

EDEN ESTATES

JN: 42215

PROJECT STORMWATER REPORT

Applicant:

EDEN LANE, LLC

42 School Street
Andover, MA 01810

Date: 05/26/2024
Revised: 07/14/2024

Prepared by:



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07/14/24

Date



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I. Checklist for Stormwater Report

*See the following pages for the
“Checklist for Stormwater Report”*



Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the [Massachusetts Stormwater Handbook](#). The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

¹ The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

² For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

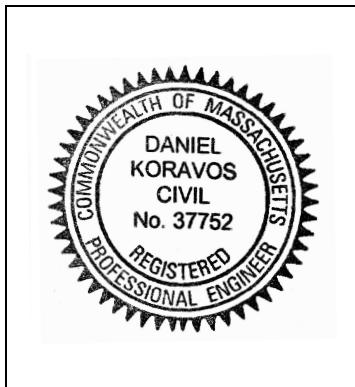
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



05/26/24

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

- New development
- Redevelopment
- Mix of New Development and Redevelopment



Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- No disturbance to any Wetland Resource Areas
- Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- Reduced Impervious Area (Redevelopment Only)
- Minimizing disturbance to existing trees and shrubs
- LID Site Design Credit Requested:
 - Credit 1
 - Credit 2
 - Credit 3
- Use of "country drainage" versus curb and gutter conveyance and pipe
- Bioretention Cells (includes Rain Gardens)
- Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- Treebox Filter
- Water Quality Swale
- Grass Channel
- Green Roof
- Other (describe): _____

Standard 1: No New Untreated Discharges

- No new untreated discharges
- Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- Soil Analysis provided.
- Required Recharge Volume calculation provided.
- Required Recharge volume reduced through use of the LID site Design Credits.
- Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - Static
 - Simple Dynamic
 - Dynamic Field¹
- Runoff from all impervious areas at the site discharging to the infiltration BMP.
- Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - Site is comprised solely of C and D soils and/or bedrock at the land surface
 - M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - Solid Waste Landfill pursuant to 310 CMR 19.000
 - Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

¹ 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - is within the Zone II or Interim Wellhead Protection Area
 - is near or to other critical areas
 - is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - involves runoff from land uses with higher potential pollutant loads.
 - The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- The BMP is sized (and calculations provided) based on:
 - The ½" or 1" Water Quality Volume or
 - The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

- The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- The NPDES Multi-Sector General Permit does **not** cover the land use.
- LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- All exposure has been eliminated.
- All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

- The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- Critical areas and BMPs are identified in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
 - Limited Project
 - Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - Bike Path and/or Foot Path
 - Redevelopment Project
 - Redevelopment portion of mix of new and redevelopment.
- Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- The project is **not** covered by a NPDES Construction General Permit.
- The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

- The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - Name of the stormwater management system owners;
 - Party responsible for operation and maintenance;
 - Schedule for implementation of routine and non-routine maintenance tasks;
 - Plan showing the location of all stormwater BMPs maintenance access areas;
 - Description and delineation of public safety features;
 - Estimated operation and maintenance budget; and
 - Operation and Maintenance Log Form.
- The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- An Illicit Discharge Compliance Statement is attached;
- NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

II. Introduction

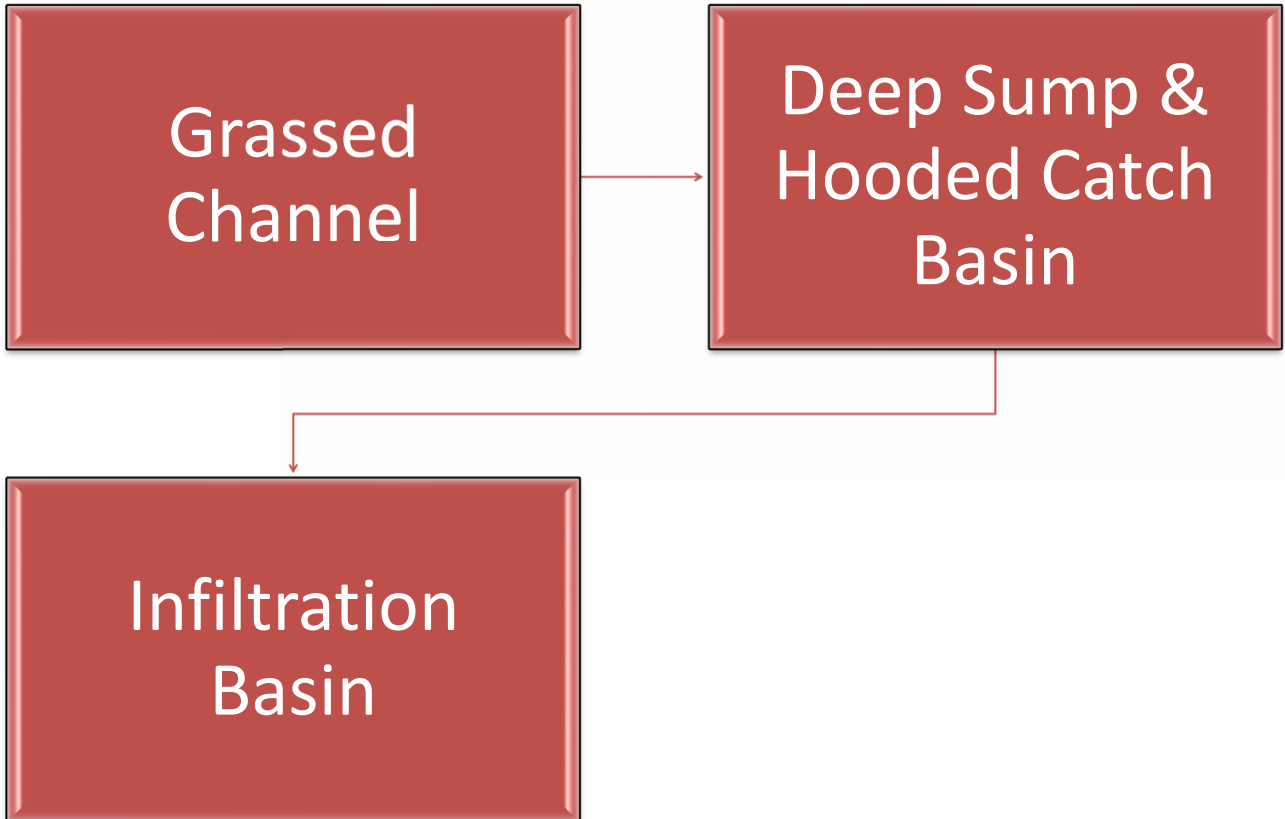
Eden Estates is a proposed three (3) lot single-family residential subdivision on a local road. The proposed development involves subdividing one (1) lot into three (3) lots, two (2) parcels and a local road (Eden Lane). The property is located at 9 Bancroft Road between South Main Street (Rt. 28) and Holt Road in Andover, Massachusetts. The subject land consists of approximately 3.9± acres. The existing vegetation mainly consists of grass areas with a tree line area along the perimeter of the property. Topography generally slopes from the easterly boundary of the property to the northwest corner of the site along Bancroft Road.

