

Southview Subdivision - Stormwater Design

Engineering Feasibility Analysis (DRAFT)

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Submitted To:

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Attachments

A – Southview Subdivision Permitting Design Planset



1. Site Summary

1.1 Topography

Southview subdivision is a residential subdivision located along Southview Drive, Joan Avenue, Westall Drive, Westall Extension, and Overlook Lane in Richmond, Vermont. The 3-Acre boundary defined by the State of Vermont Stormwater Program, includes 48 residential parcels with impervious surfaces including rooftops, patios, walkways, sheds, private driveways, and Town-owned roads. The project has 10.35 acres of impervious surfaces, of which 6.60 acres are privately owned and 3.75 acres of which are Town-owned. Several streams cross through the project area, and the site is primarily surrounded by forested slopes. VELCO transmission lines and Interstate 89 are located to the south of the subdivision, while several other residential areas are located to the north and east of the subdivision. The streams running through the subdivision discharge to the Winooski River after flowing through road culverts beneath the interstate. The site is large and has a varied mix of soil conditions and slopes.

1.2 Soils

The subdivision area is comprised of 11 NRCS soil types within varying or undefined slope ranges:

- Adams and Windsor loamy sands, 0-5%, 5-12%, 12-30%, 30-60% slopes
- Agawam fine sandy loam, 0-5%, 12-30%, 30-60% slopes
- Borrow pits
- Duane and Deerfield soils, 5-12%, 12-20% slopes
- Hartland very fine sandy loam, 25-60% slopes
- Lyman-Marlow complex, 5-30% slopes, very rocky
- Marlow fine sandy loam, 12-20%, 20-30% slopes
- Munson and Raynham silt loams, 6-12% slopes
- Peru fine sandy loam, 20-60% slopes, very stony
- Stetson gravelly fine sandy loam, 12-20% slopes
- Terrace escarpments, silty and clayey

Soil characterization and infiltration testing were completed throughout the winter and spring of 2025. Additional infiltration testing was completed in the spring of 2026.

The initial round of soils investigation field work was completed on January 15, 2025. A GeoProbe was used to complete soil borings to at least the depth of groundwater or auger refusal. Of the six test locations originally chosen, three borings were completed day-of at boring locations SB-1, SB-2, and SB-4 due to the presence of utilities and accessibility issues.

Additional test points SB-8 and SB-9 were evaluated via GeoProbe drilling on June 11th, 2025. An infiltration test using a Modified Philip-Dunne Infiltrometer was also completed to confirm a sufficient infiltration rate at the intersection of Joan Ave and Southview Drive, measuring a rate of 2.62 in/hr.

SBs 1, 2, and 8 confirmed the presence of well-draining sandy soils. SB-4 found very shallow groundwater, while SB-9 also found very shallow groundwater and poor infiltration capacity. Due to SB-9's location at a large drainage collection point, an underdrained practice was determined to still be feasible.



Three additional infiltration tests were completed on April 29th, 2026 (sites Southview 1, 2, and 3). The test completed at the end of Westall Extension measured a Ksat value of 3.07 in/hr. Two tests completed near 309 Westall Drive measured rates of 5.09 in/hr and 2.23 in/hr. These tests confirmed a high infiltration rate in areas with existing passive disconnections and a confined drainage.

1.3 Current Drainage Patterns

The subdivision has existing stormwater conveyance infrastructure that is limited primarily to grass swales and road culverts. Runoff from road surfaces and driveways is conveyed via grass swales until it is discharged downslope or into existing streams via culverts.

1.4 Existing Land Use

The subdivision project area is a total of 130.62 acres, containing 10.35 acres of impervious surface jurisdictional under the Redevelopment Standard of the 3-Acre Rule under General Permit 3-9050. The site is developed for residential use, including 48 homes, driveways, walkways, patios, personal sheds and outbuildings, as well as town-owned roads. The subdivision is part of a greater residential area located uphill of the Richmond town center located along Route 2. The region is hilly and developed home areas are surrounded by forested slopes and a VELCO transmission corridor.

