED APPLICATIONS.

KEY CHARACTERISTICS

- INTERCONNECTED PORE NETWORK.
- STRUCTURAL CEMENTITIOUS MATRIX.
- HYDRAULIC FUNCTIONALITY COMBINED WITH LOAD-BEARING CAPACITY.

MATERIAL COMPOSITION

- PORTLAND CEMENT-BASED BINDER SYSTEM.
- COARSE AND FINE AGGREGATE MATRIX.
- PROPRIETARY POROUS HYDRATE ADMIXTURE TECHNOLOGY.
- SPECIFIC MIX DESIGNS FOR PRODUCT GEOMETRY AND PERFORMANCE REQUIREMENTS.

PHYSICAL PROPERTIES

TYPICAL PHYSICAL CHARACTERISTICS TESTED USING ASTM C642:

| PROPERTY | TYPICAL CONVENTIONAL CONCRETE ^[1] | AQUIPOR POROUS CONCRETE ^[2] |
|---|--|--|
| BULK DENSITY, DRY (Mg/m ³) | 2.30–2.40 | 2.23 |
| BULK DENSITY, SSD (g/cm ³) | 2.35–2.45 | 2.41 |
| BULK DENSITY, SSD + BOIL (g/cm ³) | 2.35–2.45 | 2.42 |
| APPARENT DENSITY (Mg/m ³) | 2.60–2.70 | 2.75 |
| ABSORPTION AFTER IMMERSION (%) | 4.0–6.0 | 8.70 |
| ABSORPTION AFTER IMMERSION + BOIL (%) | 4.5–6.5 | 8.40 |
| VOLUME OF PERMEABLE PORE SPACE (%) | 8–12 | 18.80 |
| WET UNIT WEIGHT (lb/ft ³) | 145–155 | 151.10 |

^[1] CONVENTIONAL CONCRETE VALUES REPRESENT TYPICAL INDUSTRY RANGES AND ARE PROVIDED FOR GENERAL COMPARISON ONLY.

^[2] VALUES SHOWN REPRESENT LABORATORY-TESTED SPECIMENS AND ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY AND ARE NOT MINIMUM GUARANTEED PROPERTIES. ACTUAL MATERIAL PROPERTIES MAY VARY DEPENDING ON MIX DESIGN, CURING, PLACEMENT, AND ENVIRONMENTAL CONDITIONS.

MECHANICAL PERFORMANCE

DEPENDING ON THE MIX DESIGN, TESTED COMPRESSIVE STRENGTH HAS RANGED FROM 3,500 TO 8,000 PSI (24.1 TO 55.2 Mpa).

- TESTED IN ACCORDANCE WITH ASTM C39.
- CYLINDRICAL SPECIMENS TESTED AT 7, 14, AND 28 DAYS.
- RESULTS DEMONSTRATE COMPRESSIVE STRENGTH SUITABLE FOR MOST STRUCTURAL CONCRETE APPLICATIONS.
- STRENGTH VALUES ARE REPRESENTATIVE OF LABORATORY CONDITIONS AND ARE NOT MINIMUM GUARANTEED VALUES.

HYDRAULIC PERFORMANCE

INFILTRATION CHARACTERISTICS

AQUIPOR TECHNOLOGY HAS DEMONSTRATED THE ABILITY TO TRANSMIT STORMWATER VERTICALLY THROUGH THE MATERIAL UNDER REPEATED LABORATORY AND SIMULATED STORM TESTING. INFILTRATION PERFORMANCE WAS EVALUATED THROUGH A SERIES OF CONTROLLED INFILTRATION TESTS CONDUCTED ON MANUFACTURED UNITS SUBJECT TO MULTIPLE SIMULATED LOADING AND MAINTENANCE CYCLES.

OBSERVED INFILTRATION RATES VARIED OVER THE COURSE OF TESTING DUE TO SURFACE CONDITION, SEDIMENT LOADING, AND MAINTENANCE ACTIVITIES, WHICH IS CONSISTENT WITH THE BEHAVIOR OF PERMEABLE PAVEMENT MATERIALS.

TYPICAL OBSERVED INFILTRATION RATES RANGED FROM APPROXIMATELY 0.3 TO 3.0 IN/HR UNDER CONTROLLED TESTING CONDITIONS.

PERFORMANCE OVER REPEATED LOADING EVENTS

INFILTRATION TESTING WAS CONDUCTED FOLLOWING MULTIPLE SIMULATED STORM EVENTS WITH VARYING SUSPENDED SOLIDS LOADING. RESULTS INDICATE THAT INFILTRATION CAPACITY IS INFLUENCED BY SEDIMENT ACCUMULATION AT THE SURFACE BUT REMAINS FUNCTIONAL OVER REPEATED EVENTS WHEN APPROPRIATE MAINTENANCE IS PERFORMED.

MEASURED INFILTRATION RATES DECREASED FOLLOWING SIMULATED STORM LOADING AND INCREASED FOLLOWING MAINTENANCE ACTIVITIES, DEMONSTRATING THE MATERIAL'S ABILITY TO RECOVER HYDRAULIC PERFORMANCE.

MAINTENANCE RESPONSE AND HYDRAULIC RECOVERY

MAINTENANCE ACTIVITIES, INCLUDING VACUUM-BASED SURFACE CLEANING, WERE EVALUATED AS PART OF THE TESTING PROGRAM. INFILTRATION TESTING CONDUCTED BEFORE AND AFTER MAINTENANCE INDICATES THAT A SIGNIFICANT PORTION OF LOST INFILTRATION CAPACITY CAN BE RESTORED THROUGH ROUTINE MAINTENANCE PRACTICES.

HYDRAULIC VARIABILITY AND SURFACE CONDITION

INFILTRATION PERFORMANCE EXHIBITED VARIABILITY BETWEEN TEST UNITS AND ACROSS TEST CYCLES. THIS VARIABILITY IS ATTRIBUTED TO DIFFERENCES IN SURFACE EXPOSURE, SEDIMENT LOADING, AND LOCALIZED CLOGGING, WHICH ARE INHERENT TO PERMEABLE MATERIALS.

RELATIONSHIP TO MATERIAL VOID STRUCTURE

INTERCONNECTED VOID CONTENT MEASURED VIA ASTM C642 SHOWING INCREASED PERMEABLE PORE SPACE RELATIVE TO CONVENTIONAL CONCRETE AT AROUND 18%.

HYDRAULIC PERFORMANCE IS ENABLED BY THE MATERIAL'S INTERCONNECTED VOID STRUCTURE, AS QUANTIFIED THROUGH PERMEABLE PORE SPACE MEASUREMENTS CONDUCTED IN ACCORDANCE WITH ASTM C642. INCREASED PERMEABLE PORE VOLUME SUPPORTS VERTICAL FLOW THROUGH THE MATERIAL WHILE MAINTAINING STRUCTURAL INTEGRITY OF THE CEMENTITIOUS MATRIX.

LIMITATIONS OF HYDRAULIC PERFORMANCE DATA

HYDRAULIC PERFORMANCE RESULTS PRESENTED HEREIN ARE BASED ON LABORATORY AND SIMULATED TESTING OF MANUFACTURED UNITS UNDER CONTROLLED CONDITIONS. FIELD PERFORMANCE MAY VARY DEPENDING ON INSTALLATION METHODS, ENVIRONMENTAL EXPOSURE, CONTRIBUTING DRAINAGE AREA, SEDIMENT CHARACTERISTICS, AND MAINTENANCE PRACTICES.

HYDRAULIC PERFORMANCE VALUES ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY AND ARE NOT INTENDED TO REPRESENT MINIMUM GUARANTEED INFILTRATION RATES.

DURABILITY AND MATERIAL REACTIVITY

HEAT OF HYDRATION

HEAT OF HYDRATION EVALUATED USING ISOTHERMAL CALORIMETRY (ASTM C1702), WITH RESULTS INDICATING CONTROLLED HYDRATION BEHAVIOR AT EARLY AGES.

CHEMICALLY BOUND WATER

CHEMICALLY BOUND WATER CONTENT EVALUATED PER (ASTM C1897), WITH RESULTS INDICATING EFFECTIVE CEMENTITIOUS REACTION AND HYDRATION EFFICIENCY.

WATER QUALITY PERFORMANCE

TOTAL SUSPENDED SOLIDS (TSS) REDUCTION

- LABORATORY AND SIMULATED STORM TESTING INDICATE THE MATERIAL'S ABILITY TO REDUCE SUSPENDED SOLIDS, BY 97.2%, IN INFILTRATING WATER.
- LABORATORY AND SIMULATED STORM TESTING INDICATE THE MATERIAL'S ABILITY TO REDUCE 6PPD-Q (TIRE WEAR PARTICLES), BY 81.6%, IN INFILTRATING WATER.
- REMOVAL EFFICIENCY OBSERVED UNDER CONTROLLED TESTING CONDITIONS
- DEMONSTRATED POTENTIAL FOR POLLUTANT REDUCTION UNDER CONTROLLED TESTING CONDITIONS. FIELD PERFORMANCE MAY VARY.

TARGETED POLLUTANT REDUCTION

MATERIAL TESTED FOR REDUCTION OF SELECT ROADWAY-DERIVED POLLUTANTS WITH RESULTS INDICATING MEASURABLE REDUCTION THROUGH INFILTRATION AND FILTRATION MECHANISMS.

INSTALLATION AND HANDLING

- AVOID CONTAMINATION OF PORE STRUCTURE DURING HANDLING AND INSTALLATION.
- PREVENT EXPOSURE TO FINE SOILS, SEDIMENTS, OR CONSTRUCTION DEBRIS PRIOR TO SERVICE.
- FOLLOW PRODUCT-SPECIFIC INSTALLATION GUIDELINES WHERE APPLICABLE.

MAINTENANCE CONSIDERATIONS

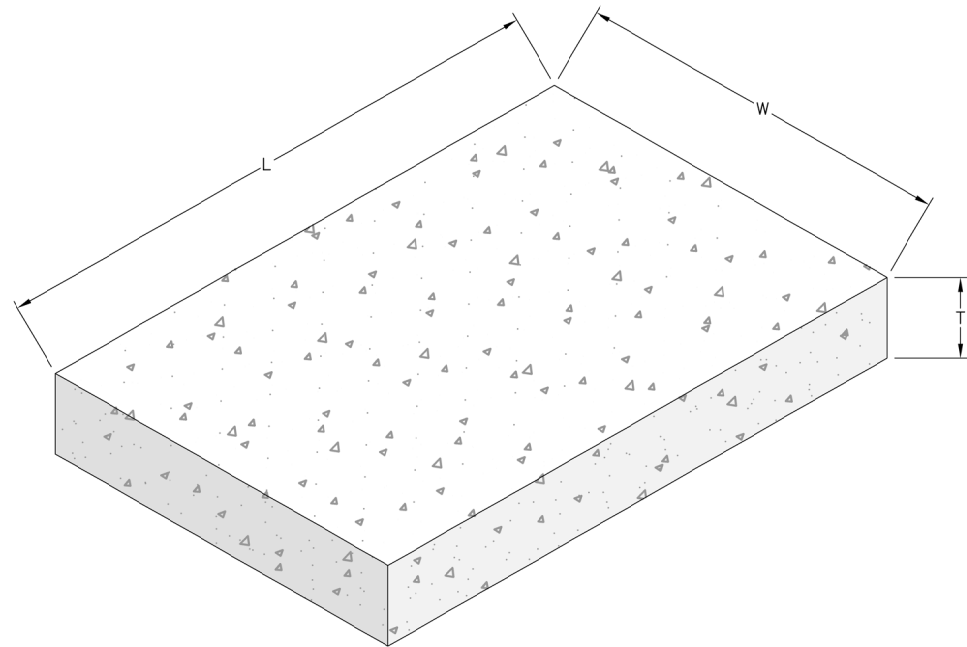
- PERIODIC CLEANING RECOMMENDED TO MAINTAIN INFILTRATION PERFORMANCE.
- SURFACE CLOGGING MAY REDUCE HYDRAULIC CONDUCTIVITY IF NOT ADDRESSED.
- MAINTENANCE FREQUENCY DEPENDS ON SITE USE AND ENVIRONMENTAL EXPOSURE.

LIMITATIONS

- PERFORMANCE VALUES ARE BASED ON LABORATORY TESTING AND CONTROLLED CONDITIONS.
- MATERIAL PERFORMANCE IS DEPENDENT ON INSTALLATION, ENVIRONMENT, AND MAINTENANCE.
- NOT INTENDED TO REPLACE PROJECT-SPECIFIC ENGINEERING DESIGN OR SYSTEM-LEVEL ANALYSIS.