The soils within the project as mapped by the Natural Resource Conservation Service (NRCS) are mainly Woodbridge series (fine sandy loam). The Woodbridge series is classified as being within the NRCS-Hydrological Soils Group C/D; ranked third and fourth on a scale of four (A, B, C, D) in terms of infiltration capacity. For a more detailed description of this soil see the "Project Report on Drainage & Sedimentation Control".

The proposed stormwater management system for the project includes the installation of deep sump catch basins that will collect all of the roadway runoff and direct the flow to the closed drainage system. The catch basins are the start of the two BMP Treatment Trains as presented and described on the following pages.

The primary low impact development element of the project is the utilization of the Local Road regulations. As compared to the Minor Road regulations, there is a reduction in the required pavement width of six (6) feet and the five (5) foot sidewalk is not required. This allows for a pavement area reduction of approximately 35%.

BMP Treatment Train



INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location:

TSS Removal Calculation Worksheet

B BMP ¹	C TSS Removal Rate ¹	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Grass Channel	0.50	1.00	0.50	0.50
Deep Sump and Hooded Catch Basin	0.25	0.50	0.13	0.38
Infiltration Basin	0.80	0.38	0.30	0.08
	0.00	0.08	0.00	0.08
	0.00	0.08	0.00	0.08

Total TSS Removal =

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project:
 Prepared By:
 Date:

*Equals remaining load from previous BMP (E) which enters the BMP

III. Standard 1: No New Untreated Discharge

The proposed BMP Train consists of the drainage area catch basins CB-1 and CB-2. The runoff flows to the proposed catch basins in roadways. These catch basins are constructed with a deep sump and hood. The runoff is then transported to a forebay that discharges to the water quality swale. The water quality transports the runoff to an extended dry detention basin.

IV. Standard 2: Peak Rate Attenuation

*See the "Project Report on
Drainage & Sedimentation Control"
dated May 26, 2024 with latest
revisions*

V. *Standard 3: Recharge*

Required Recharge Volume

$R_v = F * A = (0.25/12) \text{ ft.} * 34,628 \text{ s.f.} = \mathbf{725 \text{ c.f.}}$

F = Target Depth Factor ("C" Soils = 0.25-inch)

A = Impervious Area

Provided Recharge Volume

Infiltration Basin Bottom of the basin elevation = 285.50
 Bottom area of the basin = 5,790 s.f.
 Lowest pond outlet elevation = 286.00
 Surface area at elevation 286.00 = 6,450 s.f.

Recharge Volume Provided = 3,060 c.f. > 721 c.f. Required

Drawdown Time Calculation

Volume Below Outlet

$\text{Time}_{\text{Drawdown}} = R_v \div (K * \text{Area}) = \mathbf{7.0 \text{ hours or } 0.3 \text{ days}}$

K = Saturated Hydraulic Conductivity = 0.90 in./hr. = 0.075 ft./hr.

R_v = Storage Volume = 3,060 c.f.

Bottom Area = 5,790 s.f.

Hydrologic soil group	Representative soil texture	Saturated hydraulic conductivity (in/hr)		
		Compacted	Average ¹	Loosened ²
A	sandy loam	0.50	0.90	2.20
B	loam	0.15	0.205	0.24
C	sandy clay loam	0.11	0.14	0.30
D	silty clay	N/A	0.06	N/A

From Minnesota Stormwater Manual

Pretreatment

Total Area of the Roadway Pavement = 0.8 acs.

Annual Sediment Volume

$$= 0.8 \text{ acs.} * 750 \text{ lbs./acre-storm} \div 90 \text{ lbs./c.f.} * 10 \text{ storms/year}$$

= 67 c.f./year

Volume of Catch Basin Sump

$$\text{Area} * \text{Depth} = 2^2 * \pi * 4 \text{ ft.} = 50 \text{ c.f.}$$

Sump to be cleaned at least once per year, therefore,

Total storage provided = 100 c.f./year

Input Values

2.0400
0.300
1.80
100.000
15.000
0.300
10.000

R
Sy
K
x
y
t
hi(0)

Recharge (infiltration) rate (feet/day) Rawls Rates
Specific yield, Sy (dimensionless, between 0 and 1) See following pages
Horizontal hydraulic conductivity, Kh (feet/day)* See previous page
1/2 length of basin (x direction, in feet) page
1/2 width of basin (y direction, in feet) hours days
duration of infiltration period (days) See previous page
initial thickness of saturated zone (feet)

Conversion Table

inch/hour	feet/day
0.67	1.33
2.00	4.00
36	1.50

12.033
2.033

h(max)
Δh(max)

