STORMWATER MANAGEMENT COMMISSION

REGULATORY GUIDANCE MEMORANDUM #2025-01

March 20, 2025

To: Lake County Enforcement Officers (EO) and Other Interested Parties

From: Brian Frank, Chief Engineer, Lake County Stormwater Management Commission (SMC)

Subject: Permitting Guidance on Permeable Surface Development

This memorandum provides guidance to property owners, developers, contractors, community officials and Enforcement Officers (EOs) on the permitting requirements associated with installing artificial turf fields or permeable pavements (including permeable: pavers, concrete, asphalt, grass-pavers, etc.) on properties in Lake County, Illinois.

Permeable surface development typically includes: the removal of the vegetation and topsoil, subgrade compaction, installation of multiple layers of clean **washed** (aka clear: free of fines) aggregate [sub-base reservoir (1"-3" rock ~CA1), base course (3/4" rock ~CA7), and bedding course (3/8" rock ~CA16)], often with a perforated underdrain network, and topped with a permeable surface layer (e.g., artificial turf or permeable pavement). This type of development is often successful in allowing precipitation to infiltrate through the surface and aggregate layers below. The crux of the matter is reduced soil infiltration and increase in runoff.

The drainage concerns associated with permeable surface development primarily relate to the runoff from the subsurface storm sewer network. This network can quickly and efficiently drain downstream. Given the typical subgrade soil compaction associated with this type of development, soil infiltration is often reduced, and with no landscaping/plants/roots to evaporate, transpire, or promote soil infiltration; the runoff rates can increase significantly compared to existing conditions.

Permitting Considerations:

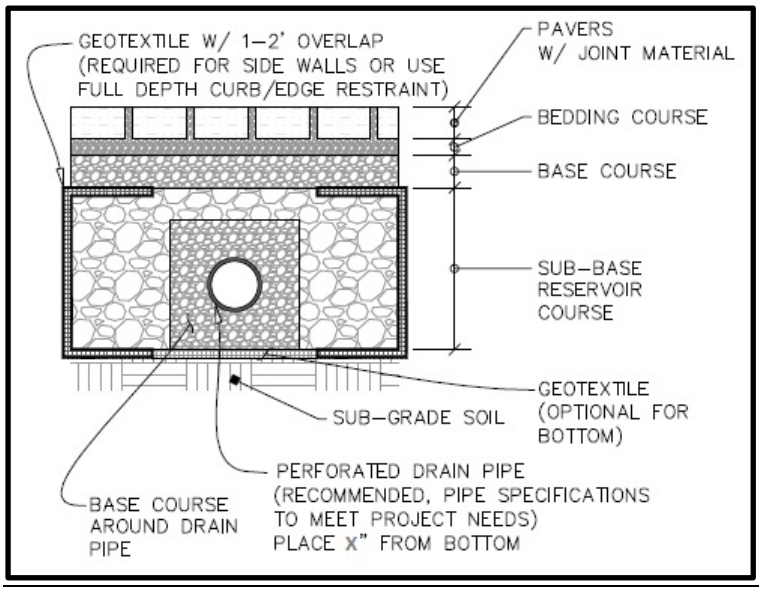
- Determine what areas should be considered ***impervious*** per the Lake County Watershed Development Ordinance (WDO, as amended). ***Detention*** may be required at 0.5 acre of "*new*"(after 10/18/1992) impervious area as specified in the WDO.
  - *impervious surface: Any hard-surfaced, man-made area that does not readily absorb or retain water, including, but not limited to, building roofs, parking and driveway areas, graveled areas, sidewalks, and paved recreation areas.(Note: This definition is for WDO stormwater uses; planning and zoning uses may differ.)*
- If the project cross-section and subgrade does not "retain water" and promote infiltration, it may be considered an ***impervious surface***.
- Artificial turf fields have not been considered ***impervious*** based on SMC reviews of completed permits to date.
  - Existing site conditions and the proposed design are key factors.
- Permeable pavement tends to be considered ***impervious*** based on SMC reviews of completed permits to date.
  - Projects tend to be smaller than artificial turf fields and consist of commercial parking lots or access roads that require extensive soil compaction and ongoing heavy vehicle loading.
  - These impervious projects did not provide adequate plans, detail and supporting documentation to be considered permeable.
- Analyze drainage system, including underdrains, to determine runoff rates and if proposed development should be considered ***impervious***. A key factor to consider is if ***infiltration*** is being maintained at existing levels. Often ***infiltration*** could be maintained; ***evapotranspiration*** decreases, and **void space** ***storage*** *volume* increases along with increased time for soil infiltration (if drain pipe is not located at the bottom of the cross-section).
  - Determine if there are limitations/restrictions on retaining water within the designed cross-section, as specified by the product manufacturer.
- **Aggregate void storage** of **36%** (default) has been widely used for calculations (clean/clear CA1 & CA7).
- ***Detention*** and ***release rate*** requirements (WDO) need to be met once triggered for the ownership parcel.
- A **Curve Number (CN)** of **93** (conservative) has been accepted by SMC for several artificial turf field projects. Depending on project location, soils and design factors this number might range (85-93). Permeable paver project's CN might have a similar range (~85-93).
- Existing and/or proposed soils should be taken into account along with protecting soil's infiltration capabilities.
  - If proposed permeable surface area is not considered impervious, then determine existing and proposed CN regarding what stormwater requirements/BMPs are necessary.