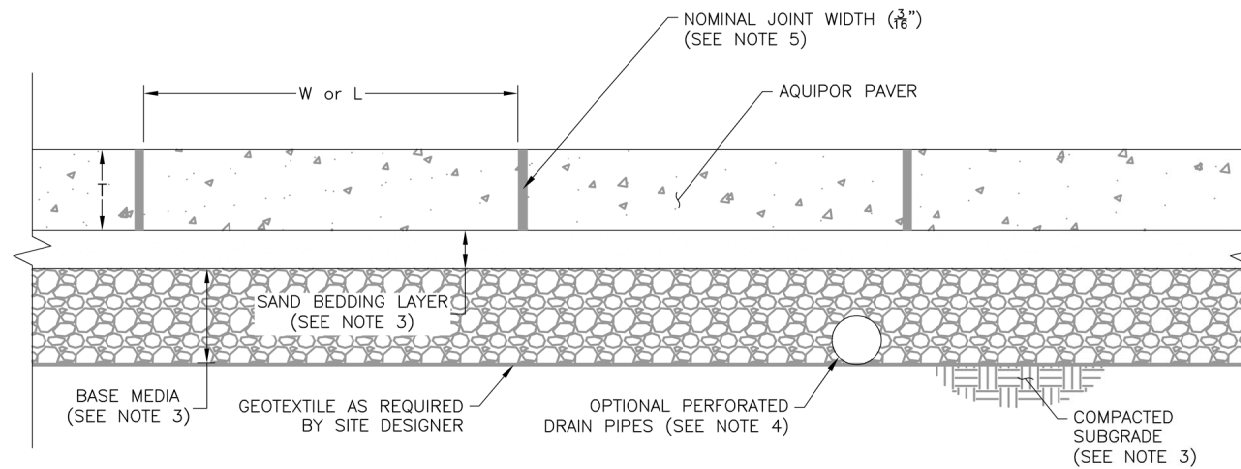
| | |
|---|--|
|  | |
| PRODUCT | AQUIPOR POROUS CONCRETE MATERIAL |
| TITLE | MATERIAL TECHNICAL SPECIFICATIONS |
| DISCLAIMER | INFORMATION PROVIDED IS BASED ON AVAILABLE TECHNICAL DATA AND EXPERIENCE AND IS INTENDED FOR GENERAL GUIDANCE ONLY. PRODUCT PERFORMANCE MAY VARY DEPENDING ON INSTALLATION, SITE CONDITIONS, AND USE. THE MANUFACTURER ASSUMES NO LIABILITY FOR THE APPLICATION OR INTERPRETATION OF THIS INFORMATION. USERS ARE RESPONSIBLE FOR DETERMINING PRODUCT SUITABILITY FOR THEIR SPECIFIC PROJECT. |

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AQUIPOR PAVER

| SIZE VARIATIONS | | |
|-------------------------------|--|--|
| DIMENSION (WxLxT, SEE NOTE 2) | 4"x8"x2 ³ / ₈ " (MIN.) | 24"x24"x2 ³ / ₈ " (MAX.) |
| UNIT WEIGHT | 18 psf | |
| WEIGHT (EACH) | 4lbs | 72lbs |
| PALLET | ~225 units (~900lbs) | ~25 units (1,800lbs) |
| COMPRESSIVE STRENGTH | 4,000 psi | |
| ABSORPTION AFTER IMMERSION | 8.7% | |
| PERMEABLE PORE SPACE VOLUME | 18.8% | |
| MAXIMUM INFILTRATION RATE | 3 (in/hr) | |



TYPICAL PAVER SUBGRADE SECTION

NOTES:

1. REFERENCE AQUIPOR GENERAL POROUS CONCRETE SPECIFICATION SHEET FOR FURTHER INFORMATION ON THE PROPERTIES OF THE MATERIAL.
2. CURRENTLY AQUIPOR PAVERS ARE MADE IN 4"x8" AND 12"x12" HOWEVER OTHER COMMON SIZES WILL BE AVAILABLE AS PER THE PROJECT REQUIREMENTS. THE PAVERS ARE SUITABLE FOR PEDESTRIAN AND LIGHT VEHICULAR APPLICATIONS WHEN INSTALLED OVER AN OPEN-GRADED BASE DESIGNED IN ACCORDANCE WITH THE PROJECT GEOTECHNICAL AND STORMWATER REQUIREMENTS.
3. SUBGRADE MATERIAL TYPE AND THICKNESS WILL BE DETERMINED ON A PROJECT BASIS AND SHALL BE MOISTURE CONDITIONED AND COMPACTED PER PROJECT GEOTECHNICAL RECOMMENDATIONS BY SITE DESIGNER.
4. IF THE SITE SUBGRADE DOES NOT MEET DESIGN INFILTRATION RATES, COLLECTION PIPES CAN BE INSTALLED IN THE BASE MEDIA TO CONVEY FLOWS TO SURFACE DISCHARGE, STORMWATER CONVEYANCE SYSTEMS, OR TO STORAGE VAULTS PER SITE REQUIREMENTS.
5. PAVERS CAN BE INSTALLED WITH STANDARD JOINT WIDTHS FOR OPEN-GRADED AGGREGATES OR OTHER MATERIAL AS SPECIFIED BY THE SITE DESIGNER.
6. THE FOLLOWING TEST METHODS WERE USED:
 - 6.1. COMPRESSIVE STRENGTH: ASTM C140
 - 6.2. ABSORPTION AFTER IMMERSION: ASTM C642
 - 6.3. PERMEABLE PORE SPACE: ASTM C642
 - 6.4. INFILTRATION RATE: ASTM C1701

**NOT
FOR CONSTRUCTION**

| | | | |
|--|---|---------|------------|
| PRODUCT | STANDARD PAVERS | DWG.NO. | AQ.SPEC.02 |
| TITLE | TYPICAL PHYSICAL PROPERTIES AND INSTALLATION REQUIREMENTS | REV. | 1 |
| DISCLAIMER | | | |
| AQUIPOR INFORMATION PROVIDED IS BASED ON AVAILABLE TECHNICAL DATA AND EXPERIENCE AND IS INTENDED FOR GENERAL GUIDANCE ONLY. PRODUCT PERFORMANCE MAY VARY DEPENDING ON INSTALLATION, SITE CONDITIONS, AND USE. THE MANUFACTURER ASSUMES NO LIABILITY FOR THE APPLICATION OR INTERPRETATION OF THIS INFORMATION. USERS ARE RESPONSIBLE FOR DETERMINING PRODUCT SUITABILITY FOR THEIR SPECIFIC PROJECT. | | | |

TO: Aquipor
FROM: Evergreen StormH2O
DATE: March 5, 2026
SUBJECT: Testing Results & Recommendations

PROJECT OVERVIEW

The goal of this study was to evaluate Aquipor's permeable pavers as a stormwater best management practice (BMP) in a laboratory setting. This involved flow-through column testing of permeable pavers to evaluate the design infiltration rate and treatment performance. Results from the study will be used to enter the pavers into the Technology Assessment Protocol – Ecology (TAPE) program and obtain a pilot use level designation (PULD) to conduct field testing. The specific study objectives to achieve this goal included:

- **Flushing Test:** Deionized water was used to flush the pavers and assess whether they are leaching pollutants regulated by the by the Washington State National Pollutant Discharge Elimination System (NPDES) Permit for owners of Municipal Separate Storm Sewer Systems (MS4) [MS4 Permit].
- **Water Quality Testing:** Eight simulated storm events were run using synthetic stormwater to measure TSS removal performance. In addition, one event was conducted using natural stormwater to evaluate the pavers' ability to reduce 6PPDQ.
- **Infiltration Rate Monitoring:** The infiltration rate was measured throughout testing to assess the changes over time as well as determine the design infiltration rate and identify when maintenance would be needed.
- **Design and Maintenance Guidance:** The study results and a literature search were used to define design and maintenance guidance for field applications.

EXPERIMENTAL DESIGN

The study (experimental) design is included in [Appendix A](#), and any deviations from the experimental design performed during testing are noted in [Appendix B](#).

RESULTS

Flushing Test

A flushing event was performed using deionized (DI) water to determine if the pavers are leaching pollutants regulated by the Washington MS4 Permit. These pollutants include total suspended solids (TSS), dissolved copper, dissolved zinc, total phosphorus, oils, and hardness. [Table 1](#) summarizes the effluent sample results along with the TAPE influent concentration ranges, which are the typical pollutant concentrations in stormwater and the required range when evaluating treatment BMPs. The TAPE range was included in [Table 1](#) to provide a point of comparison and confirm the effluent concentrations were lower than the range. As noted in [Table 1](#), all effluent concentrations were less than the TAPE ranges. However, since dissolved copper and zinc were close to the low-end range, it is recommended that the testing be repeated after additional flushing to determine if these concentrations are typical or temporary and would decline with additional flushing.

The effluent pH was measured and, as shown in **Table 1**, found to increase after flowing through the pavers. This is consistent with the effects of other concrete mixtures and is likely due to the cement component of the paver; when calcium oxide is exposed to water during the hydration process, calcium hydroxide is produced. The leaching of calcium hydroxide can increase the pH of water up to values of 12.5 (Setunge, Nguyen, Alexander, & Dutton, 2009). In addition, DI water lacks buffering capacity, or the presence of minerals that normally stabilize water's pH, which makes the water highly susceptible to chemical changes from the immediate environment (Why is the pH of Deionized Water not 7?, 2026). As such, the pH of DI water may be more impacted by the chemical mechanisms in the paver than rainwater would be. Additional discussion regarding pH is included in the Recommendations Section under **Construction**.

Appendix C contains additional pH testing results and **Appendix E** the full analytical results from the lab.

Table 1. DI Flush Results

| Parameter | Test Method | Units | Average Effluent Concentration | TAPE Influent Concentration Range |
|------------------|-------------------------|-------|--------------------------------|-----------------------------------|
| pH ¹ | | – | 9.9 | N/A |
| TSS | SM 2540D | mg/l | 4.53 | 20–100 mg/L |
| Dissolved Copper | EPA 200.8 (ICP/MS) | mg/l | 0.004 | 0.005–0.02 mg/L |
| Dissolved Zinc | EPA 200.8 (ICP/MS) | mg/l | 0.018 | 0.02–0.3 mg/L |
| Total Phosphorus | SM 4500- P F | mg/l | 0.044 | 0.1–0.5 mg/L |
| Oils | EPA SW-846 method 8015B | mg/l | 0.91 | >= 10 mg/L |
| Hardness | SM 23408 (ICP) | mg/l | 389 | N/A |

¹Influent concentrations were assumed to be zero. The influent stormwater was not tested.

Water Quality Testing – TSS Treatment Performance

Ten simulated storm events were performed to evaluate the pavers' TSS treatment performance. The results from the first two events were excluded from the results because of difficulty collecting representative influent samples. Reference **Appendix B** for additional details. Results from simulated events 3–10 are summarized in **Table 2**. The average removal was 96.8%, which exceeded the TAPE treatment criteria of 80%. **Appendix B** contains the results from each paver for each simulated event and **Appendix E** contains the full analytical results from the lab.

Table 2. Average TSS Treatment Performance

| Influent Concentration ¹ (mg/L) | Effluent Concentration (mg/L) | Removal Efficiency (%) | TAPE Treatment Criteria |
|---|----------------------------------|---------------------------|-------------------------|
| 113.2 | 3.6 | 96.8 | ≥ 80 % TSS Removal |

¹The first two simulated events were conducted using 100 mg/L of TSS and the remaining simulated events were conducted using 300 mg/L. Reference **Appendix B** for additional details.



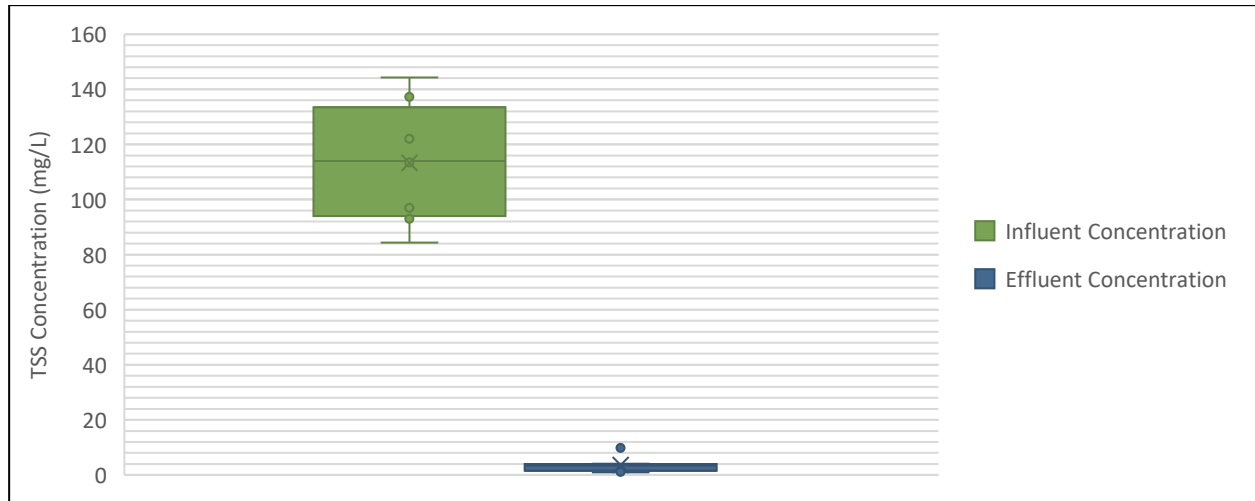


Figure 1. Average Influent and Effluent TSS Concentrations: Events 3–10

Water Quality Testing – 6PPDQ Treatment Performance

Natural stormwater was used to evaluate the treatment performance of one paver for removing 6PPDQ from stormwater. The paver used for 6PPDQ testing was different than the pavers used to test for TSS removal to prevent interference with testing. Before testing, the paver infiltration rate was measured to assess if the rate was similar to the other pavers. As shown in **Figure 2**, the infiltration rate was slightly lower than the initial rate but within the range of the rate measured during TSS testing.