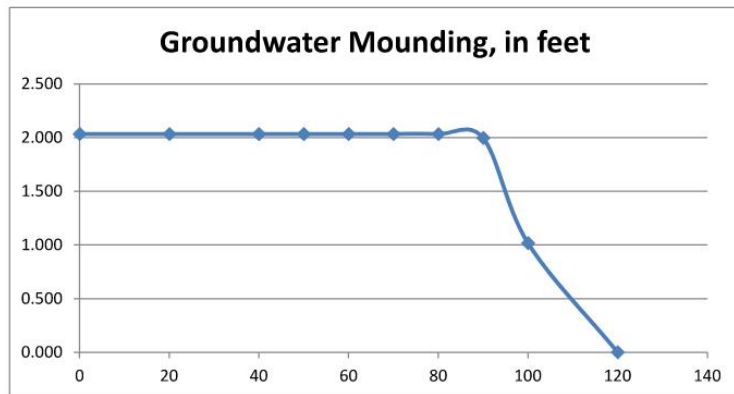
maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet
Distance from center of basin in x direction, in feet

2.033	0
2.033	20
2.033	40
2.033	50
2.033	60
2.033	70
2.033	80
1.996	90
1.017	100
0.001	120



Re-Calculate Now



USGS
OFR 63-59
C.1

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SPECIFIC YIELD in in
COMPILATION OF SPECIFIC YIELDS
FOR VARIOUS MATERIALS

By A. I. Johnson

PREPARED IN COOPERATION WITH THE CALIFORNIA DEPARTMENT OF WATER RESOURCES

U.S. Geological Survey Open-File Report

U.S. GEOLOGICAL SURVEY
WRD, LIBRARY
505 MARQUETTE NW, RM 720
ALBUQUERQUE, N.M. 87102

Denver, Colorado
1963
Revised 1966

Table 3.--Specific yields of valley-fill materials in San Diego County,
Calif.

Material	Specific yield (percent)
Coarse sand -----	34
Medium sand -----	37
Fine sand -----	37
Fine sandy loam -----	30

VI. Standard 4: Water Quality

Water Quality Treatment Volume

$$V_{WQ} = (D_{WQ}/12 \text{ inches/foot}) * (A_{IMP} * 43,560 \text{ square feet/acre})$$

V_{WQ} = Required Water Quality Volume (in cubic feet)

D_{WQ} = Water Quality Depth = 1 inch

A_{IMP} = Impervious Area (in acres) = 0.8 acs.

$$V_{WQ} = (1/12 \text{ inches/foot}) * (0.8 * 43,560 \text{ square feet/acre})$$

$V_{WQ} = 2,904 \text{ c.f.} < 3,060 \text{ c.f. in the infiltration basin}$

VII. Standard 5: Land Uses with Higher Potential Loads

Not Applicable

VIII. Standard 6: Critical Areas

Not Applicable

IX. Standard 7: Redevelopments

Not Applicable

X. Standard 8: Construction Period Pollution Prevention & Erosion and Sedimentation Control

Sequence of Major Activities

The order of activities will be as follows:

1. Install the erosion control line to protect surrounding areas
2. Install the construction stabilization entrance
3. Clear and grub for roadway and infiltration basin
4. Construction of the infiltration basin and swales
5. Stockpile loam in designated areas
6. Grade for roadway
7. Install utilities including water, gas, sewer, electric and storm drain
8. Place base course of pavement
9. Construct buildings
10. Complete grading and install permanent seeding and plantings
11. Complete final paving
12. Remove accumulated sediment from the basin and clean drainage system
13. When all construction activity is complete and the site is stabilized, remove silt socks and reseed any areas disturbed by their removal

Controls - Erosion and Sediment Controls

Stabilization practices

Permanent stabilization – Disturbed portions of the site where construction activities have permanently ceased shall be hydroseeded within three weeks of completion and the roadway has been paved with a base course.

Sediment Basin – The proposed detention basin will be constructed so that it can be used as a sedimentation basin during construction. The basin will be formed by excavating the basin area as indicated on the construction plans. Once the outlet riser is constructed, compost filter socks will be placed around the outlet, which will create ponding in the basin. This will allow sediment to settle prior to reaching the outlet riser. This basin will drain through a corrugated metal riser and outlet pipe to a riprap outlet apron. Once construction activities are nearly complete, the accumulated sediment will be removed from the basin.

Storm Water Management - Storm water drainage will be provided by storm sewer and catch basins for the developed areas. The areas which are not developed will be graded as shown on the Grading Plan and have permanent seeding or plantings. When construction is complete, the majority of the developed portions of the site will

drain to a detention basin. During construction the detention basin will act as a sedimentation basin. When upslope areas are stabilized, the accumulated sediment will be removed from the detention basin, and the areas on the sides of the basin will be planted with vegetation. It is expected that the drainage system will result in over 90 percent removal of total suspended solids from the site's storm water runoff. The pond has been designed by a professional engineer to keep peak flow rates from the two, ten, twenty-five and one hundred year/ 24 hour storms at their pre-development rates. Discharge from the basin will be directed to an existing closed drainage system in Bancroft Road.

Other Controls - Waste Disposal

Waste Materials

All waste materials will be collected and stored in a metal dumpster. The dumpster will meet all local and state solid waste management regulations. All trash and construction debris from the site will be deposited in the dumpster. The dumpster will be emptied as necessary, and the trash will be hauled to the local dump. No construction waste materials will be buried onsite. All personnel will be instructed regarding the correct procedure for waste disposal. Mr. Greg Alexandris, the individual who manages the day-to-day site operations, will be responsible for seeing that these procedures are followed.

Hazardous Waste

All hazardous waste materials, if any, will be disposed of in the manner specified by local or state regulations or by the manufacturer. Site personnel will be instructed in these practices and Mr. Greg Alexandris, the individual who manages day-to-day site operations, will be responsible for seeing that these practices are followed.

Sanitary Waste

All sanitary waste will be collected from the portable units as required by local regulations.

Offsite Vehicle Tracking

A stabilized construction entrance has been provided to help reduce vehicle tracking of sediments. The paved street adjacent to the site entrance will be swept as necessary to remove any excess mud, dirt or rock tracked from the site.