1.5 Right-Of-Ways or Easements

No right-of-way (ROW) assessment or easements are required to implement the stormwater treatment practices.

Several existing conditions for which WQv credit is proposed under the 10% Rule would require easements as formally permitted STPs, primarily simple disconnection areas located on individual lots. Given this project's status as an "Orphan Permit" held only by the Town of Richmond with no expectation for individual landowners or a Homeowners' Association to become applicants, the necessity for such easements was intentionally avoided as supported by the VT DEC Stormwater Program and Operational Section Supervisor Terry Purcell.

1.6 Design Summary

The proposed stormwater treatment system is limited to two new structural Stormwater Treatment Practices (STPs). A confined infiltrating drainage area at the west end of Westall Drive is also proposed for WQv credit to be incorporated as a permitted practice given that it is located in the Town right-of-way.

Chamber A

16 underdrained ADS StormTech MC-3500 chambers containing a Tier 3 sand filter are proposed in the right-of-way south of 504 Southview Drive. Pre-treatment will be provided via an isolator row wrapped in geotextile fabric. One new catchbasin will receive inflow to the chambers. Overflow will discharge to the existing culvert inlet across Southview Drive. Stormwater runoff treated through the subsurface sand filter will discharge via 6" pipe across Southview Drive to a shared stone outfall with the existing culvert.

Chamber B

18 underdrained ADS StormTech MC-3500 chambers containing a Tier 3 sand filter are proposed at the intersection of Westall Drive and Southview Drive beneath an existing swale. Pre-treatment will be provided via an isolator row wrapped in geotextile fabric. New catchbasins and pipes are proposed for conveyance.



Runoff will filter through the sand layer and discharge via perforated underdrain to a solid pipe and stone outfall pad, then enter an existing culvert conveying flow south across Westall Drive.

1.7 10% Rule Analysis

Several existing conditions within the site were evaluated under Section 4.1.C.4 of General Permit 3-9050 (2020) for Operation Stormwater Discharges, which states:

“If an engineering feasibility analysis shows that constructing a new best management practice will equate to an increase in compliance with an applicable standard by a factor of 10% or less, the project shall not be required to construct a new best management practice to comply with the applicable standard and shall satisfy the maximization requirement for purposes of compliance with that standard. (p. 20)”

The Southview Subdivision permit series has been held and maintained with the Town of Richmond as the sole applicant, known as an “orphan permit,” and the Southview neighborhood does not have an HOA. As an HOA was not expected to be formed and individual landowners were not expected to sign on as co-applicants, it was determined that obtaining easements for each proposed simple disconnection area was not appropriate.

As such, the site was evaluated with regard to the 10% criterion, assessing existing passive disconnections, isolated drainages, and an existing constructed pond onsite. Through a desktop slope analysis, additional infiltration testing, and several site visits, these areas were evaluated and confirmed to be functioning within 10%, to 2017 VSMM STPs. As advised on a similar stormwater permit application for a different project site, privately owned impervious areas meeting this definition were removed from the Standards Compliance Workbook calculation for required WQv calculations and WQv credit. One isolated drainage was included for WQv credit as it is located within a Town-owned right-of-way. In total, 2.49 acres of impervious managed by privately owned disconnection areas or a privately owned constructed pond were removed from WQv calculations. 0.77 impervious acres draining to a confined infiltration area within the Town right-of-way were considered as being managed by a permitted existing feature. A detailed description of each condition’s evaluation and analysis is described below.