As shown in **Table 3**, the paver reduced 6PPDQ by 81.6%. These results are consistent with other permeable pavement studies done by the City of Gresham, Oregon, and the Washington Stormwater Center. Specifically, the City of Gresham, Oregon found greater than 75% removal of 6PPDQ using porous pavement overlays and full-depth porous pavement (Holzer, 2026). Similarly, Mitchell and Jayakaran found an average 6PPDQ removal ranging from 52-100%, with a mean mass reduction of 68% when investigating various types of permeable pavement (Mitchell, 2024).

Table 3. 6PPDQ Testing Results

| Test Method | Influent Concentration (ng/L) | Effluent Concentration (ng/L) | Removal Efficiency (%) |
|-----------------------|-------------------------------|-------------------------------|------------------------|
| EPA Draft Method 1634 | 76 | 14 | 81.6 |

Infiltration Rate Monitoring

The infiltration rate was measured throughout testing to assess the changes over time as well as determine the design infiltration rate and identify when maintenance would be needed. This section focuses on the changes over time with the other items discussed in the **Design Recommendations** Section. The plan for infiltration testing was to conduct testing prior to starting TSS testing to get the initial rate and then repeat the test following every two simulated storms, for a total of five tests; however, additional testing was conducted for the reasons described below. **Figure 2** provide a summary of the results and **Appendix C** contains the results from each paver for each infiltration test.



- **Test # 1** was conducted prior to conducting TSS testing and **Test #2** was conducted following the first two simulated events using 100 mg/L of TSS. Since the rate increased by more than 50% between the two tests, the infiltration test (**Test #3**) was repeated and more than doubled from Test #2. Through discussions with AQUIPOR, they have found that when the pavers are fully saturated, they retain 10% of the water in the pores spaces before water begins to discharge (infiltrate) from the pavers. Between discussions with AQUIPOR and the results from Tests #1–3, it appeared that the pavers were not fully saturated using the standard prewetting volume. Consequently, the amount of water used for prewetting was doubled and then the infiltration test was repeated twice (**Tests #4–5**) until the results stabilized. The initial infiltration rate was therefore assumed to be 1.37 in/hr (average of 1.34 in/hr and 1.39 in/hr).
- **Test #6** was performed after simulated events #3–4 and **Test # 7** was performed after simulated events #5–6. Because the infiltration rate decreased significantly and TSS buildup was observed on the surface of the pavers (**Figure 3**), maintenance was conducted to restore the infiltration rate, as described in **Appendix B**.
- **Test #9** was conducted following maintenance, which restored the infiltration rate to 70% of the initial rate. It is possible that more maintenance could further improve the infiltration rate. However, maintenance was not continued to avoid breaking the seal around the pavers used for column testing. In the field, further maintenance could be performed and tested to determine how much of the infiltration rate can be restored (see **Maintenance Recommendations**).
- **Test #10** was performed after simulated events #7–8 and **Test #11** was performed after the last two simulated events #9–10.

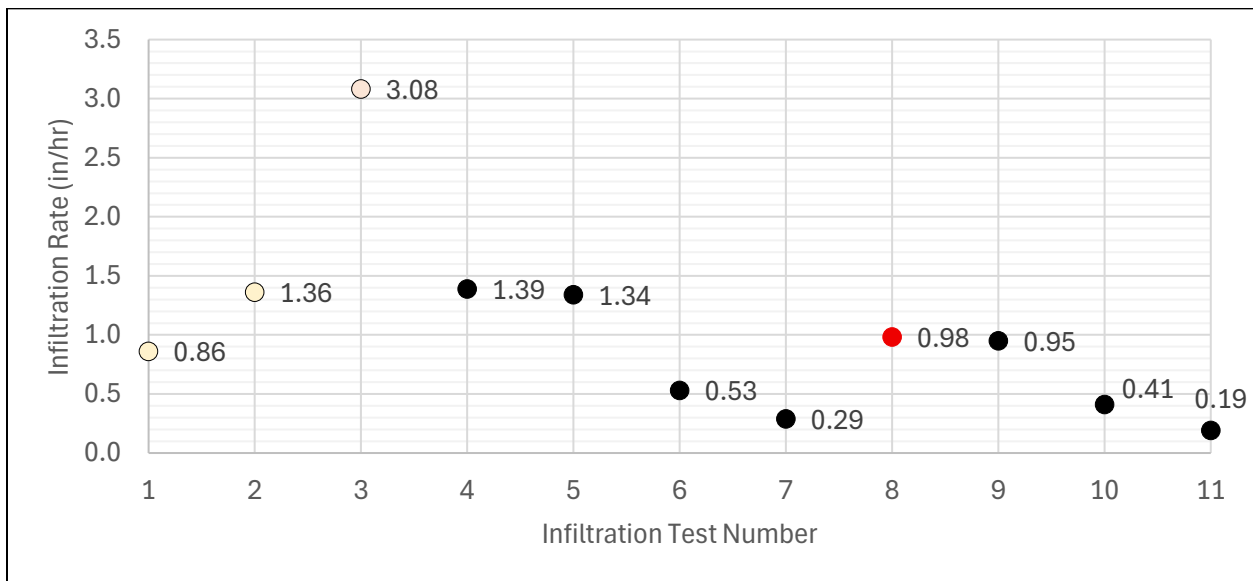


Figure 2. All Infiltration Results

Note: The prewetting volume was doubled after Tests #1–3. Infiltration Test #8 was done on a paver that was only used for 6PPDQ testing.





Figure 3. Paver Before (left) and After (right) Maintenance

RECOMMENDATIONS

This section provides recommendations for the design, maintenance, and field testing of the pavers based on the results of this study as well as a search of the literature. These recommendations focus on managing stormwater runoff and as such are not inclusive of all considerations related to designing, maintaining, and field testing the pavers.

Design Recommendations

Infiltration Rate

- While the initial infiltration rate of the pavers was 1.37 in/hr, the design infiltration rate selected by AquiPor is 0.5 in/hr. This is the rate at which maintenance would be required to remove solids and restore the infiltration rate.
- If the native soil design infiltration rate is less than the paver design rate, the native soil infiltration rate would be used for design.

Subsurface Conditions

- For projects in Washington State conducted to meet the MS4 Permit requirements, the soils underlying the paver will need to be assessed to confirm the soil suitability criteria (SSC) is met for infiltration. These are defined in the Western Washington (WWA) and Eastern Washington (EWA) Ecology Stormwater Management Manuals (SWMM) – specifically, Section 6.5.6 of the EWA SWMM (Washington State Department of Ecology, 2024). The SSC includes items such as minimum depth to groundwater that need to be considered before selecting a site for constructing the pavers.

Contributing Basin Area

Areas contributing runoff to the paver will either be from the paver only or the paver plus other contiguous impervious areas. In this document, contributing basin areas were considered as ratios of the paver area to the contributing area, as shown in **Figure 4**. For example, if the area contributing to the paver is the paver plus an impervious area equal to the paver area, this is represented as a 1:1 ratio of paver to impervious area.



Note: Runoff from permeable areas is not recommended due to increased potential for clogging the pavers (Minnesota Pollution Control Agency, 2026).

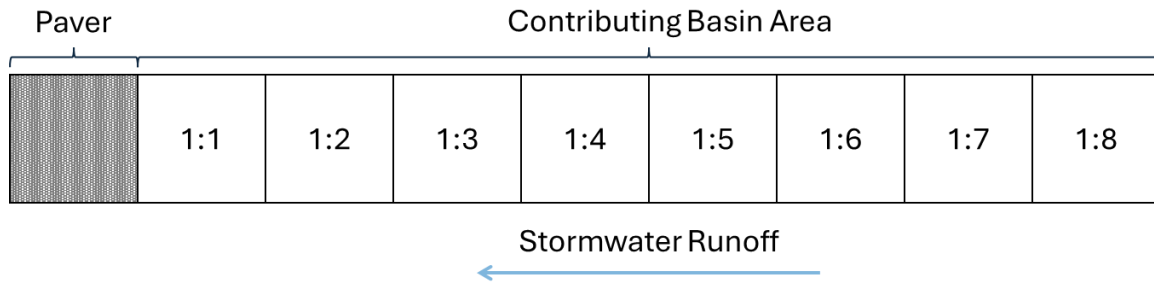


Figure 4. Paver and Contributing Basin Area Ratios

When introducing flows from other impervious surfaces, The Low Impact Development Technical Guidance Manual for Puget Sound (Hinman & Wulkan, 2012) recommends careful consideration of the sediment introduced as well as assessment of the infiltration capacity. This is further discussed below based on the results from this study.

1. **Sediment.** The amount of sediment contributing to the paver will increase as the contributing basin area increases, which will impact the maintenance frequency to restore the infiltration rate. See the [Maintenance Recommendations](#) for additional discussion on this topic.
2. **Infiltration Capacity.** When the infiltration capacity of the paver or subgrade is exceeded, ponding will occur. Ponding may be acceptable if it is factored into the design and considered in relation to other design requirements such as safety. An example is installing pavers along the edge of a parking lot or roadway with the remaining parking lot or paver sloped toward the paver with a curb along the edge to contain the ponding, as shown in [Figure 5](#). For installations such as these, the design needs to consider the maximum allowable spread to provide safe driving conditions and potentially an overflow. Both topics are discussed in the [Modeling and Overflow](#) section.

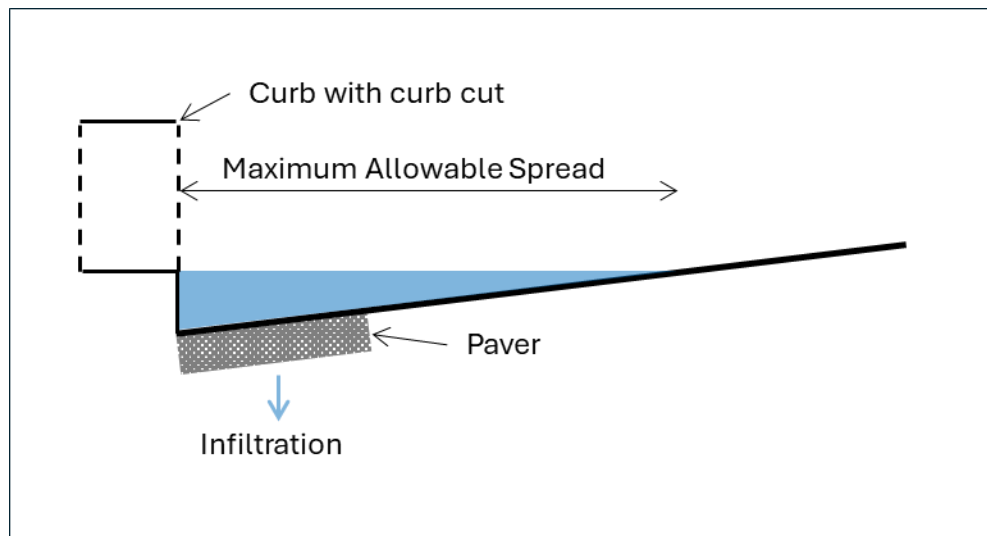


Figure 5. Paver with Curb Cut Overflow

Modeling and Overflow

Modeling is needed to assess the ponded condition, verify the maximum spread is not exceeded, verify the runoff volume from the water quality event is treated, and consider if an overflow is needed. Modeling requirement can vary by jurisdiction and MS4 Permit. As such, this section provides an overview of the process with examples based on the EWA MS4 Permits, as defined in the EWA SWMM.

- **Water Quality Event** – Runoff from the water quality event is the minimum volume or flow rate that needs to be treated to meet the MS4 Permit requirements. For example, in EWA the water quality event is the 6-month 24-hour event and in WWA it is the 2-year 24-hour event (Washington State Department of Ecology, 2024; Washington State Department of Ecology, 2024).
- **Ponding** – Modeling to assess the ponded condition includes determining if ponding will occur, the depth of ponding, and assessing if ponding depth is acceptable. This consists of comparing the runoff contributing to the paver to the runoff that will infiltrate during the storm event. The portion of runoff that does not infiltrate will pond on the pavers. In EWA, modeling would include using the single event model with a Type 1A design storm (Washington State Department of Ecology, 2024). Results from this modeling are shown in [Figure 6](#) for different precipitation depths and contributing basin configurations. For example, in Spokane where the water quality event is 1-inch, the ponding depth would be just below 0.2-inches for the paver only and 0.35-inches for a 1:1 ratio of paver to contributing impervious area. The maximum ponding depth is defined differently depending on the jurisdiction. For example, WSDOT does not define a depth but instead requires runoff to be contained with the maximum allowable spread, whereas the City of Everett requires that the depth of flow not exceed 0.12-feet at the edge of the roadway shoulder during the 10-year design storm (City of Everett, 2026, pp. 4-11).
- **Maximum Spread** in the context of stormwater runoff refers to the allowable width that water, flowing along a curb, can extend into the traveled lanes of a roadway during a design storm event. It is a key factor in roadway drainage design to ensure safety and prevent excessive flooding on roads. The Washington State Department of Transportation (WSDOT) Hydraulics Manual Chapter 5 provides guidance for modeling and evaluating maximum spread (Washington State Department of Transportation, 2023). This analysis would just need to be modified to include the infiltration from the pavers. For example, the maximum allowable spread on a local street with a driving speed less than 45 mph is determined using the 10-year design storm and limited to half the driving lane. This is based on Table 5-1 in the WSDOT Hydraulics Manual.
- **Overflow.** Depending on the application, an overflow path may be needed to provide runoff with a place to go during larger storm events. This could be done using a curb cut with the opening depth set to just above the water quality event. The runoff from events that exceed the water quality event could discharge to an adjacent swale or be routed to a storm drain conveyance system.



