WATERSHED
CONSULTING ASSOCIATES, LLC
Stormwater Management | Erosion Control

Yestermorrow Design/Build School
Stormwater Feasibility Study
Final Report

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1. Project Summary

Watershed Consulting Associates, LLC (WCA) was retained by Yestermorrow Design/Build School to assist with planning and conceptual design of a stormwater management system to provide treatment and control of runoff for a master plan build out. Yestermorrow considers water quality improvement a main priority of the campus revitalization project, and wanted to explore potential options for improved stormwater management on the campus including the daylighting of existing streams, treatment areas for new impervious surfaces, capture and reuse of stormwater for irrigation and a developed permaculture landscape, and creating more of a focus for surface water features through the design and site layout. In addition, Yestermorrow requested guidance on the applicable permits required for the master plan project, and the most efficient and practical way to navigate the regulatory process to secure these permits.

2. Permit Review

The following existing facility permits were obtained and reviewed by WCA. Copies of the permit materials are provided in the electronic deliverables file.

- Act 250 Landuse Permit (#5W1142)
- Public Service Board Certificate of Public Good (CPG #NM-821)
- Waitsfield Zoning CU (#3213/3237)
- State Wastewater (WW-5-0295-1/2)
- State Water Supply (misc. memoranda)
- State Wetlands CUD (2009-274)

Considering this permit information, WCA prepared a constraints map that showed various setbacks required to natural resource features as well as areas likely to be reserved for wastewater disposal systems, to assist the Yestermorrow core design team in preparing the master plan layout. This constraints map is provided in the electronic deliverables file. WCA also prepared a development process flow chart, that provides guidance on the timing and sequence of securing various permits as the project is phased in. This flow chart is also provided in the electronic deliverables file.

The focus of this report is stormwater management, and therefore, our assessment of future permit considerations was directly related to how build out of the master plan may trigger the need for stormwater review in the context of current permit conditions, and also what additional permits may be required. A summary by permit is provided here:

Act 250 Landuse Permit

Act 250 will require submission and review of a concept level stormwater plan that shows, in general terms, how runoff will be managed on the site. The recommended concept plan, perhaps in addition to a short narrative, should be sufficient for this level of review.

Waitsfield Zoning

Waitsfield Development Review will likely be interested to see detail related to drainage and also erosion control during construction. The recommended concept plan with a short narrative description should be sufficient for this level of review.

State Wetlands

If Yestermorrow intends to pursue the recommended concept option including the stream daylight portion of the project (discussed in Section 3 of this report), the State Wetlands Office should be notified, given the modification in drainage above a State regulated Class II wetland. Since the modification will only be channeling water to another location in the same contiguous wetland complex, WCA does not foresee issues with the change, although it should be vetted with the wetland regulators.

Operational Stormwater (General Permit 3-9015)

An operational stormwater permit will likely be required for the project, given that the new impervious area plus the existing impervious area will result in greater than the minimum regulatory threshold of one acre. Yestermorrow may choose to submit for a permit in a phased nature, or for the entire master plan. By submitting in a phased nature, construction plans need to be developed only for the portion of the project to be permitted. It is anticipated that the recommended design option can be developed into a final design which can meet current permitting standards.

Construction Stormwater (General Permit 3-9020)

A construction stormwater permit will be required for the project, given that over the entire master plan build out, an acre or more of land will be disturbed. It is recommended that a permit be secured in a phased nature.

3. Stormwater Design Alternatives Analysis

Field & Modeling Methodology

The current Master Plan layout was overlaid with ortho photography and available Geographic Information System (GIS) data include NRCS-mapped soils, mapped drainage

structures under Route 100, topography of the upstream watershed, and mapped surface waters. A site visit was conducted with a mapping-grade GPS unit (Trimble GeoXH) to locate key features including watershed drainage boundaries, and other site/off site features not currently located on existing surveys or geographic databases. Runoff peak discharges and volumes for a range of design storm events including water quality, 1-year, 10-year, and 100-year, were predicted using HydroCAD version 10.0 software for existing and proposed conditions to measure the impact of the master plan development project, and also to provide a basis for the conceptual designs. A runoff modeling report is provided in the electronic deliverables file.