Disconnections & Slope Analysis

A slope and drainage path analysis was performed to determine whether select impervious surfaces within the Southview subdivision comply with the 10% rule. A DEM for the area was downloaded from VGCI and symbolized by percent slope. The dataset was broken into four distinct slope categories: $\leq 15\%$, 15-20%, 20-25%, and $\geq 25\%$. Next, a point dataset was created by adding a point on the rooftop of each section of impervious surface being considered for the 10% assessment. A flow path was measured from the point to the nearest discharge point or body of water to determine the length of the flow path. The flow path was further broken up to identify the areas where the slope was $\leq 15\%$. The total distance from these areas was summed to determine whether it exceeded the minimum 50’ required for a disconnection area under the slope and soil type categories. All parcels classified as meeting the 10% rule well exceeded the minimum 50’ flow path length requirement with most locations having flow paths at least several times this length including all slope classes. Of the 13 assessment points, all but one exceeded 50’ in length with 8 exceeding 100’ in length in the slope class $\leq 15\%$.



Wet Pond

A landscaped pond located at 433 Southview Drive was evaluated by Watershed Consulting, including a site visit and interview with the homeowner regarding the pond's design and construction. The homeowner indicated that the pond is at least 14' deep and its level is controlled by a standpipe outlet structure that discharges to the stream. The pond is able to collect and store runoff for prolonged periods of time, similar to an engineered wet pond, and runoff from the surrounding area has long overland flow paths across vegetated and forested terrain prior to reaching the pond, effectively providing pretreatment. Based on consideration of the contributing developed land WQV as compared to the WQv stored in the wet pond, it was determined that constructing a separate STP for this drainage area would not improve treatment by a factor of 10% or greater and would be very challenging due to topography and site ownership.

-WQv of drainage area to pond (DA23): 0.081 AF

-WQv storage in wet pond (approximate): 1.95 AF

Infiltration Trench

An elongated depression was identified along the northern edge of Westall Drive near the road's western cul-de-sac end. The swale collects stormwater runoff from the northern portion of the road and portions of four private residential lots. Feedback from residents described this as an area where stormwater collects and then infiltrates with no discharge. A survey crew from Civil Engineering Associates, Inc. surveyed the area and confirmed elevations. Two infiltration tests were then conducted to confirm infiltration rates. The underlying soils are mapped as "Unrated" by the NRCS, but field testing confirmed the presence of well-draining sand as in other nearby areas of the site. The two infiltration rates yielded Ksat values of 5.90 in/hr and 2.23 in/hr. This feature was then modeled in HydroCAD and confirmed to be infiltrating the 1.0" WQv storm without discharge to the road culvert. It has been determined to be functioning very similarly to an infiltration trench, where upgrading the area to a formal VSMM-compliant infiltration trench would not equate to a 10% or greater increase in treatment and compliance.

Unlike the disconnection areas and wet pond described above, this feature is located within the Town right-of-way and is accessible for the Town to maintain. As such, it is proposed for WQv credit as a permitted structure.

2. Considerations

2.1 Natural Resources Constraints

Flood Hazard Areas:

There are no mapped Flood Hazard Areas within proximity of the proposed project site or its contributing drainage area.

Stream Alteration:

There are no stream alterations proposed for the stormwater treatment system.

River Corridor:

There are no mapped river corridors within the proposed project site or its contributing drainage area beyond that of standard 50-foot stream buffers where applicable.

Wetlands & Hydric Soils:



No VSWI wetlands, VSWI wetland advisories, or hydric soils are mapped within the areas planned for project implementation.

Groundwater Source Protection Areas (SPAs):

The Riverview Commons Groundwater SPA is located directly to the north of the project area but no STPs or construction work is proposed within the mapped SPA.

Deer Wintering Area (DWA):

A DWA is mapped to the north, west, and south of the subdivision, but not within the subdivision boundary. No work or tree-cutting is proposed within the nearby DWA.

2.2 Water Quality Objectives & Goals

Compliance with Stormwater General Permit (GP 3-9050) – 3-Acre Rule:

For this property, the GP 3-9050 requires the site to meet the Redevelopment Standard on all impervious surfaces *not* covered by an existing post-2002 stormwater permit. There are no post-2002 permits covering any part of this property. However, as discussed above, impervious areas subject to the 10% Rule that are not proposed to be permitted STPs were removed from the calculation of the Redevelopment Standard, reducing the jurisdictional impervious on site subject to this standard from 10.35 acres to 7.86 acres.