Timing of Controls/Measures

As indicated in the Sequence of Major Activities, installation of the erosion control line and stabilized construction entrance will be constructed prior to clearing or grading of any other portions of the site. The detention basin and all disturbed areas associated with the construction of the roadway will be hydroseeded within three weeks of completion. The individual lots will be constructed at different times and seeded as soon as the site work for the lot is completed.

Compliance with Federal, State and Local Regulations

The storm water pollution prevention plan reflects the requirements for storm water management and erosion and sediment control, as established. To ensure compliance, this plan was prepared in accordance with the requirements of the town of Andover, Massachusetts, and the Massachusetts Department of Environmental Protection.

Maintenance/Inspection Procedures

Erosion and Sediment Control Inspection and Maintenance Practices

These are the inspection and maintenance practices that will be used to maintain erosion and sediment controls:

- All control measures will be inspected at least once each week and following any storm event of 0.5 inches or greater.
- All measures will be maintained in good working order; if a repair is necessary, it will be initiated within 24 hours of it being reported.
- Built up sediment will be removed from compost filter socks when it has reached one half the height of the barrier.
- Compost filter socks will be inspected for depth of sediment and tears, to see if the fabric is securely attached and to see that the stakes are firmly in the ground.
- The sediment basin will be inspected for depth of sediment and built up sediment will be removed when it reaches 10 percent of the design capacity or at the end of the job.
- Temporary and permanent seeding and planting will be inspected for bare spots, washouts, and healthy growth.
- A maintenance inspection report will be made after each inspection.
- Mr. Greg Alexandris, site superintendent, will select individuals who will be responsible for inspections, maintenance, and repair activities, and filling out the inspection and maintenance report.

- Personnel selected for inspection and maintenance responsibilities will receive training as required. They will be trained in all the inspection and maintenance practices necessary for keeping the erosion and sediment controls used onsite in good working order.

Non-Storm Water Discharges

It is expected that the following non-storm water discharges will occur from the site during the construction period:

- Water from water line flashings
- Pavement wash waters (where no spills or leaks of toxic or hazardous materials have occurred)
- All non-storm water discharges will be directed to the sediment basin prior to discharge.

Inventory for pollution prevention plan

The materials or substances listed below are expected to be present onsite during construction:

Concrete	Petroleum based products
Detergents	Cleaning solvents
Paints (enamel & latex)	Wood
Tar	Masonry block
Fertilizers	Roofing shingles

Spill Prevention

Material Management Practices

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to storm water runoff.

Good Housekeeping

The following good housekeeping practices will be followed onsite during the construction project:

- An effort will be made to store only enough product required to do the job
- All materials stored onsite will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure
- Products will be kept in their original containers with the original manufacturer's label

- Substances will not be mixed with one another unless recommended by the manufacturer
- Whenever possible, all of a product will be used up before disposing of the container
- Manufacturer recommendations for proper use and disposal will be followed
- The site superintendent will inspect daily to ensure proper use and disposal of materials onsite

Hazardous Products

These practices are used to reduce the risks associated with hazardous materials

- Original labels and material safety data will be retained; they contain important product information
- If surplus product must be disposed of, manufacturer's or local and state recommended methods for proper disposal will be followed

Product Specific Practices

Petroleum Products

All onsite vehicles will be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers, which are clearly labeled. Any asphalt substances used onsite will be applied according to the manufacturer's recommendations.

Fertilizers

Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked into the soil to limit exposure to storm water. Storage will be in a covered shed. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.

Paints

All containers will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm sewer system but will be properly disposed of according to manufacturer's instructions or state and local regulations.

Spill Control Practices

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup:

- Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.
- Materials and equipment necessary for spill cleanup will be kept in the materials storage area onsite. Equipment and materials will include but not be limited to brooms, dustpans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.
- All spills will be cleaned up immediately after discovery.
- The spill area will be kept well-ventilated area and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
- Spills of toxic or hazardous materials will be reported to the appropriate State or local government agency, regardless of the size.
- The spill prevention plan will be adjusted to include measures to prevent this type of spill from reoccurring and how to clean up the spill if there is another one. A description of the spill, what caused it, and the cleanup measures will also be included.
- Mr. Greg Alexandris, the site superintendent responsible for the day-to-day site operations, will be the spill prevention and cleanup coordinator. He will designate at least two (2) other site personnel who will receive spill prevention and cleanup training. These individuals will each become responsible for a particular phase of prevention and cleanup. The names of responsible spill personnel will be posted in the material storage area and in the office trailer onsite.

Erosion and Sedimentation Control Specifications

Compost Filter Soxx (or equal)

Installation

1. Perimeter control used for control of sediment in storm runoff shall meet filtrex soxx mesh material and filtrex certified filter media specifications.
2. Perimeter control will be placed at locations indicated on plans and in a manner as directed by the engineer or manufacturer.
3. Perimeter control should be installed parallel to the base of the slope or other disturbed area.
4. Effective soxx height in the field for 12" diameter soxx should be = 9.5" high.
5. Stakes should be installed through the middle of the perimeter control at 10 ft. on center using nominal 2 in by 2 in by 3 ft wooden stakes.
6. Staking depth for sand and silt loam soils shall be 12 in.
7. Loose compost may be backfilled along the upslope side of the perimeter control, filling the seam between the soil surface and the device, improving filtration and sediment retention.

Inspection & maintenance

Routine inspection should be conducted within 24 hrs. of a runoff event or as designated by the regulating authority. Perimeter control should be regularly inspected to make sure they maintain their shape and are producing adequate hydraulic flow-through. If ponding becomes excessive, additional perimeter control may be required to reduce effective slope length or sediment removal may be necessary. Perimeter control shall be inspected until areas above have been permanently stabilized and construction activity has ceased.