- All concentrated stormwater discharges must be conveyed into a maintainable outlet with adequate downstream stormwater capacity.

Design Factors to Mitigate Increased Runoff:

- Promote/maintain infiltration into the sub-grade soils (see list below).
- Elevate perforated drain pipe inverts to allow for increased infiltration. This should be in conjunction with any pertinent manufacture's specifications and/or downstream restrictor design aspects as necessary.
  - Restrictor design should include controlling both low- and high-water levels to allow for infiltration (low water) and preventing surface runoff/damage (high water). This design could be in conjunction with downstream surface detention and/or water quality basins.
- Sub-grade terracing and berming (grading) may be necessary to provide adequate storage within the sub-base reservoir course. Sub-grade soil slope should be less than 3% (preferably less than 1%) to allow for infiltration.
- Caution should be used to prevent fine particulates/sediments from getting into this permeable system. Including aggregate fines that may not have been thoroughly rinsed in processing the washed aggregates and/or sediment from adjacent area/soils.
- Adequate number and location of clean-out structures should be included to monitor and maintain the subsurface drain pipe network. Determine if a cut-off collar is required for outlet pipe.

Visual Example of a Permeable Surface Cross-section – For Discussion Purposes Only



Maintain subgrade soil infiltration:

- Determine if there is a reason to avoid infiltration (basement foundation, subsidence or contamination concerns, etc.)
  - If so, infiltration should be avoided, water proofing and proper sub-surface drainage conveyance likely required.
  - In this case, this area of no soil infiltration should be considered impervious regarding the detention thresholds of the WDO. Void storage detention may be considered in this case, if appropriate.
- Determine required level of soil compaction given the permeable surface design requirements; this will likely require soil testing. Account for soil compaction in infiltration design.
- Identify project area soils to determine existing soil permeability, this will require soil testing.
  - If soil does not allow infiltration this should be accounted for in project design and development of mitigation needs (existing versus proposed conditions).
- Identify if there is a restrictive layer that can be mitigated to promote infiltration, this might include excavating infiltration/dry wells or trenches to access permeably soil layers below.
- If sub-grade soil does not require compaction, caution should be taken to prevent unnecessary compaction. May include proper phasing of excavation and/or the use of low ground pressure tracked equipment.
- Prevent smearing of soils; otherwise scarify soils after compaction/smearing, and/or replacement of unsuitable soils with engineered soils.

Additional Drainage Concerns:

- Ongoing maintenance to prevent the surface, aggregate layers and/or underdrains from clogging and resulting in increased runoff as the area transitions from permeable to impervious.
- Conversion of permeable pavement areas to impervious pavement if the pavement surface is seal-coated, overlayed with traditional impervious surface (asphalt), or if permeable pavers are grouted; persons performing these types of conversions are unlikely to inquire about permit requirements/regulations or are unaware of permeable design.

The EO, in conjunction with the project design professionals, needs to determine:
How will the proposed development impact offsite drainage (rate and volume) along with water quality. Will this project be successful in maintaining permeability long-term and are there proposed safeguards (e.g., recorded maintenance plan, plat restriction, observation/maintenance structures, etc.) adequate to ensure WDO compliance.

Example Cases

Case 1: No soil infiltration:

- Permeable surface area shall be treated as impervious regarding WDO release rates.
- Detention provided in accordance with the WDO (if triggered), consider aggregate void storage.
  - Proper restrictor design needs to be approved.
- Perforated drain tile invert will typically be place at the subgrade or below in a trench design.
- Proper surface maintenance will be required if there is aggregate void storage being implemented or if the subsurface drainage system is necessary for proper drainage routing/conveyance. Surface overflow design should be considered/implemented as necessary.
- Deed or plat restriction, likely required.
- *Reservoir Course minimum depth of 24 inches to provide appropriate detention volume (24” at 36% = 8.64”).

Case 2: Limited/Reduced soil infiltration (typical):

- Determine if permeable surface area shall be treated as impervious regarding WDO detention requirements.
- Detention provided in accordance with the WDO (if triggered), consider aggregate void storage.
  - Curve Number needs to be determined for proposed conditions.
  - Proper restrictor design needs to be approved.
- Perforated drain tile invert will typically be placed approximately 4 inches above subgrade.
- Proper surface maintenance is required. Surface overflow design should be included as necessary.
- Deed or plat restriction, likely required.
- *If a long-term minimum subgrade infiltration rate of 0.5”/hr is attainable, the Reservoir Course minimum depth of 12 inches required to provide appropriate detention volume (12” at 36% = 4.3”).

Case 3: Adequate soil infiltration (requires proper soil testing):

- Perforated drain tile inverts, if needed, will typically be placed approximately 4 inches above subgrade.
- Proper surface maintenance will be required. Surface overflow design should be included as necessary.
- Deed or plat restriction, likely required.
- *If a long-term minimum subgrade infiltration rate of 2.0”/hr is attainable, the Reservoir Course minimum depth of 8 inches required to provide appropriate storage volume to allow for full infiltration (8” at 36% = 2.9”).

***Assumptions**: 100% functional void storage (flat sub-grade) and no tributary area outside of the permeable surface area (no additional run-on area). Reservoir Course may consist of sub-base reservoir course and courses above that, based on downstream restrictor design include potential spillway(s) elevations.