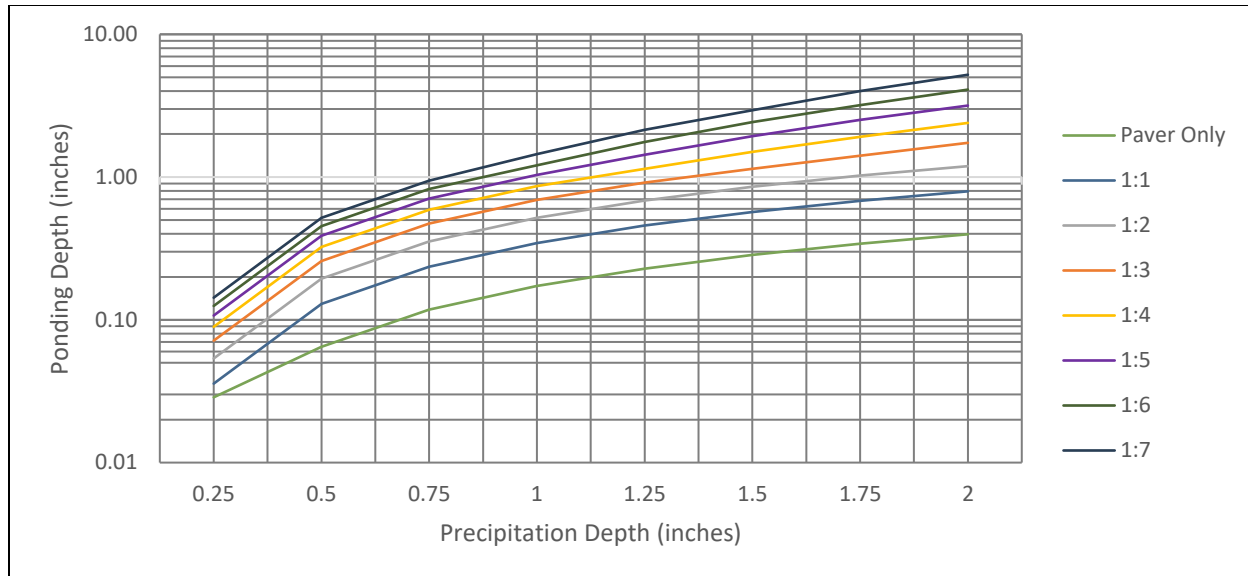


Figure 6. Ponding Depth from Single Event Model & Type 1A Design Storm

Construction

- As noted in the Results section under Flushing Test, the pH increased after infiltrating through the pavers. Increased pH can increase the toxicity of other pollutants, impacting aquatic organisms. For example, the toxicity of ammonia is 10 times more severe to fish at a pH of 8.5 than it is at a pH of 7.5 (Hunter, Kang, & Bundy, 2014). Consequently, there are recommendations for mitigating the impacts of concrete on the pH of water. Because freshly set concrete has high potential to increase pH and cause harm to aquatic species, it should be isolated to prevent discharges to water bodies until the curing process is complete. The amount of time it takes to reach this point is not well understood, but the California Department of Fish and Wildlife requires 30 days for Portland cement concrete (AASHTO, 2025). Additionally, a study done by the Maryland Department of Transportation demonstrated that surface washing may reduce the impact of cement on the pH of water (Hunter, Kang, & Bundy, 2014). The amount of time it takes and factors which may stabilize the pH between 6.5 and 9 (i.e. to meet EPA's Aquatic Life Criteria (US EPA, 1986)) should be evaluated in the field.

Maintenance Recommendations

Maintenance recommendations primarily focus on the maintenance frequency needed to support the 0.5 in/hr design infiltration rate. Additional considerations for field testing the pavers infiltration are also included.

Maintenance Frequency

Maintenance frequency to remove sediment is primarily a function of the sediment accumulation rate. Sediment on paved surfaces consists of solid particles that range in size from gravel to clay (Navickis-Brasch, Maurer, Harbeson, Ledebor, & Alvarez, 2025). The smaller sediment is regulated by the MS4 Permits, namely TSS. As such, this size (TSS) was the focus of the laboratory testing that was done for this study. Using data from the study along with information from a literature search, recommendations for street sweeping frequency were developed.



- Using the infiltration rate measured during the study and the TSS loading applied to the columns, a relationship between the change in infiltration rate and TSS loading was developed, as shown in **Figure 7**. This figure shows that the infiltration rate will drop to 0.5 in/hr when the TSS loading is about 5,100 mg.
- Average TSS concentrations in stormwater are often defined by land use. For example, the average TSS concentration from residential areas is 140 mg/L, whereas the average for commercial and industrial is 220 mg/L (Minton, 2011). Given this information, the TSS loading was estimated for residential areas (**Appendix D**) based on the amount of rainfall and contributing basin area ratio. For example, a paver with a 1:1 ratio of contributing area would reach 5,100 mg TSS after 31 inches of rainfall, whereas a 1:7 ratio would only take 7 inches of rainfall. This would be the minimum frequency for maintenance to restore the infiltration rate from TSS loading.
- Considering there are sediment sizes larger than TSS in street sediment, it is likely that maintenance will be needed more frequently to keep the paver infiltration rate above 0.5 in/hr. Additional research will be needed in the field to determine the minimum frequency.
- The Washington MS4 Permit recently implemented requirements for street sweeping that could also impact the maintenance frequency of pavers, as required sweeping may be sufficient to maintain the infiltration rate. Street sweeping is required three times per year in priority areas for the Phase II Permits and four times per year for the Phase I Permits (Washington State Department of Ecology, 2024).

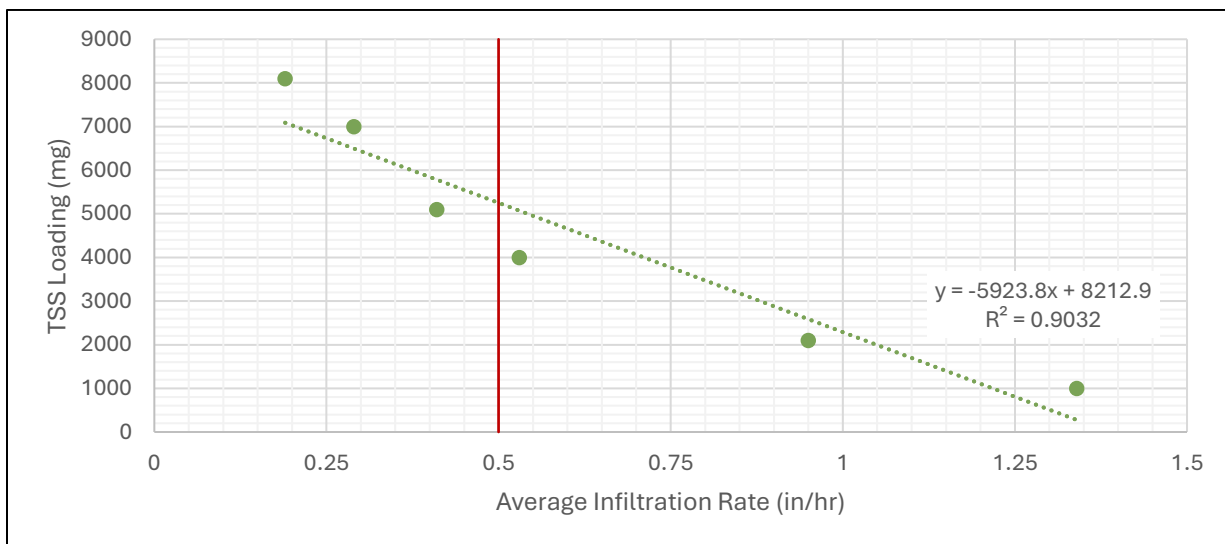


Figure 7. Pollutant Loading versus Average Infiltration Rate

Field Testing and Maintenance

- The volume of water used for prewetting following ASTM C1701 should be doubled to ensure the pavers are fully saturated before collecting infiltration rate data.
- A combination of vacuuming and pressure washing should be used to perform maintenance, remove TSS build-up on the surface, and unclog pores to restore the infiltration rate. During this study, care was taken not to break the seal around the pavers, which would not exist in the field. As such, more aggressive pressure washing could help to fully restore the infiltration rate and needs to be tested in the field to confirm. Alternatively, regenerative air or vacuum assisted street sweeping are efficient methods for removing fine

particles on road surfaces (Navickis-Brasch, Maurer, Harbeson, Ledeboer, & Alvarez, 2025). An evaluation of these sweepers to remove debris from Aquipor's pavers as a maintenance option should be evaluated during field testing.

- Researchers in the Spokane area noted the use of a 45-degree angle when spraying water to best dislodge debris from the surface while street cleaning. They also noted that if pavement is not regularly maintained, multiple (2 to 4) passes may be required to remove debris from pavement. These recommendations could apply to pressure washing and vacuuming street surfaces as described in this section and should be investigated to determine field maintenance best practices.



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APPENDIX A: EXPERIMENTAL DESIGN



To: Aquipor
From: Evergreen StormH2O
Date: August 15, 2025
Subject: Experimental Design

Purpose

The purpose of this experiment is to evaluate Aquipor's permeable pavers as a stormwater best management practice (BMP) in a laboratory setting. This will involve flow-through column testing of four permeable pavers to evaluate the design hydraulic loading rate (design infiltration rate) and treatment performance. Results from the study will be used to enter the pavers into the Technology Assessment Protocol – Ecology (TAPE) program and obtain a pilot use level designation (PULD) to conduct field testing.

Experimental Procedure

The steps below outline the experimental design for the project. An overview of each step is provided in the subsequent paragraphs. An appendix section has also been included for some steps that provide additional details.

- **Column Setup:** Assemble the test column as shown in Figures 1 and 2.
- **Flushing Test:** Use deionized water to flush the column and evaluate regulated pollutants, including TSS, dissolved copper (Cu), zinc (Zn), total phosphorus (TP), and oils.
- **Infiltration Rate Monitoring:** Measure infiltration rate before the first event and after every two events to determine the design infiltration rate and identify when maintenance is needed.
- **Synthetic Stormwater Testing:** Run eight simulated storm events using synthetic stormwater to measure TSS removal performance.
- **Natural Stormwater Testing:** Conduct one event using natural stormwater to evaluate the pavers' ability to reduce 6PPDQ.
- **Define Design and Maintenance Guidance:** Use study results to define guidance for field applications.

Step 1 – Column Setup

The purpose of step 1 will be to design and assemble the column setup for conducting the stormwater and infiltration rate testing. Figures 1 and 2 show the setup, which includes a water tank for mixing the influent stormwater solution that will be pumped to each paver with effluent samples collected in a 5-gallon bucket (one for each paver). Each paver will have an impermeable layer of plexiglass secured around the perimeter to contain stormwater over the paver. A wood flange will be attached to the plexiglass, which will support the paver over the buckets. Reference Appendix B for additional information on how the column setup will be constructed.

This step will also include measuring each of the pavers (Table 1) to determine the amount of each material needed to construct the test apparatus as well as the flow rate and volume of stormwater to distribute to each paver during testing events. The materials identified and purchased to construct the column setup are listed in

Appendix A.
Table 1. Paver Dimensions

| Paver Dimensions (inches) | | | |
|---------------------------|--------|-------|--------|
| Paver ID | Length | Width | Height |
| 1 | 5.75 | 6.25 | 2.4 |
| 2 | 6 | 5.75 | 2.4 |
| 3 | 6 | 6 | 2.4 |
| 4 | 5.75 | 5.75 | 2.4 |

Step 2 – Flushing Test

After the test apparatus has been constructed, a flushing event will be performed using deionized (DI) water. This test is required as part of the TAPE application to determine whether the pavers are leaching pollutants regulated by the Washington State National Pollutant Discharge Elimination System (NPDES) permit for owners of Municipal Separate Storm Sewer Systems (MS4) [MS4 Permit]. This test will be run by pouring DI water over each of the pavers. Then effluent samples from each paver will be submitted to the lab for analysis. See Appendix F for additional details.

Step 3 – Infiltration Rate Monitoring

The infiltration rate of the pavers will be determined following ASTM C1701. The first infiltration event will occur after the DI flushing event and repeated after every other storm event. The initial infiltration rate will be used to calculate the contributing basin area and estimate the limits of the influent flow rate to use during the simulated events. The changes in infiltration rate over the testing period will be used to determine when maintenance will be needed. Reference Appendix C for additional details regarding infiltration testing.

Step 4 – Synthetic Stormwater Testing

Eight simulated events will be run using synthetic stormwater. The synthetic solution will consist of tap water and Sil-Co-Sil 106, which is the industry standard for laboratory testing BMP treatment performance for total suspended solids (TSS). This process consists of the following three steps:

1. **Calculate the volume and flow rate of simulated stormwater:** The volume and flow rate of synthetic stormwater will first be estimated. The volume is the amount of stormwater that will be distributed to each paver during each testing event. The flow rate is the rate at which stormwater will be distributed to each paver. See Appendix D for additional details.
2. **Prepare simulated stormwater:** Five liters (5L) of tap water will be mixed with 5 grams of Sil-Co-Sil to create the synthetic stormwater. Five grams was selected to create a TSS concentration of 100mg/L of TSS, a benchmark for TSS concentration as defined in TAPE. The tap water and TSS will be mixed inside the water tank throughout the experiment to prevent the settling of solids. See Appendix E for additional details on the procedure outlined in this section.
3. **Perform TSS treatment performance testing to obtain influent and effluent samples:** Eight simulated storm events will be conducted. Testing will be divided into three groups, with the first two events occurring followed by an approximately three-week break, then

then the next 3 events occurring followed by another three-week break. Each grouping of events will occur back-to-back. The three-week break was added to allow time for the lab to analyze the samples and evaluate the data before beginning the next test.