1. The contractor shall maintain the perimeter control in a functional condition at all times and it shall be routinely inspected.
2. If the perimeter control has been damaged, it shall be repaired, or replaced if beyond repair.
3. The contractor shall remove sediment at the base of the upslope side of the perimeter control when accumulation has reached 1/2 of the effective height of the soxx, or as directed by the engineer. Alternatively, a new perimeter control can be placed on top of and slightly behind the original one creating more sediment storage capacity without soil disturbance.
4. Perimeter control shall be maintained until disturbed area above the device has been permanently stabilized and construction activity has ceased.
5. The filter media will be dispersed on site once disturbed area has been permanently stabilized, construction activity has ceased, or as determined by the engineer.
6. For long-term sediment and pollution control applications, perimeter control can be seeded at the time of installation to create a vegetative filtering system for prolonged and increased filtration of sediment (contained vegetative filter strip). The appropriate seed mix shall be determined by the engineer.

Stabilized Construction Entrance - Developing Areas

Definition

A stabilized pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right-of-way, street, alley, sidewalk, or parking area shall be provided.

Purpose

The purpose of a stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights-of-way or streets.

Conditions Where Practice Applies

A stabilized construction entrance shall be used at all points of construction ingress and egress.

Design Criteria

1. Aggregate Size - Use 2-inch stone or reclaimed or recycled concrete equivalent.
2. Thickness - Not less than 6 inches.
3. Width - 10-foot minimum but not less than the full width of points where ingress or egress occurs.
4. Length - As required, but not less than 50 feet (except on a single residence lot where a 30-foot minimum would apply).
5. Filter cloth - To be placed over the entire area to be covered with aggregate. Filter cloth will not be required on a single-family residence lot.
6. Piping of surface water under entrance shall be provided as required. If piping is impossible, a mountable berm with 5:1 slopes will be permitted.

Maintenance

The entrance shall be maintained in a condition which will prevent tracking of sediment onto public rights-of-way or streets. This may require periodic topdressing with additional aggregate. All sediment spilled, dropped, or washed onto public rights-of-way must be removed immediately.

When necessary, wheels must be cleaned to remove sediment prior to entrance onto public rights-of-way. When washing is required, it shall be done on an area stabilized with aggregate, which drains into an approved sediment trapping device. All sediment shall be prevented from entering storm drains, ditches, or watercourses.

Criteria for Filter Cloth

The filter cloth shall be a woven or non-woven fabric consisting only of continuous chain polymeric filaments or yarns of polyester. The fabric shall be inert to commonly encountered chemicals, hydrocarbons, mildew, rot resistant, and conform to the properties of the following table:

	Light Duty 1-/ Heavy Duty 2-/ Roads Haul Roads Test Fabric Properties 3/ Grade Subgrade Rough Graded Method		
Grab Tensile Strength (lbs.)	200	220	ASTM D1682
Elongation at Failure (%)	50	60	ASTM D1682
Mullen Burst Strength (lbs.)	190	430	ASTM D3786
Puncture Strength (lbs.)	40	125	ASTM D751 modified
Equivalent Opening Size	40-80	40-80	US Std Sieve CW-02215
Aggregate Depth (in.)	6	10	--

1-/ Light Duty Road: Sites that have been graded to subgrade and where most travel would be single axle vehicles and an occasional multi-axle truck. Trevira Spunbond 1115, Mirafi 100X, Typar 3401, or equivalent.

2-/ Heavy Duty Road: Sites with only rough grading, and where most travel would be multi-axle vehicles. Trevira Spunbond 1135, Mirafi 600X, or equivalent.

3-/ Fabrics not meeting these specifications may be used only when design procedure and supporting documentation are supplied to determine aggregate depth and fabric strength.

XI. Standard 9: Operation and Maintenance Plan

Erosion and Sedimentation Control Maintenance Plan

In general, the erosion control methodology to be employed on the site involves the installation of Compost Filter Soxx (or equal) in any area in which land disturbing activities could result in sediment spilling onto abutting property. The Filter Soxx will remain in place until the earth disturbing activity is stabilized with loam and seed and grass is growing, and/or houses are constructed, and roadway paved. Paving, loaming, and seeding, are permanent methods of site stabilization while the Compost Filter Soxx placement is considered temporary erosion control methods. Compost Filter Soxx are also specified to be placed around each of the catch basins, which will be constructed in the road, to prevent sediment travel into the storm drainage system. The storm drain catch basins are specified with 4' sumps to maximize the sediment trapping capability of the system. The protective Compost Filter Soxx are considered temporary measures to be employed during construction and not necessary after the roadway pavement is put in place. If a significant amount of soil is tracked onto the roadway from the on lot construction, then, at the direction of the Town Agent and/or Inspector, Compost Filter Soxx can be reinstalled adjacent to the catch basins.

The detention basin has the effect of collecting and holding runoff from the street drainage system, and allowing it to be treated and controlled, before being infiltrated into the ground or discharged. The pond will be loamed and seeded. Overland outlets from the ponds will be loamed and seeded or riprap, depending upon the pond location and slope.

The disturbed portions of the entire site will be hydroseeded if construction including loaming and seeding has not been completed prior to October 1st of a season. This will provide approximately three (3) or four (4) weeks growing season for the grass, which will serve to stabilize the site to accommodate spring runoff periods. No other methods to stabilize the site for winter construction are necessary.

During construction, and upon completion of construction, the project will require some maintenance of erosion control devices. During construction, Compost Filter Soxx must be checked every couple of weeks and after rainstorms, repaired and replaced as necessary due to sediment buildup behind it or on the device. After large storm events, the detention pond might require cleaning of sediment to restore them to the pre-event condition. If storm events occur after the side slopes and other areas, which are stabilized, have been planted but prior to seed germination, then replanting and re-grading of those areas might be necessary. This work will be performed by the developer on an as-needed basis, during the construction phase. After the subdivision is constructed, cleaning of catch basin sumps, drainage swale

and sediment ponds/sumps are probably the only item of maintenance, which will be necessary, other than to restore any grass areas, which are disturbed through normal use of roadways. The property owner will perform this work

The plan set contains the erosion and sedimentation control layout, while the storm drainage calculations attached hereto describe the soils which are present on the site, as well as the methodology for handling storm water flow on the property.