The Standards Compliance Workbook generated a required WQv of 0.3708 acre-feet, based on a contributing site area limited to the immediate neighborhood and yards and not inclusive of surrounding large steeply forested areas. This was completed in line with guidance received on a similar operational stormwater permit application. The proposed subsurface sand filter chambers and confined infiltrating drainage provided 0.3774 acre-feet of treatment, exceeding the requirement.

There are 10.35 acres of impervious surfaces onsite, though only 7.86 were determined to be subject to the Redevelopment Standard. Sites that do not meet their WQv treatment goals may be subject to payment of impact fees and sites that exceed their WQv treatment goals by a certain percentage may be eligible to receive the payment of impact fees.

Based on these values, the impact fee calculation is as follows:

- 7.86 acres onsite
- 0.3708 ac-ft WQv required
- 0.3774 ac-ft WQv provided

$(0.3774/0.3708) = 1.02$ Average WQv Achieved

$50\% \text{ WQv required} * (1.02) = 50.84\%$

$0.5 - (0.5084) = -0.0084$

$\$25,000 * (7.86 * 0.0084) = \$1,650.60$ Impact Fee Payment Received

However, because the WQv is not exceeded by more than 10%, the impact fee payment may not be applicable. This is subject to final review by the Stormwater Program.



3. Maximization Criteria

An Engineering Feasibility Analysis (EFA) was completed according to Chapter 22 of the Environmental Protection Rule, the Stormwater Permitting Rule, to determine whether the site can feasibly “maximize the acreage in compliance” with the Vermont Stormwater Management Manual’s Redevelopment Standard. The site was evaluated according to the Maximization Feasibility Criteria, a list of activities not required to maximize compliance with the requirements of General Permit 3-9050:

- 1. The purchase or acquisition of land for off-site treatment of stormwater**
 - ✓ The purchase or acquisition of additional land is not required to meet compliance with the requirements of GP 3-9050 under the proposed design. The proposed stormwater features are all within the subdivision boundary and Town road right-of-way to the extent possible.
- 2. Removal of, or actions that would permanently preclude the use or operation of existing structures, utilities, roads, parking areas, sidewalks, and similar infrastructure.**
 - ✓ The proposed project designs will not permanently preclude the use or operation of any existing structure, utilities, roads, parking areas, sidewalks, and similar infrastructure. The proposed STPs will be integrated into the existing stormwater infrastructure within the site.
- 3. Site re-grading or site re-contouring that would permanently preclude the existing land use.**
 - ✓ Proposed site re-grading and re-contouring will not permanently preclude the existing land use.
- 4. Pumping of stormwater runoff.**
 - ✓ The proposed design does not require pumping of stormwater.
- 5. Infiltration where basement flooding or subsurface pollutant plume transport would occur based on a site-specific analysis identifying seasonal high-water table, soil-infiltrative capacity, and direction of groundwater flow.**
 - ✓ The proposed permitted STPs are lined and are fitted with underdrain collection systems and therefore do not have the potential to result in basement flooding or subsurface plume transport.
- 6. Construction that would not be in compliance with the Agency’s “Flood Hazard Area and River Corridor Protection Procedure,” namely the “No Adverse Impact Standard.”**
 - ✓ There are no mapped Flood Hazard Areas or River Corridors within the project site or its contributing drainage area.
- 7. Construction within any wetland or its 50-foot buffer zone.**
 - ✓ There is no construction proposed within any mapped Class II wetlands or wetlands advisory regions.
- 8. Destruction of contiguous forest areas exceeding 5,000 square feet where such forest areas are to remain forest under the terms of another permit issued under the Stormwater Permitting Rule.**
 - ✓ No contiguous forest areas will be disturbed for the proposed design.



9. Activities not approvable under local, state, and federal laws and regulations.

- ✓ Compliance with local, state, and federal laws and regulations will be followed prior to and during implementation of the proposed projects.