Prior to each simulated event, one influent sample from the synthetic stormwater will be collected and submitted to the laboratory for analytical testing of TSS. The pump will be calibrated and set to the target flow rate to distribute synthetic stormwater over the center of the pavers until the targeted volume has been distributed to each paver. After the solution has been infiltrated through each paver, effluent samples will be collected from the bucket below the paver. See Appendix G for additional information on the procedure.

Step 5 – Natural Stormwater Testing

6PPDQ treatment testing will be completed using two pavers that are not being used for synthetic stormwater testing. Stormwater will be collected from a natural rainfall event where 6PPDQ has been measured in runoff from prior testing. The same procedures as outlined for synthetic stormwater testing (Step 4) will be followed. One influent and two effluent samples will be collected for this event and will be processed as described in Appendix H.

Step 6 - Define Design and Maintenance Guidance

Using study results, the design and maintenance guidance will be developed for field applications. This will include determining the amount of run-on that will be allowed from adjacent impermeable areas to the pavers along with the design infiltration rate. It is expected this decision will be a balance between how frequently maintenance is required compared to the amount of run-on allowed. Specifically, as the area of run-on increases, the pollutant loading (sediment) will also increase, and with more sediment loading, the faster the infiltration rate will decrease, which in turn increases the need for maintenance. Evergreen StormH2O will prepare a summary of results and scenarios between run-area and maintenance frequency and, in coordination with AquiPor Staff, will decide which guidance to proceed with for field applications.



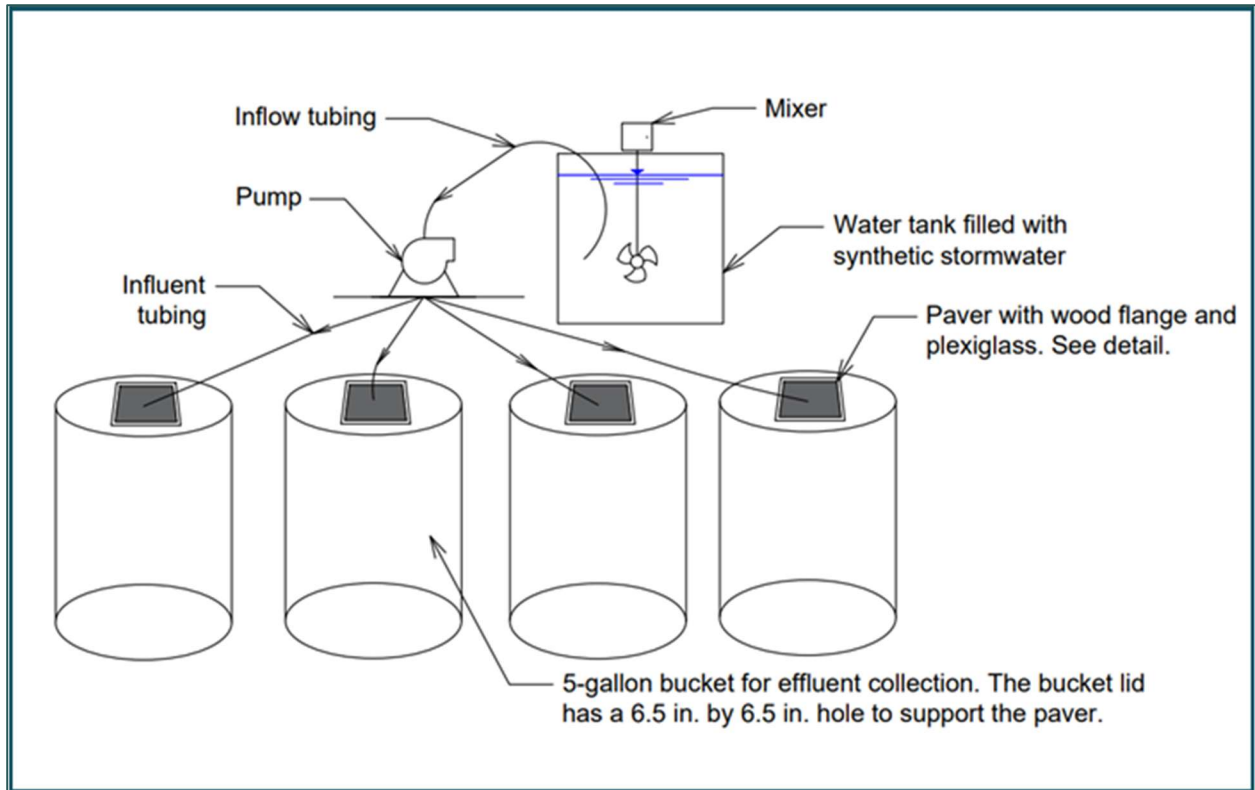


Figure 1. Column Testing Step-up for Simulated and Natural Stormwater Testing

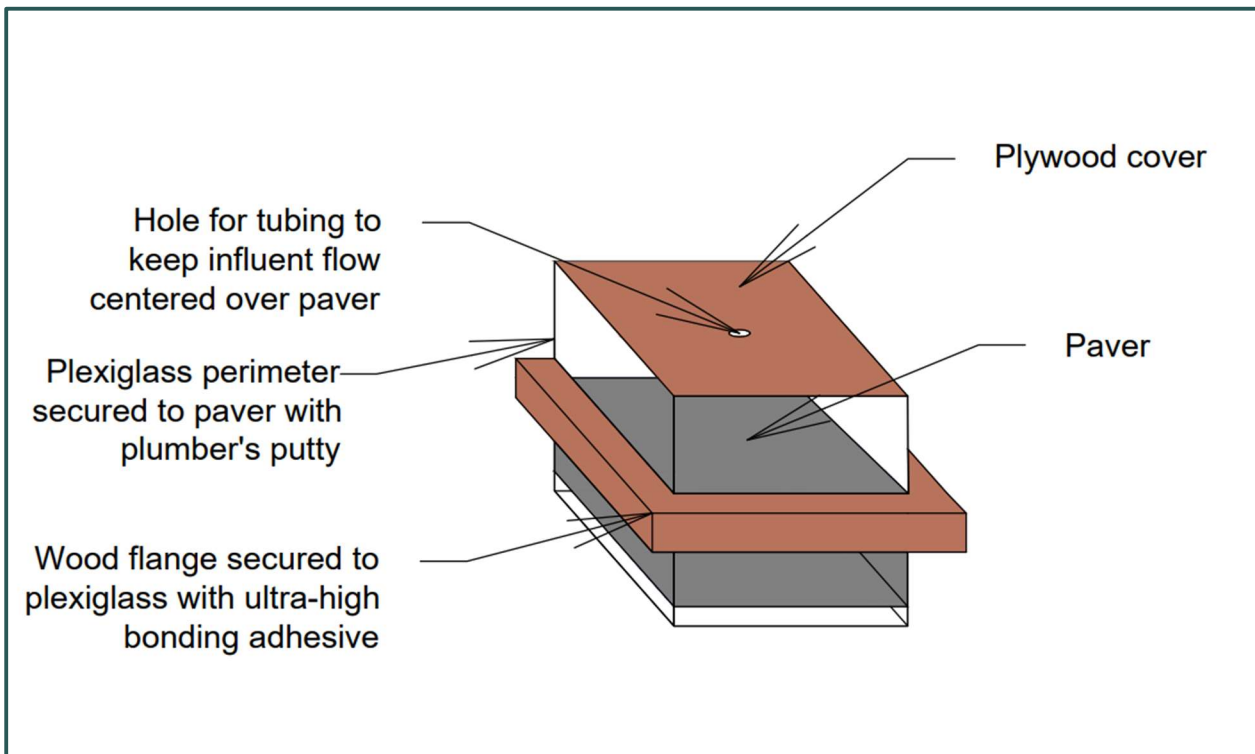


Figure 2. Paver With Supporting Elements for Securement During Testing

Appendix A

Materials List

- Pavers
- 1/16" plexiglass sheets
- Plumber's putty
- Adhesive caulk
- L/S 13 tubing
- L/S 14 tubing
- Masterflex L/S pump
- Water tank (fish tank)
- Mixer
- Graduated cylinder
- Stopwatch
- 5-gallon buckets
- 5-gallon bucket lids
- Ruler
- 2' x 2' plywood
- 1" x 2" wood boards
- 1 1/4" screws (#8 diameter)
- 1/2 inch width Ultra High Bond (UHB) tape
- Miscellaneous construction supplies
- Masking tape
- Lab supplies
- DI water
- Tap water
- Sil-Co-Sil 106

Appendix B

Construct Column Testing Apparatus

1. Prepare the pavers. Secure the permeable pavers with an impermeable layer to ensure that water is unable to escape out of the sides of the paver.
 - a. Measure and cut plexiglass sheets to secure around the outside of the paver. The plexiglass sheets will serve as an impermeable layer to contain water over the paver and prevent water from flowing out of the sides of the paver during testing. Each plexiglass sheet will match the length of the paver side and be 9 inches.
 - b. Use plumber's putty to secure plexiglass sheets on each 2.4-inch side of the paver. The plumber's putty will create an airtight seal between the paver and the plexiglass.
 - c. Assume a 0.5-inch overhang on the bottom of the paver, and an approximate height of 6 inches above the thickness of the paver. Secure a ruler with 1/16-inch markings to the outside of the plexiglass to keep track of the height of ponded water.
 - d. Apply adhesive caulk to the corners where the plexiglass sheets meet to seal the corners and provide additional protection against leakage.
2. After the impermeable layer has been secured, construct the test apparatus for testing pavers in duplicate. Four pavers will be set up for testing because two will be dedicated to the synthetic stormwater testing and two will be dedicated to the 6PPDQ testing.
 - a. Set four (4) five-gallon buckets in line where the pump tubing can reach all of them. Label each bucket to correspond with pavers 1 through 4.
 - b. Place the lid on each bucket.
 - c. Measure a square that is 6.5" x 6.5" on the lid of each bucket and mark it using a marker.
 - d. Cut out a 6.5" x 6.5" square using a jigsaw.
 - e. Secure a wood flange around the plexiglass to support it over the bucket. This will be done by securing 1" x 1" wood boards around the perimeter of the plexiglass structure (along the centerline of the paver) using 3M UHB tape strips. The wood boards should create a square around the plexiglass structure (see Figure 2).
 - f. Use 1 ¼" screws to screw the wood boards into each other around the paver. Pre-drill holes to avoid splitting the wood.
3. After the wood boards have been secured, set each paver into the hole cut into the lid of the bucket. The wood flanges will hold the paver in place, suspending it over the bucket for water to flow through.



Appendix C

Infiltration Testing

1. Perform a falling head infiltration test using ASTM C1701, which generally includes the following:
 - a. Conduct this test immediately following the flushing test to reduce the time required for prewetting as described in the next step.
 - b. Prewet the pavers by ponding water between 0.4 and 0.6 inches over the pavers to fill (saturate) the pore spaces. Once the water has completely infiltrated, start step c within two (2) minutes.
 - c. Pour water over the permeable paver to a depth of 0.4-0.6 inches. Note the weight of the water poured over each paver.
 - d. Use the stopwatch to determine the time to fall for each 1/8- or 1/16-inch increment until the water has completely infiltrated.
 - e. Calculate the infiltration rate from the falling head test.
 - f. Use the infiltration rate to calculate the flow in cfs and convert this value to mL/min (the units of flow used for the pump). The rate will be evaluated to estimate the contributing basin area and pollutant loading for the synthetic testing in Step 4 – Synthetic Stormwater Testing.
2. After all testing is completed, the infiltration rate will be graphed to determine the change over time using a regression analysis.



Appendix D

Calculate the Volume and Flow Rate of Synthetic Stormwater Needed

Volume

1. The infiltration rate from the falling head infiltration test will be reduced by 75% (to account for the reduction in infiltration expected to occur due to pollutant loading and before maintenance occurs). The reduced rate will be used to determine the contributing basin area (paver area plus runoff from adjacent impermeable areas) that can contribute to pavers without ponding during the water quality event.
2. Once the basin area is determined, the volume will be determined using a single event model with the short duration storm and precipitation depth from the water quality event (6-month 3-hour storm). This is the volume that will run through each paver during each simulated event.
3. Convert the stormwater volume to liters. Since the pavers are all slightly different sizes, the average volume will be distributed to each paver. See Table 2 for an example.

Table 2. Summary of Volume and TSS Calculations

| Summary of Volume and TSS Calculations | |
|--|------------|
| Paver ID | Volume (L) |
| 1 | 0.0128 |
| 2 | 0.0100 |
| 3 | 0.0123 |
| 4 | 0.0100 |
| Average | .01130 |

Flow Rate

1. The flow rate of synthetic stormwater that will be distributed to each paver during testing is a function of the rate of rainfall during the storm event and the rate of flow from the contributing basin area. The flow rate for testing will be determined by using the higher of these two rates.
 - a. The rate of rainfall will be determined using the peak rate of rainfall during the water quality event (6-month 3-hour storm) in Spokane, Washington.
 - b. The rate of contributing runoff will be determined using the same single event model as noted for the volume calculations.
 - c. Convert the flow rate to mL/min and set the pump to this flow rate. Since the pavers are all slightly different sizes, the average flow rate will be distributed to each paver.