Operation and Maintenance Procedures

Infiltration Basin

Detention basin shall be inspected at least once per year to ensure that the basin is operating as intended. Inspections conducted at intervals during and after the storm will help to determine if the basin is meeting the expected detention times. The outlet structure shall be inspected for evidence of clogging or outflow release velocities that are greater than design flow. Potential problems that shall be checked include subsidence, erosion, cracking, or tree growth on the embankment; damage to the emergency spillway; sediment accumulation around the outlet; inadequacy of the inlet/outlet channel erosion control measures; changes in the condition of the pilot channel; and erosion within the basin and banks. Any necessary repairs shall be made immediately. During inspections, changes to the detention basin or the contributing watershed shall be noted, as these may affect basin performance.

The upper-stage, side slopes, embankment, and emergency spillway shall be mowed at least twice per year. Trash and debris shall also be removed at this time.

Sediment shall be removed from the basin as necessary, and at least once every ten (10) years. Providing an on-site sediment disposal area will reduce the overall sediment removal costs.

Maintenance Criteria

- Detention basin shall be inspected at least once per year to ensure that the basin is operating as intended. Inspections shall be conducted during wet weather to determine if the basin is meeting the targeted detention times.
- At least twice during the growing season the upper-stage, side slopes, embankment, and emergency spillway shall be mowed, and accumulated trash and debris removed.
- Remove sediment from the extended dry detention basin as necessary, but at least once every ten (10) years.

Deep Sump Catch Basins

The actual removal of sediments and associated pollutants and trash occurs only when inlets or sumps are cleaned out; therefore, regular maintenance is required. Most studies have linked the failure of inlets to the lack of regular maintenance. The more frequent the cleaning, the less likely sediments will be re-suspended and subsequently discharged. In addition, frequent cleaning also results in more volume available for future storms and enhances the overall performance. Ideally, in areas of high sediment loading, inlets shall be inspected, and cleaned, after every major storm event. At a minimum, water quality inlets and deep sumps shall be cleaned four times per year and inspected monthly. Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations.

Maintenance Criteria

- Inlets shall be cleaned a minimum of four (4) times per year and inspected monthly.
- All sediments and hydrocarbons shall be properly handled and disposed of, in accordance with local, state, and federal guidelines and regulations.

Sediment Forebays

The actual removal of sediments and associated pollutants occurs only when sediment traps and forebays are cleaned; therefore, regular maintenance is required. Frequently the removal of accumulated sediments will make it less likely that sediments will be re-suspended. At a minimum, sediment traps shall be cleaned four (4) times per year and inspected monthly.

Maintenance Criteria

- Traps shall be cleaned four (4) times per year and inspected monthly.
- All sediments and hydrocarbons shall be handled properly and disposed in accordance with local, state, and federal guidelines and regulations.

Drainage Swale

A maintenance and inspection schedule shall be incorporated into the design to ensure the effectiveness of water quality swales. Swales shall be inspected on a semi-annual basis; additional inspections shall be scheduled during the first few months to make sure that the vegetation in the swales becomes adequately established. The water quality swales shall be inspected for slope integrity, soil

moisture, vegetative health, soil stability, soil compaction, soil erosion, ponding, and sedimentation.

Regular maintenance tasks include mowing, fertilizing, liming, watering, pruning, and weed and pest control. Swales shall be mowed at least once per year. The grass must not be cut shorter than four (4) inches because the effectiveness of the vegetation in reducing flow velocity and pollutant removal may be reduced.

Sediment and debris shall be removed manually, at least once per year, and periodic reseeding may be required to maintain the dense growth of vegetation. Care shall be taken to protect water quality swales from snow removal and disposal practices and off street parking. Since swales may be located on private residential property, it is important for developers to clearly outline the maintenance requirements to property purchasers.

Maintenance Criteria

- Maintenance is required for the proper operation of water quality swales. Plans for water quality swales shall identify owners, parties responsible for maintenance, and an inspection and maintenance schedule.
- Water quality swales shall be inspected at least semi-annually, and maintenance and repairs made as necessary. Additional inspections shall be scheduled during the first few months to make sure the vegetation becomes adequately established. Repairs and reseeding shall be done as required.
- Swales shall be mowed at least once per year. Grass clippings shall be removed. The grass must not be cut too often or shorter than four (4) inches, in order to maintain the effectiveness of the swale.
- Sediment and debris shall be removed manually, at least once per year, before the vegetation is adversely impacted.
- Care shall be taken to protect water quality swales from snow removal and disposal practices and off street parking.

Grass Channels

Grassed Channels (formerly known as Biofilter swales) are treatment systems with a longer hydraulic residence time than drainage channels. The removal mechanisms are sedimentation and gravity separation, rather than filtration. To receive TSS credit, a sediment forebay or equivalent must be provided for pretreatment.

Maintenance

Mowing: Set the mower blades no lower than three (3) to four (4) inches above the ground. Mow on an as-needed basis during the growing season so that the grass height does not exceed six (6) inches.

Inspection: Inspect semi-annually the first year, and at least once a year thereafter. Inspect the grass for growth and the side slopes for signs of erosion and formation of rills and gullies. Plant an alternative grass species if the original grass cover is not successfully established.

Trash/Debris Removal: Remove accumulated trash and debris prior to mowing.

Sediment Removal: Check on a yearly basis and clean as needed. Use hand methods (i.e., a person with a shovel) when cleaning to minimize disturbance to vegetation and underlying soils. Sediment build-up in the grass channel reduces its capacity to treat and convey the water quality event, 2-year, and 10-year 24-hour storm.