Designs

Several variations were explored with the design team over the course of a number of meetings and plan iterations. Four concepts were evaluated, each of which are described in in the following section. The four concepts contained certain identical components. These components are described below:

Stream daylight: A daylight of the culverted stream and design of a step-pool stream channel is proposed. The daylight would continue past the current man made pond feature to a point where the slope eases at the Class II wetland buffer. The daylighted stream would be designed to convey the 1-year bankfull discharge, which is approximately 4 cfs based on hydrological modeling completed as part of this study. It is recommended to create small floodplan zones in the lower reach of the daylight where flood flows could be stored to reduce energy and dissipate sediment.

Linear bioswales: These features are proposed below the upper row of buildings, along the road on the uphill side of the existing school building, and below the existing school building. These features are intended to be shallow features that would be planted with native vegetation. The intent is to provide some roughness and storage to slow and capture stormwater. The bioswales could be pitched to transport the collected flow. We recommend a perforated underdrain in the upper bioswale, as this will serve to protect the wastewater disposal system down slope.

Erosion channel stabilization: Stabilization of the erosion channel leading from the woods road above the Class III wetland area is highly recommended. At the bottom of this stabilized section, just above the Class III wetland area, a plunge pool/level spreader structure is recommended to dissipate the energy of the runoff in the channel, and disperse the runoff as sheet flow into the wetland area.

Concept Decision Matrix

Concept	Treatment	Permittable	Cost Level	Maintenance	Aesthetics	Student Curricula Integration
1	High	Yes	Low	Low	High	High
2	High	Yes	Medium	High	High	High
3	Medium	Yes	Medium	Low	Medium	Medium
4	Medium	Yes	High	High	Medium	High

recommended option

Concept 1:

This concept included the features described above, and in addition, a multi-cell gravel wetland. The gravel wetland has a forebay, which is intended to capture particles prior to discharge into the main wetland. The gravel wetland was chosen because it is a top performer for pollutant removal and does not create thermal pollution, which is a concern with wet ponds. The potential drawback for this option is the large footprint of the structures, and the potential for a traditional "retention pond" look. The gravel wetland would collect runoff from the parking lot, the road, and the lower row of units. We recommend this concept given that gravel wetlands 1) provide superior pollutant removal, 2) provide some temporary storage of storm flow, 3) can be permitted under State regulations, and 4) if designed and constructed correctly, could be a very attractive land scape feature.

Concept 2:

This concept involves creating bioretention cells within the islands of the parking lot. This would allow for a reduction in the required size of the gravel wetland, as the runoff from the parking lot would be treated within these islands. This concept could be attractive and functional, but will also likely be more expensive and difficult to maintain as compared to concept 1.

Concept 3:

Concept 3 would include the creation of a bioswale on the western edge of the parking lot. The parking lot would be crowned in the middle, and half of the runoff from the parking lot could be managed in this bioswale. The other portion of the parking lot would drain into a gravel wetland that would be reduced in size, as compared to the large scale feature included in concept 1. It is possible that the bioswale could interfere with plans for vegetative screening, which is a potential drawback to this option.

Concept 4:

A porous asphalt or other material could be utilized on the parking lot. By incorporating a porous system in this location, there is a possibility of falling below the regulatory threshold for an operational stormwater permit, although a refined calculation needs to confirm this. The potential drawback is that the system would need to stay porous for the permit waiver to remain in effect. Maintenance would be required at least twice per year and would consist of vacuuming or pressure washing the surface. These systems are costly and are prone to failure if the site conditions are not ideal (low groundwater, very well drained soil conditions, no winter sanding).