Appendix E

Prepare the Stormwater for TSS Treatment Performance Testing

1. Assume a volume of approximately 5L of synthetic stormwater. This amount is greater than what will be applied to the pavers but will ensure that the water level of the tank is high enough that the pump can easily pump water. Multiply the 5L volume by 100mg/L to determine how much TSS should be added to the water.
2. Mark the outside of the tank with a marker at the elevation needed for 5L and the elevation the solution will be when the volume calculated from Table 2 has been distributed to the pavers.
3. Prepare the stormwater for the simulated events for the round of testing to evaluate the treatment performance for reducing TSS.
 - a. Measure 5L of tap water for the batch of synthetic stormwater.
 - b. Measure 500 mg (0.5g) of TSS for the batch of synthetic stormwater.
 - c. Place the tap water with 0.5g of TSS in the water tank with the mixer attached.
 - d. Turn on mixer for continuous mixing. This will continue throughout the simulated event to prevent solids from settling.
4. Proceed to Appendix G for next steps.



Appendix F

Flushing Test

1. Prior to the first infiltration test and simulated storm event, perform a flushing event using DI water and the two pavers that will be used for the synthetic stormwater testing.
 - a. Use a bucket to pour 3L of water over each paver. This volume will ensure there is enough effluent volume for the analysis of TSS, Dissolved Copper, Dissolved Zinc, Total Phosphorus, Oils, and Hardness. Control the pour so that water does not pond and overflow the plexiglass structure.
 - b. After the water has completely infiltrated, collect effluent samples from the buckets below each paver and follow the TAPE sample collection SOPs (see Appendix H). Label the sample bottle with the Paver Number and Flushing Event for identification purposes.
2. The effluent samples will be analyzed by the laboratory for TSS, Dissolved Copper, Dissolved Zinc, Total Phosphorus, Oils, and Hardness.



Appendix G

Conduct Simulated Storm Events

1. Conduct simulated storm events.
 - a. Place the Masterflex L/S pump with L/S 13/14 tubing attached on the table adjacent to the column testing structure and place the tubing that pulls water into the water tank.
 - b. Calibrate the pump per the manufacturer's instructions so the flow from each tube is less than 5% different.
 - c. Set the flow rate of the pump to the value (mL/min) (see Appendix C).
 - d. Collect one influent sample from the synthetic stormwater batch. This will be collected from the end of the two tubes that will distribute stormwater to each paver. Preserve and submit to the laboratory for analytical testing of TSS. Label the sample bottle with the Event Number for identification purposes.
 - e. Over the top of the plexiglass structure, lay a 6.5-inch x 6.5-inch piece of plywood with a hole drilled in the middle. Secure tubing to the inside of the hole using tape. In addition, secure the inflow tubing to the inside of the water reservoir where the simulated stormwater is being held/mixed. The water will be pumped from the tank to the inside of the plexiglass perimeter onto the paver.
 - f. Turn on the pump. Allow water to flow through the paver and into the collection bucket below until the water level has dropped to the pre-marked level described in Appendix E. When it has reached this level, turn off the pump. Throughout testing, note whether water is ponding.
 - g. After the water has completely infiltrated, take two (2) effluent samples from the water collected in the bucket below following the TAPE sample collection SOPs (see Appendix H). Label the sample bottle with the Paver and Simulated Storm Number for identification purposes.
 - h. Step 1 (a-g) for each of the eight (8) storm events. After the flushing event, and following every other simulated storm event, repeat the falling head infiltration test (see Appendix C).



Appendix H

Laboratory Sample Collection Procedures

Table X. DI Testing Sample Containers, Preservative, and Holding Times

| Parameter | Units | Method | Sample Container ¹ | Preservative | Pre-filtration Holding Time | Holding Time |
|-------------------------------|-------|-------------------------|-------------------------------|--|-----------------------------|----------------------|
| Total Suspended Solids (TSS) | mg/L | SM 2540D | P, FP, G; 1000mL | Cool, ≤ 6°C | N/A | 7 days |
| pH | std | EPA 150.2 | N/A | N/A | N/A | N/A |
| Dissolved Copper (Cu) | µg/L | EPA 200.8 (ICP/MS) | P, FP, G, 125mL | Cool, ≤ 6°C; filtration, 0.45 µm; HNO ₃ to pH < 2 | 12 hours | 6 months |
| Dissolved Zinc (Zn) | µg/L | EPA 200.8 (ICP/MS) | P, FP, G 125mL | Cool, ≤ 6°C; filtration, 0.45 µm; HNO ₃ to pH < 2 | 12 hours | 6 months |
| Hardness as CaCO ₃ | mg/L | SM 2340B (ICP) | P, FP, G 125mL | HNO ₃ pH < 2 | N/A | 6 months |
| Total Phosphorus (TP) | mg/L | SM 4500-P F | P, FP, G 44mL | Cool, ≤ 6°C; H ₂ SO ₄ to pH < 2 | N/A | 28 days |
| NWTPH-Dx | mg/L | EPA SW-846 Method 8015B | G | Cool, ≤ 6°C; HCl to pH < 2 | N/A | 14 days ² |

¹Sample container abbreviations: P – Polyethylene, G – glass, FP - fluoropolymer

² If preserved, the 14-day holding time applies. If unpreserved, the holding time is only 7 days (Ecology 1997).

Following is a summary of steps for collecting sample jars from the test site:

- Step 1: At least one (1) hour prior to transferring samples to the sample container, place sample bottles in a plastic bag within the freezer to cool the bottles.
- Step 2: Transfer samples to the sample bottles specified and provided by the laboratory and store the samples in the refrigerator to reduce the temperature to 6°C.
- Step 3: Fill out the Chain of Custody form for the samples.
- Step 4: Place the filled laboratory bottles in the plastic bags provided by the lab and place the plastic bag(s) in the ice bath within the cooler to keep samples at or below 6°C.
- Step 5: Transport the samples to the laboratory. If samples have been collected after laboratory hours, filter, preserve, and keep samples below 6°C in a cooler or refrigerator until the laboratory reopens the next business day. Ship the NWTPH-Dx samples to Anatek Labs in Moscow, Idaho, and the 6PPDQ samples to Manchester Environmental Laboratory in Port Orchard, Washington. Deliver all other samples to Anatek Labs in Spokane, Washington. Keep samples below 6°C and ship in ice and protective packaging.

Note: 6PPDQ samples must be collected in a glass container. To do this, place a glass funnel on the glass sample jar provided by the lab and located in the center of the effluent bucket to collect samples during the natural stormwater testing.



APPENDIX B: DEVIATIONS FROM EXPERIMENTAL DESIGN



There were some deviations from the procedures in Experimental Design ([Appendix A](#)), and in most cases this occurred to better fit the needs of the experiment.

Experimental Design: Column Set Up

- Adhesive caulk was used to secure plexiglass to outside of paver in place of UHM tape. The adhesive caulk was also used to create a seal in addition to plumber's putty.
- 2 pavers were tested in duplicate.

Infiltration Testing

There were three primary changes to the infiltration testing procedure related to prewetting, the number of tests conducted, and the maintenance required to restore infiltration rates. More details about these changes are described below.

- The amount of water used for prewetting was doubled after the first three initial tests to stabilize the infiltration rate. Reference the [Infiltration Rate Monitoring](#) Section for more details.
- More infiltration tests were conducted than were planned for. After the prewetting volume was doubled, the infiltration rate stabilized and seven additional tests were performed. One additional test was performed on the paver used for 6PPDQ testing, making a total of 8 infiltration tests after the prewetting volume was doubled.
- Over time, the infiltration rate of the pavers decreased significantly (see [Infiltration Rate Monitoring](#) Section) and TSS build-up was visible on the surface of the pavers. As a result, maintenance was attempted to restore the infiltration rate.
- Maintenance consisted of simulating conditions similar to what would be expected in the field using a vacuum sweeper and pressure washing while also protecting the column setup from damage. This consisted of using a shop vac with a brush head attachment in circular motions to clear off the surface of the paver while vacuuming debris off the paver, followed by pouring water over the surface of the paver to flush the pores while holding the vacuum close to loosen and remove TSS. Next, the head of the vacuum hose (no brush attachment) was used to remove debris by holding the nozzle in place for 30–45 seconds at each location. Then, the flushing process was repeated. Finally, a pump-pressurized weed sprayer was used to simulate a pressure washer while simultaneously vacuuming the surface.

Simulated Events

Three major changes were made to the procedure for simulated events related to the amount of simulated stormwater mixed and distributed for testing, the concentration of TSS, the test apparatus for 6PPDQ, and allowed ponding during the simulated storm. More details about these changes are below.

- Approximately 27 liters of simulated stormwater were produced, with a target concentration of 100mg/L. The larger volume was used to ensure there was a sufficient volume of water in the tank to be mixed using the automatic mixer as described in the experimental design. For the first two simulated events, 2.7 grams of Sil-co-Sil were added to the 27 liters of tap water to hit the target concentration of 100mg/L. However, the influent concentration was measuring significantly lower than 100mg/L so the amount of Sil-co-Sil was increased to 300 mg/L. Based on the experience of the principal investigator, this was most likely due to the mixer keeping the TSS suspended and preventing it from being pumped for sample collection because the pump inlet is at the bottom of the tank. To



address this, the TSS concentration was tripled for the remaining simulated events, and 9.7 liters of water were distributed between the two pavers.

- The test apparatus for the testing of 6PPDQ removal efficiency was modified to reduce the potential for interference with the sealant used around the edges of the paver. This included setting the paver atop a glass bowl and then pouring the stormwater solution through a glass cylinder that was sealed around the exterior edges of the cylinder to the paver using plumber's putty.
- Ponding was allowed above the 10–15mm due to time/resources and a slower infiltration rate.



APPENDIX C: FULL RESULTS



Table 4. DI Flush pH Results

| Sample | pH Test 1 | pH Test 2 | pH Test 3 | pH Test 4 |
|---------------------|-----------|-----------|-----------|-----------|
| Influent pH | 7.9 | 8.03 | 7.24 | 7.9 |
| Paver 1 Effluent pH | 7.9 | 10.6 | 10.9 | 9.9 |
| Paver 4 Effluent pH | 7.8 | 10.5 | 10.9 | 10.6 |
| Average Effluent pH | 7.9 | 10.6 | 10.9 | 10.3 |

Table 5. TSS Treatment Performance All Data

| Simulated Storm Number | Influent Concentration (mg/L) ^a | | | Effluent Concentration (mg/L) | | | Removal Efficiency (%) | | |
|------------------------|--|----------|---------|-------------------------------|---------|---------|------------------------|---------|---------|
| | Sample 1 | Sample 2 | Average | Paver 2 | Paver 3 | Average | Paver 2 | Paver 3 | Average |
| 1 ^b | 33.6 | 0.2 | 16.9 | 0.7 | 13.6 | 7.2 | 95.9 | 19.5 | 57.7 |
| 2 ^b | 33.6 | 0.2 | 16.9 | 0.7 | 20 | 10.4 | 79.1 | -457.0 | -189.0 |
| 3 | 74.5 | 214 | 144.3 | 4.12 | 1.75 | 2.9 | 97.2 | 98.8 | 98.0 |
| 4 | 123 | 104 | 113.5 | 3.7 | 4.6 | 4.2 | 96.7 | 95.9 | 96.3 |
| 5 | 57.6 | 111 | 84.3 | 4.4 | 2.6 | 3.5 | 94.8 | 96.9 | 95.9 |
| 6 | 77.1 | 109 | 93.1 | 1.3 | 0.9 | 1.1 | 98.6 | 99.0 | 98.8 |
| 7 | 74.5 | 200 | 137.3 | 3.7 | 3.2 | 3.5 | 97.3 | 97.7 | 97.5 |
| 8 | 106 | 87.9 | 97.0 | 3.1 | 3.4 | 3.3 | 96.8 | 96.5 | 96.7 |
| 9 | 135 | 109 | 122 | 2.6 | 17 | 9.8 | 97.9 | 86.1 | 92.0 |
| 10 | 106 | 123 | 114.5 | 1 | 0.9 | 1.0 | 99.1 | 99.2 | 99.2 |
| Tests #3-10 Average | 113.2 | | | 3.0 | 4.3 | 3.6 | 97.3 | 96.3 | 96.8 |

^aThe concentration of TSS added to the solution was 100 mg/L for simulated storms #1-2 and 300 mg/L for the remaining simulated storms.

^bThe results from the first two events were not included in the average because of problems with pulling an accurate influent sample as described in the Simulated Events section of [Appendix B](#).



Table 6. Infiltration Testing Results

| Infiltration Test Number | Paver 2 Infiltration Rate (in/hr) | Paver 3 Infiltration Rate (in/hr) | Average Infiltration Rate (in/hr) |
|--------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| 1 ^a | 0.74 | 0.97 | 0.86 |
| 2 ^a | 1.09 | 1.62 | 1.36 |
| 3 ^a | 2.49 | 3.67 | 3.08 |
| 4 | 1.19 | 1.58 | 1.39 |
| 5 | 1.1 | 1.57 | 1.34 |
| 6 | 0.39 | 0.67 | 0.53 |
| 7 | 0.15 | 0.44 | 0.29 |
| 8 ^b | - | 0.98 | - |
| 9 | 0.92 | 0.99 | 0.95 |
| 10 | 0.35 | 0.47 | 0.41 |
| 11 | 0.14 | 0.24 | 0.19 |

^aPrewetting volume was doubled after Tests #1–3.