Maintenance Budget

The following is an approximate maintenance budget for the inspections and items outlined above:

- 1. Inspections of the BMP elements..... \$1,200
- 2. Remove and dispose of debris from treatment BMP Including the Grass Channel, Infiltration Basin and Forebay & Drainage Swale \$1,300
- 3. Mowing of the BMP's including the Grass Channel, Infiltration Basin and Drainage Swale \$750
- 4. Catch Basin cleaning \$1,000

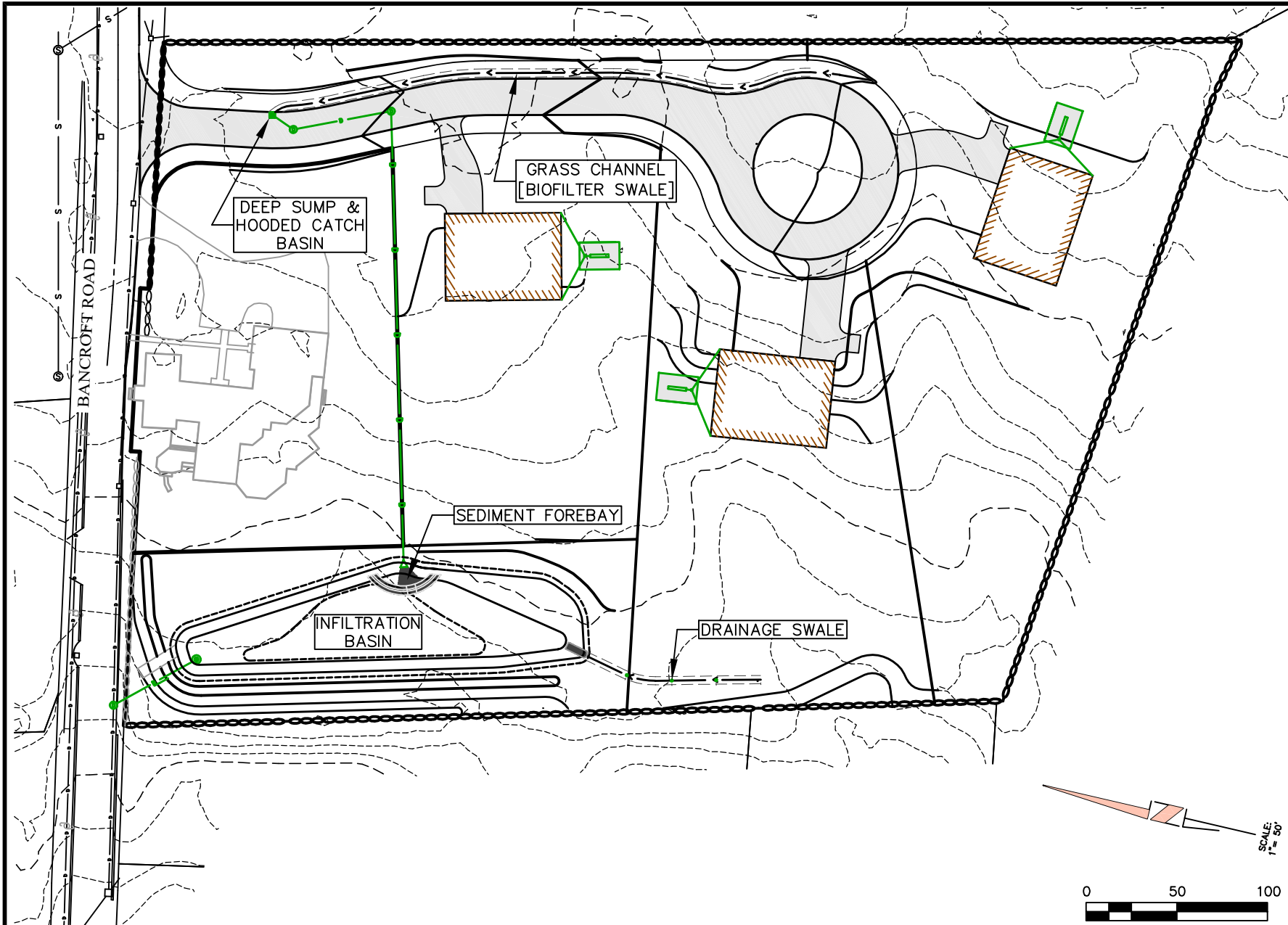
STORMWATER MANAGEMENT BEST MANAGEMENT PRACTICES

INSPECTION SCHEDULE & EVALUATION CHECKLIST
POST CONSTRUCTION PHASE

BMP	Inspection Frequency	Date Inspected	Inspector	Minimum Maintenance & Key Items to Check	Cleaning/ Repair Needed YES/NO List Items	Date of Cleaning/ Repair	Performed By	Water Level in Drainage System
Grass Channel	Annually							
Deep Sump & Hooded Catch Basin	Monthly							
Forebay	Monthly							
Infiltration Basin	Twice a year							
Drainage Swale	Twice a year							

XII. Standard 10: Prohibition of Illicit Discharges


Recording of this instrument constitutes an agreement by the Owner and Operator of the facility that no stormwater discharges other than those outlined on this plan are allowed for this site.



EDEN LANE

DK Engineering LLC

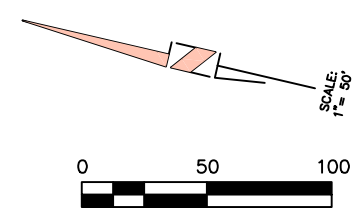
69 Granite Lane, Chester, NH 03036
 Tel. Number: (603) 605-6226
 E-mail Address: dan@dkc.com



Assessor's Map & Lot: Map 59 & Lot 30	
Project No.: 42215	Drawing Scale: 1" = 50'
Plan Date: 07/14/24	Revised Date:

Sheet Title:
BMP LOCATION MAP

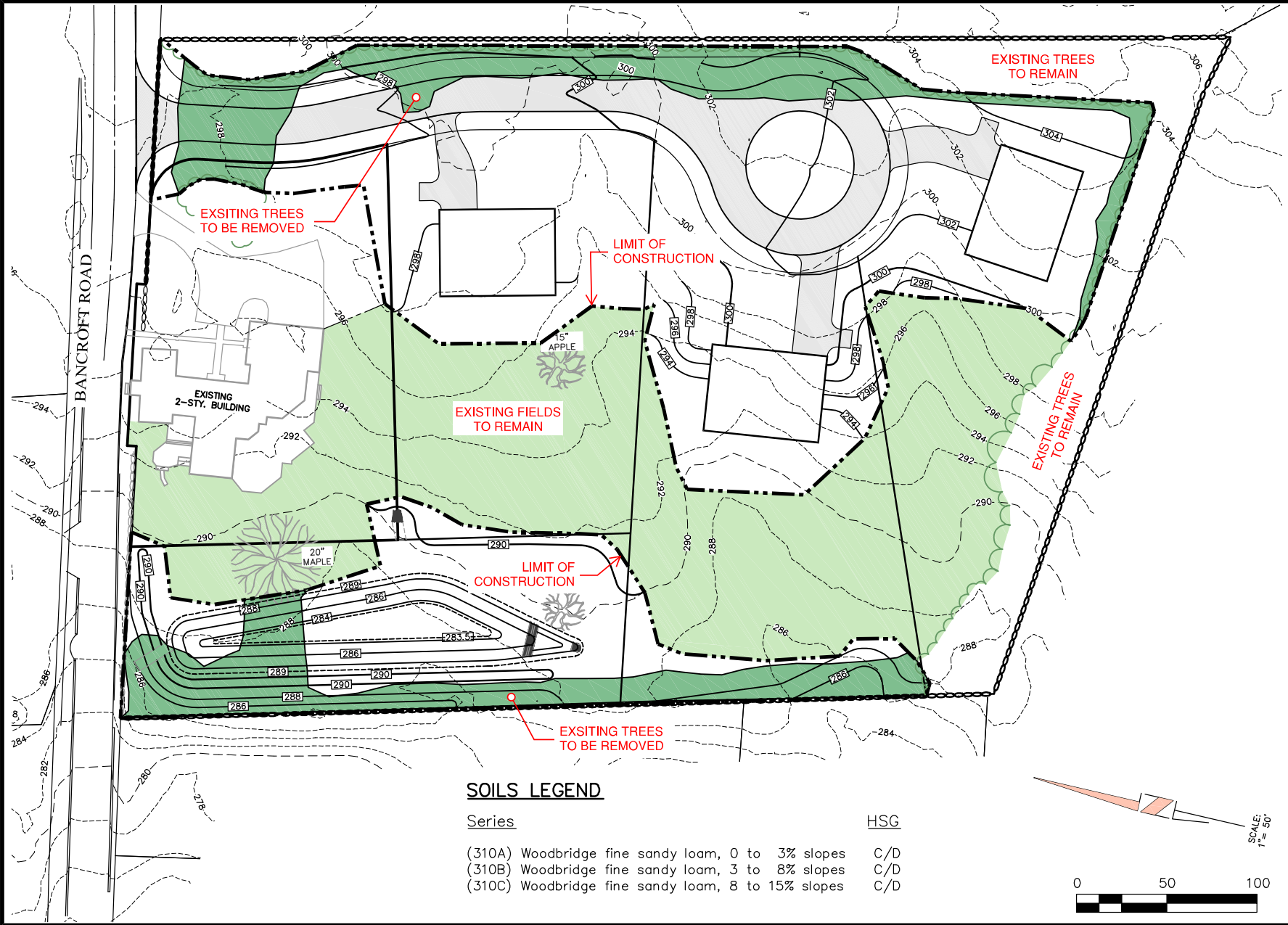
Sheet No.: **1**
 No. of Shts.: 1



Drawing name: D:\dk_data\Projects\42215 ~ADC - 9 Bancroft St - Andover\dwg\42215 ~ Subd Plan 2024-07-14.dwg

XIII. Inspection Forms

*See the following pages for Sample
Project Inspection Forms*



EDEN LANE

DK Engineering LLC

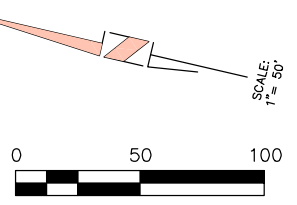
69 Granite Lane, Chester, NH 03036
 Tel. Number: (603) 505-5226
 E-mail Address: dan@dkc.com



Assessor's Map & Lot: Map 59 & Lot 30	
Project No.: 42215	Drawing Scale: 1" = 50'
Plan Date: 07/02/24	Revised Date:

Sheet Title:
TREE REMOVAL EXHIBIT

Sheet No.: **1**
 No. of Shts.: 1



Drawing name: D:_dk_data\Projects\42215 ~ADC - 9 Bancroft St - Andover\dwg\42215 ~ Subd Plan 2024-07-02xx.dwg

Inspection Form

To be completed every 7 days and within 24 hours of a rainfall event of 0.5 inches or

Inspector:

Date:

Inspector's Qualifications:

Days since last rainfall:

Amount of last rainfall:

Inches

Stabilization Measures:

more

Area Disturbed	Date Since Last Disturbance	Date of Next Disturbance	Stabilized (Yes/No)	Stabilized With	Condition

Stabilization required:

On or before: _____

To be performed by: _____

Maintenance Report Form

Detention/Sediment Basins:

Depth of sediment basin	Condition of basin side slopes	Any evidence of overtopping of the embankment	Condition of outfall from sediment basin

Maintenance required for sediment basin:

On or before:

To be performed by:

Stabilization to avoid off-site sedimentation:

Does sediment get transported to the road?	Is the gravel clean, or does it contain sediment?	Does all traffic use stabilized areas to leave the site?	Do the construction vehicles exit through a wash-down area prior to leaving the site, if necessary?

Maintenance required for stabilized construction:

On or before: _____

To be performed by: _____

PROJECT: **EDEN ESTATES**

ANDOVER, MASSACHUSETTS

Erosion Control Barrier Inspection and Maintenance Report Form

Perimeter Structural Controls:

Date:

Silt Fence and/or Straw Bales

Barrier Location	Has silt reached 1/3 of fence height?	Is the fence properly secured?	Is there evidence of washout or overtopping?

Maintenance required for silt fence and straw bales:

On or before: _____

To be performed by: _____