^bInfiltration Test #8 was done on the paver that was only used for 6PPDQ testing.



APPENDIX D: MAINTENANCE TABLES



Table 7. TSS Accumulation for Residential Areas

| Rainfall Depth (in) | Contributing Basin Area | | | | | | | |
|---------------------|---|------|------|-------|-------|-------|-------|-------|
| | Paver Only | 1:1 | 1:2 | 1:3 | 1:4 | 1:5 | 1:6 | 1:7 |
| | TSS Loading (mg) assuming 140mg/L concentration | | | | | | | |
| 1 | 83 | 165 | 248 | 330 | 413 | 496 | 578 | 661 |
| 2 | 165 | 330 | 496 | 661 | 826 | 991 | 1156 | 1321 |
| 3 | 248 | 496 | 743 | 991 | 1239 | 1487 | 1734 | 1982 |
| 4 | 330 | 661 | 991 | 1321 | 1652 | 1982 | 2313 | 2643 |
| 5 | 413 | 826 | 1239 | 1652 | 2065 | 2478 | 2891 | 3304 |
| 6 | 496 | 991 | 1487 | 1982 | 2478 | 2973 | 3469 | 3964 |
| 7 | 578 | 1156 | 1734 | 2313 | 2891 | 3469 | 4047 | 4625 |
| 8 | 661 | 1321 | 1982 | 2643 | 3304 | 3964 | 4625 | 5286 |
| 9 | 743 | 1487 | 2230 | 2973 | 3717 | 4460 | 5203 | 5947 |
| 10 | 826 | 1652 | 2478 | 3304 | 4130 | 4955 | 5781 | 6607 |
| 11 | 909 | 1817 | 2726 | 3634 | 4543 | 5451 | 6360 | 7268 |
| 12 | 991 | 1982 | 2973 | 3964 | 4955 | 5947 | 6938 | 7929 |
| 13 | 1074 | 2147 | 3221 | 4295 | 5368 | 6442 | 7516 | 8589 |
| 14 | 1156 | 2313 | 3469 | 4625 | 5781 | 6938 | 8094 | 9250 |
| 15 | 1239 | 2478 | 3717 | 4955 | 6194 | 7433 | 8672 | 9911 |
| 16 | 1321 | 2643 | 3964 | 5286 | 6607 | 7929 | 9250 | 10572 |
| 17 | 1404 | 2808 | 4212 | 5616 | 7020 | 8424 | 9828 | 11232 |
| 18 | 1487 | 2973 | 4460 | 5947 | 7433 | 8920 | 10406 | 11893 |
| 19 | 1569 | 3138 | 4708 | 6277 | 7846 | 9415 | 10985 | 12554 |
| 20 | 1652 | 3304 | 4955 | 6607 | 8259 | 9911 | 11563 | 13215 |
| 21 | 1734 | 3469 | 5203 | 6938 | 8672 | 10406 | 12141 | 13875 |
| 22 | 1817 | 3634 | 5451 | 7268 | 9085 | 10902 | 12719 | 14536 |
| 23 | 1900 | 3799 | 5699 | 7598 | 9498 | 11398 | 13297 | 15197 |
| 24 | 1982 | 3964 | 5947 | 7929 | 9911 | 11893 | 13875 | 15858 |
| 25 | 2065 | 4130 | 6194 | 8259 | 10324 | 12389 | 14453 | 16518 |
| 26 | 2147 | 4295 | 6442 | 8589 | 10737 | 12884 | 15032 | 17179 |
| 27 | 2230 | 4460 | 6690 | 8920 | 11150 | 13380 | 15610 | 17840 |
| 28 | 2313 | 4625 | 6938 | 9250 | 11563 | 13875 | 16188 | 18500 |
| 29 | 2395 | 4790 | 7185 | 9581 | 11976 | 14371 | 16766 | 19161 |
| 30 | 2478 | 4955 | 7433 | 9911 | 12389 | 14866 | 17344 | 19822 |
| 31 | 2560 | 5121 | 7681 | 10241 | 12802 | 15362 | 17922 | 20483 |
| 32 | 2643 | 5286 | 7929 | 10572 | 13215 | 15858 | 18500 | 21143 |
| 33 | 2726 | 5451 | 8177 | 10902 | 13628 | 16353 | 19079 | 21804 |
| 34 | 2808 | 5616 | 8424 | 11232 | 14041 | 16849 | 19657 | 22465 |
| 35 | 2891 | 5781 | 8672 | 11563 | 14453 | 17344 | 20235 | 23126 |
| 36 | 2973 | 5947 | 8920 | 11893 | 14866 | 17840 | 20813 | 23786 |



| | | | | | | | | |
|----|------|------|-------|-------|-------|-------|-------|-------|
| 37 | 3056 | 6112 | 9168 | 12224 | 15279 | 18335 | 21391 | 24447 |
| 38 | 3138 | 6277 | 9415 | 12554 | 15692 | 18831 | 21969 | 25108 |
| 39 | 3221 | 6442 | 9663 | 12884 | 16105 | 19326 | 22547 | 25768 |
| 40 | 3304 | 6607 | 9911 | 13215 | 16518 | 19822 | 23126 | 26429 |
| 41 | 3386 | 6772 | 10159 | 13545 | 16931 | 20317 | 23704 | 27090 |
| 42 | 3469 | 6938 | 10406 | 13875 | 17344 | 20813 | 24282 | 27751 |
| 43 | 3551 | 7103 | 10654 | 14206 | 17757 | 21309 | 24860 | 28411 |
| 44 | 3634 | 7268 | 10902 | 14536 | 18170 | 21804 | 25438 | 29072 |
| 45 | 3717 | 7433 | 11150 | 14866 | 18583 | 22300 | 26016 | 29733 |
| 46 | 3799 | 7598 | 11398 | 15197 | 18996 | 22795 | 26594 | 30394 |
| 47 | 3882 | 7764 | 11645 | 15527 | 19409 | 23291 | 27173 | 31054 |
| 48 | 3964 | 7929 | 11893 | 15858 | 19822 | 23786 | 27751 | 31715 |
| 49 | 4047 | 8094 | 12141 | 16188 | 20235 | 24282 | 28329 | 32376 |
| 50 | 4130 | 8259 | 12389 | 16518 | 20648 | 24777 | 28907 | 33037 |
| 51 | 4212 | 8424 | 12636 | 16849 | 21061 | 25273 | 29485 | 33697 |
| 52 | 4295 | 8589 | 12884 | 17179 | 21474 | 25768 | 30063 | 34358 |
| 53 | 4377 | 8755 | 13132 | 17509 | 21887 | 26264 | 30641 | 35019 |
| 54 | 4460 | 8920 | 13380 | 17840 | 22300 | 26760 | 31219 | 35679 |
| 55 | 4543 | 9085 | 13628 | 18170 | 22713 | 27255 | 31798 | 36340 |
| 56 | 4625 | 9250 | 13875 | 18500 | 23126 | 27751 | 32376 | 37001 |
| 57 | 4708 | 9415 | 14123 | 18831 | 23539 | 28246 | 32954 | 37662 |
| 58 | 4790 | 9581 | 14371 | 19161 | 23951 | 28742 | 33532 | 38322 |
| 59 | 4873 | 9746 | 14619 | 19492 | 24364 | 29237 | 34110 | 38983 |
| 60 | 4955 | 9911 | 14866 | 19822 | 24777 | 29733 | 34688 | 39644 |

Note: For commercial and industrial areas, multiply the TSS loading by 1.57.



APPENDIX E: ANALYTIC TESTING RESULTS



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Client: Evergreen StormH20
Address: P.O. Box 18912
Spokane, WA 99228
Attn: Aimee Navickis-Brash

Work Order: WFI1180
Project: Permeable Paver
Reported: 10/9/2025 18:40

Analytical Results Report

Sample Location: P1D120250924
Lab/Sample Number: WFI1180-01 **Collect Date:** 09/24/25 11:30
Date Received: 09/24/25 13:12 **Collected By:** Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------------------------|---------|------------|---------|---------------|---------|-------------|-----------|
| Inorganics | | | | | | | |
| Hardness | 421 | mg CaCO3/L | 6.00 | 10/3/25 7:40 | JCG | SM 2340 C | |
| Total Phosphorus (PO4 + Org P) as P | 0.0357 | mg/L | 0.00500 | 10/8/25 15:28 | AAI | SM 4500-P H | |
| TSS | 4.50 | mg/L | 0.0100 | 9/26/25 11:00 | KSG | SM 2540 D | |
| Metals by ICP-MS | | | | | | | |
| Dissolved Copper | 0.00319 | mg/L | 0.00100 | 9/29/25 16:25 | JLG | EPA 200.8 | |
| Dissolved Zinc | 0.0213 | mg/L | 0.00100 | 9/29/25 16:25 | JLG | EPA 200.8 | |

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Sample Location: P4D120250924
Lab/Sample Number: WFI1180-02 Collect Date: 09/24/25 11:30
Date Received: 09/24/25 13:12 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|---|---------|-------------------------|---------|---------------|---------|-------------|-----------|
| Inorganics | | | | | | | |
| Hardness | 357 | mg CaCO ₃ /L | 6.00 | 10/3/25 7:40 | JCG | SM 2340 C | |
| Total Phosphorus (PO ₄ + Org P) as P | 0.0528 | mg/L | 0.00500 | 10/8/25 15:29 | AAI | SM 4500-P H | |
| TSS | 4.55 | mg/L | 0.0101 | 9/26/25 11:00 | KSG | SM 2540 D | |
| Metals by ICP-MS | | | | | | | |
| Dissolved Copper | 0.00474 | mg/L | 0.00100 | 9/29/25 16:29 | JLG | EPA 200.8 | |
| Dissolved Zinc | 0.0156 | mg/L | 0.00100 | 9/29/25 16:29 | JLG | EPA 200.8 | |

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Client: Evergreen StormH20
Address: P.O. Box 18912
Spokane, WA 99228
Attn: Aimee Navickis-Brash

Work Order: MFJ0091
Project: Permeable Pavement
Reported: 10/14/2025 10:23

Analytical Results Report

Sample Location: P1D12020924
Lab/Sample Number: MFJ0091-01 **Collect Date:** 09/24/25 11:25
Date Received: 10/02/25 11:56 **Collected By:** Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|------------------------------|-------------|-------|---------------|----------------------|------------|-----------------|-----------|
| Semivolatiles | | | | | | | |
| Diesel | 0.752 | mg/L | 0.105 | 10/7/25 20:08 | JBC | NWTPH-Dx | |
| Lube Oil | ND | mg/L | 0.421 | 10/7/25 20:08 | JBC | NWTPH-Dx | |
| ----- | | | | | | | |
| <i>Surrogate: Hexacosane</i> | <i>108%</i> | | <i>50-150</i> | <i>10/7/25 20:08</i> | <i>JBC</i> | <i>NWTPH-Dx</i> | |

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Sample Location: P4D12020924
Lab/Sample Number: MFJ0091-02 Collect Date: 09/24/25 11:45
Date Received: 10/02/25 11:56 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|------------------------------|-------------|-------|---------------|----------------------|------------|-----------------|-----------|
| Semivolatiles | | | | | | | |
| Diesel | 1.06 | mg/L | 0.112 | 10/7/25 20:42 | JBC | NWTPH-Dx | |
| Lube Oil | ND | mg/L | 0.446 | 10/7/25 20:42 | JBC | NWTPH-Dx | |
| <i>Surrogate: Hexacosane</i> | <i>108%</i> | | <i>50-150</i> | <i>10/7/25 20:42</i> | <i>JBC</i> | <i>NWTPH-Dx</i> | |

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Client: Evergreen StormH20
Address: P.O. Box 18912
Spokane, WA 99228
Attn: Aimee Navickis-Brash

Work Order: WFI1315
Project: Permeable Pavement
Reported: 10/6/2025 16:14

Analytical Results Report

Sample Location: P2P3SS120250925-IN
Lab/Sample Number: WFI1315-01 **Collect Date:** 09/25/25 09:00
Date Received: 09/26/25 14:18 **Collected By:** Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|---------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 33.6 | mg/L | 0.0100 | 9/30/25 10:59 | KSG | SM 2540 D | |

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Sample Location: P2P3SS120250925-IN2
Lab/Sample Number: WFI1315-02 Collect Date: 09/25/25 13:00
Date Received: 09/26/25 14:18 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|---------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 0.200 | mg/L | 0.0100 | 9/30/25 10:59 | KSG | SM 2540 D | E10 |

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Sample Location: P2SS1202509
Lab/Sample Number: WFI1315-03 Collect Date: 09/26/25 07:00
Date Received: 09/26/25 14:18 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|---------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 0.700 | mg/L | 0.0100 | 9/30/25 10:59 | KSG | SM 2540 D | E10 |

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Sample Location: P3SS1202509
Lab/Sample Number: WFI1315-04 Collect Date: 09/26/25 07:00
Date Received: 09/26/25 14:18 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|---------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 13.6 | mg/L | 0.0100 | 9/30/25 10:59 | KSG | SM 2540 D | |

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Sample Location: P2P3SS220250926-IN
Lab/Sample Number: WFI1315-05 Collect Date: 09/26/25 07:45
Date Received: 09/26/25 14:18 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|---------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 5.40 | mg/L | 0.0100 | 9/30/25 10:59 | KSG | SM 2540 D | |

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Sample Location: P2P3SS220250926-IN2
Lab/Sample Number: WFI1315-06 Collect Date: 09/26/25 12:00
Date Received: 09/26/25 14:18 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|---------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 1.30 | mg/L | 0.0100 | 9/30/25 10:59 | KSG | SM 2540 D | E10 |

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Sample Location: P2SS2202509
Lab/Sample Number: WFI1315-07 Collect Date: 09/26/25 11:30
Date Received: 09/26/25 14:18 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|---------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 0.700 | mg/L | 0.0100 | 9/30/25 10:59 | KSG | SM 2540 D | E10 |

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Sample Location: P3SS2202509
Lab/Sample Number: WFI1315-08 Collect Date: 09/26/25 11:30
Date Received: 09/26/25 14:18 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|---------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 20.0 | mg/L | 0.0100 | 9/30/25 10:59 | KSG | SM 2540 D | |

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Client: Evergreen StormH20
Address: P.O. Box 18912
Spokane, WA 99228
Attn: Aimee Navickis-Brash

Work Order: WFJ1233
Project: Non-Vegetative Biorention TAPE
Reported: 11/10/2025 10:39

Analytical Results Report

Sample Location: P2P3SS320251024
Lab/Sample Number: WFJ1233-01 **Collect Date:** 10/24/25 09:00
Date Received: 10/28/25 14:49 **Collected By:** Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|----------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 74.5 | mg/L | 0.0250 | 10/30/25 11:36 | KSG | SM 2540 D | |

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Sample Location: P2P3SS320251024-2
Lab/Sample Number: WFJ1233-02 Collect Date: 10/24/25 10:30
Date Received: 10/28/25 14:49 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|----------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 214 | mg/L | 0.0667 | 10/30/25 11:36 | KSG | SM 2540 D | |

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Sample Location: P2SS3202510
Lab/Sample Number: WFJ1233-03 Collect Date: 10/25/25 11:00
Date Received: 10/28/25 14:49 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|----------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 4.12 | mg/L | 0.0125 | 10/30/25 11:36 | KSG | SM 2540 D | |

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Sample Location: P3SS3202510
Lab/Sample Number: WFJ1233-04 Collect Date: 10/25/25 11:00
Date Received: 10/28/25 14:49 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|----------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 1.75 | mg/L | 0.0125 | 10/30/25 11:36 | KSG | SM 2540 D | E10 |

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Sample Location: P2P3SS420251027
Lab/Sample Number: WFJ1233-05 Collect Date: 10/27/25 13:00
Date Received: 10/28/25 14:49 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|---------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 123 | mg/L | 0.0250 | 11/3/25 14:48 | KSG | SM 2540 D | |

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Sample Location: P2P3SS420251027-2
Lab/Sample Number: WFJ1233-06 Collect Date: 10/27/25 14:30
Date Received: 10/28/25 14:49 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|---------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 104 | mg/L | 0.0250 | 11/3/25 14:48 | KSG | SM 2540 D | |

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Sample Location: P2SS420251027
Lab/Sample Number: WFJ1233-07 Collect Date: 10/27/25 20:00
Date Received: 10/28/25 14:49 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|---------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 3.70 | mg/L | 0.0100 | 11/3/25 14:48 | KSG | SM 2540 D | |

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Sample Location: P3SS420251027
Lab/Sample Number: WFJ1233-08 Collect Date: 10/27/25 20:00
Date Received: 10/28/25 14:49 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|----------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 4.60 | mg/L | 0.0200 | 10/31/25 15:00 | KSG | SM 2540 D | E10 |

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504 E Sprague Ste. D - Spokane, WA 99202 - (509) 838-3999 - email spokane@anateklabs.com

Client: Evergreen StormH20
Address: P.O. Box 18912
Spokane, WA 99228
Attn: Aimee Navickis-Brash

Work Order: WFK0551
Project: TSS
Reported: 11/29/2025 20:12

Analytical Results Report

Sample Location: P2P3SS520251113
Lab/Sample Number: WFK0551-01 **Collect Date:** 11/13/25 10:46
Date Received: 11/14/25 14:26 **Collected By:** Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|----------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 57.6 | mg/L | 0.0100 | 11/20/25 10:30 | KSG | SM 2540 D | |

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Sample Location: P2P3SS520251113 - 2
Lab/Sample Number: WFK0551-02 Collect Date: 11/13/25 13:42
Date Received: 11/14/25 14:26 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|----------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 111 | mg/L | 0.0100 | 11/20/25 10:30 | KSG | SM 2540 D | |

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Sample Location: P2SS520251113
Lab/Sample Number: WFK0551-03 Collect Date: 11/13/25 08:10
Date Received: 11/14/25 14:26 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|----------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 4.40 | mg/L | 0.0100 | 11/20/25 10:30 | KSG | SM 2540 D | |

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Sample Location: P3SS520251113
Lab/Sample Number: WFK0551-04 Collect Date: 11/13/25 08:15
Date Received: 11/14/25 14:26 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|----------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 2.60 | mg/L | 0.0100 | 11/20/25 10:30 | KSG | SM 2540 D | |

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Client: Evergreen StormH20
Address: P.O. Box 18912
Spokane, WA 99228
Attn: Aimee Navickis-Brash

Work Order: WFK0595
Project: Permeable Pavement
Reported: 11/29/2025 20:30

Analytical Results Report

Sample Location: P2P3SS620251114
Lab/Sample Number: WFK0595-01 **Collect Date:** 11/14/25 07:15
Date Received: 11/17/25 15:18 **Collected By:** Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|----------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 77.1 | mg/L | 0.0153 | 11/20/25 10:30 | KSG | SM 2540 D | |

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Sample Location: P2P3SS620251114-2
Lab/Sample Number: WFK0595-02 Collect Date: 11/14/25 10:20
Date Received: 11/17/25 15:18 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|----------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 109 | mg/L | 0.0167 | 11/20/25 10:30 | KSG | SM 2540 D | |

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Sample Location: P2SS620251114
Lab/Sample Number: WFK0595-03 Collect Date: 11/15/25 11:30
Date Received: 11/17/25 15:18 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|----------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 1.30 | mg/L | 0.0100 | 11/21/25 11:23 | KSG | SM 2540 D | E10 |

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Sample Location: P3SS620251114
Lab/Sample Number: WFK0595-04 Collect Date: 11/15/25 11:30
Date Received: 11/17/25 15:18 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|--------|----------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 0.900 | mg/L | 0.0100 | 11/21/25 11:23 | KSG | SM 2540 D | E10 |

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504 E Sprague Ste. D - Spokane, WA 99202 - (509) 838-3999 - email spokane@anateklabs.com

Client: Evergreen StormH20
Address: P.O. Box 18912
Spokane, WA 99228
Attn: Aimee Navickis-Brash

Work Order: WGA0221
Project: Permeable Pavement
Reported: 1/15/2026 09:03

Analytical Results Report

Sample Location: P2P3SS720260106
Lab/Sample Number: WGA0221-01 **Collect Date:** 01/06/26 00:00
Date Received: 01/08/26 08:38 **Collected By:** Aimee Navickis-Brash
Matrix: Wastewater

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|-------|--------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 74.5 | mg/L | 0.100 | 1/8/26 12:00 | KAS | SM 2540 D | |

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Sample Location: P2P3SS720260106-02
Lab/Sample Number: WGA0221-02 Collect Date: 01/06/26 00:00
Date Received: 01/08/26 08:38 Collected By: Aimee Navickis-Brash
Matrix: Wastewater

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|-------|--------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 200 | mg/L | 0.100 | 1/8/26 12:00 | KAS | SM 2540 D | |

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Sample Location: P2SS720260106
Lab/Sample Number: WGA0221-03 Collect Date: 01/07/26 00:00
Date Received: 01/08/26 08:38 Collected By: Aimee Navickis-Brash
Matrix: Wastewater

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|-------|--------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 3.70 | mg/L | 0.100 | 1/8/26 12:00 | KAS | SM 2540 D | |

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Sample Location: P3SS720260106
Lab/Sample Number: WGA0221-04 Collect Date: 01/07/26 00:00
Date Received: 01/08/26 08:38 Collected By: Aimee Navickis-Brash
Matrix: Wastewater

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|-------|--------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 3.20 | mg/L | 0.100 | 1/8/26 12:00 | KAS | SM 2540 D | |

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Sample Location: P2P3SS820260107
Lab/Sample Number: WGA0221-05 Collect Date: 01/07/26 00:00
Date Received: 01/08/26 08:38 Collected By: Aimee Navickis-Brash
Matrix: Wastewater

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|-------|--------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 106 | mg/L | 0.100 | 1/8/26 12:00 | KAS | SM 2540 D | |

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Sample Location: P2P3SS820260107-2
Lab/Sample Number: WGA0221-06 Collect Date: 01/07/26 00:00
Date Received: 01/08/26 08:38 Collected By: Aimee Navickis-Brash
Matrix: Wastewater

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|-------|--------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 87.9 | mg/L | 0.100 | 1/8/26 12:00 | KAS | SM 2540 D | |

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Sample Location: P2SS820260107
Lab/Sample Number: WGA0221-07 Collect Date: 01/08/26 00:00
Date Received: 01/08/26 08:38 Collected By: Aimee Navickis-Brash
Matrix: Wastewater

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|-------|--------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 3.10 | mg/L | 0.100 | 1/8/26 12:00 | KAS | SM 2540 D | |

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Sample Location: P3SS820260107
Lab/Sample Number: WGA0221-08 Collect Date: 01/08/26 00:00
Date Received: 01/08/26 08:38 Collected By: Aimee Navickis-Brash
Matrix: Wastewater

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|-------|--------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 3.40 | mg/L | 0.100 | 1/8/26 12:00 | KAS | SM 2540 D | |

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504 E Sprague Ste. D - Spokane, WA 99202 - (509) 838-3999 - email spokane@anateklabs.com

Client: Evergreen StormH20
Address: P.O. Box 18912
Spokane, WA 99228
Attn: Aimee Navickis-Brash

Work Order: WGA0782
Project: Permeable Pavement
Reported: 1/29/2026 16:50

Analytical Results Report

Sample Location: P2P3SS920260120
Lab/Sample Number: WGA0782-01 **Collect Date:** 01/20/26 08:25
Date Received: 01/26/26 11:09 **Collected By:** Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|-------|--------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 135 | mg/L | 0.100 | 1/26/26 9:20 | SCD | SM 2540 D | |

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Sample Location: P2P3SS920260120-2
Lab/Sample Number: WGA0782-02 Collect Date: 01/20/26 10:25
Date Received: 01/26/26 11:09 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|-------|--------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 109 | mg/L | 0.100 | 1/26/26 9:20 | SCD | SM 2540 D | |

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Sample Location: P2SS920260120
Lab/Sample Number: WGA0782-03 Collect Date: 01/22/26 08:05
Date Received: 01/26/26 11:09 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|-------|--------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 2.57 | mg/L | 0.100 | 1/26/26 9:20 | SCD | SM 2540 D | |

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Sample Location: P3SS920260120
Lab/Sample Number: WGA0782-04 Collect Date: 01/22/26 08:08
Date Received: 01/26/26 11:09 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|-------|--------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 17.0 | mg/L | 0.100 | 1/26/26 9:20 | SCD | SM 2540 D | |

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Sample Location: P2P3SS1020260122
Lab/Sample Number: WGA0782-05 Collect Date: 01/22/26 09:08
Date Received: 01/26/26 11:09 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|-------|--------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 106 | mg/L | 0.100 | 1/26/26 9:20 | SCD | SM 2540 D | |

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Sample Location: P2P3SS1020260122-2
Lab/Sample Number: WGA0782-06 Collect Date: 01/22/26 10:15
Date Received: 01/26/26 11:09 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|-------|--------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 123 | mg/L | 0.100 | 1/26/26 9:20 | SCD | SM 2540 D | |

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Sample Location: P2SS1020260122
Lab/Sample Number: WGA0782-07 Collect Date: 01/26/26 09:45
Date Received: 01/26/26 11:09 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|-------|---------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 1.00 | mg/L | 0.100 | 1/26/26 11:20 | SCD | SM 2540 D | |

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Sample Location: P3SS1020260122
Lab/Sample Number: WGA0782-08 Collect Date: 01/26/26 09:50
Date Received: 01/26/26 11:09 Collected By: Aimee Navickis-Brash
Matrix: Water

| Analyte | Result | Units | PQL | Analyzed | Analyst | Method | Qualifier |
|-------------------|--------|-------|-------|---------------|---------|-----------|-----------|
| Inorganics | | | | | | | |
| TSS | 0.900 | mg/L | 0.100 | 1/26/26 11:20 | SCD | SM 2540 D | |

Detection Summary

Client: Evergreen StormH2o
Project/Site: Permeable Pavement

Job ID: 320-128477-1

Client Sample ID: SWIN20251217-P6

Lab Sample ID: 320-128477-1

| Analyte | Result | Qualifier | RL | MDL | Unit | Dil Fac | D | Method | Prep Type |
|--------------|--------|-----------|-----|-----|------|---------|---|--------|-----------|
| 6PPD-Quinone | 76 | | 2.0 | | ng/L | 1 | | 1634 | Total/NA |

Client Sample ID: SWEF20251217-P6

Lab Sample ID: 320-128477-2

| Analyte | Result | Qualifier | RL | MDL | Unit | Dil Fac | D | Method | Prep Type |
|--------------|--------|-----------|-----|-----|------|---------|---|--------|-----------|
| 6PPD-Quinone | 14 | | 2.1 | | ng/L | 1 | | 1634 | Total/NA |

This Detection Summary does not include radiochemical test results.

Eurofins Sacramento