

Manheim Township

Guidelines for Exemptions

and Small Project Stormwater

Management Plans

Introduction

This manual is designed as a tool to help Manheim Township property owners manage stormwater runoff resulting from small scale construction projects. The management of stormwater runoff, notably the flows that result from the construction of impervious surfaces like buildings, patios, and driveways, is regulated by the Township's Stormwater Management Ordinance. Manheim Township recognizes that this process can be streamlined for qualifying small projects creating no more than 2,000 square feet of new impervious surface coverage in order to reduce costs and obligations on property owners.

Stormwater is the runoff produced by precipitation and snow or ice melt. Land development activities, including small scale construction projects, can affect stormwater runoff characteristics, including its rate, volume, and water quality. When stormwater is not managed, the increased volume can lead to aggravated flooding and diminished water quality in our community. Therefore, the principal objective of stormwater management is to prevent or mitigate the adverse impacts of the increase in rate and volume of stormwater runoff, while also protecting health, safety, and property.

Stormwater Best Management Practices (BMPs) aim to maintain or improve water quality, encourage infiltration in appropriate areas, promote groundwater recharge, maintain the natural drainage characteristics of a site to the maximum extent possible, and protect stream banks and beds. The BMPs listed in this manual should be used as a guide and are not a comprehensive list of options. Contact Manheim Township Planning and Zoning staff to discuss alternative solutions for site-specific applications.

Sections 109.1 and 109.2 of the SWMO establish the criteria for exemptions and the small project stormwater management process outlined in this manual.

Standard Terms Used in the Guidelines

Agricultural Activities – Activities associated with agriculture such as agricultural cultivation, agricultural operation, and animal heavy use areas. This includes the work of producing crops, including tillage, land clearing, plowing, disking harrowing, planting and harvesting crops; pasturing and raising of livestock; and installation of conservation practices. Construction of new buildings or impervious areas is not considered an agricultural activity.

Best Management Practice (BMP) – Activities, facilities, control measures, designs or procedures used to manage stormwater impacts from regulated activities, to meet state water quality requirements, to promote groundwater recharge, and to otherwise meet the purposes of the SWMO. BMPs are commonly grouped into two broad categories: structural or non-structural. Non-structural BMPs refer to design approaches, operational and/or behavior-related practices that attempt to minimize the contact of pollutants with stormwater runoff. Structural BMPs consist of physical devices and practices that capture and treat stormwater runoff and are permanent appurtenances to the development site.

High Tunnels – A structure which meets the following:

1. Is used in the course of agricultural operations, including production and preparation for market of crops, livestock products and the production, harvesting, storage and preparation for market or use of agricultural, agronomic, horticultural, floricultural, silvicultural,

hydroponic and aquacultural crops and commodities and the necessary accessory uses for packing, treating or storing the produce and equipment.

2. Is constructed consistent with all of the following:

- (a) Has a metal, wood or plastic frame.
- (b) When covered, has a plastic, woven textile or other flexible covering.
- (c) Has a floor made of soil, crushed stone, matting, pavers or a floating concrete slab.

Impervious Surface Coverage or Area – Surfaces which prevent the infiltration of water into the ground. All structures, buildings, parking areas, driveways, streets, sidewalks, decks, patios, or any other areas of concrete, asphalt, packed stone, and compacted soil shall be considered impervious surface if they prevent infiltration. In addition, other areas determined by the Township Engineer to be impervious within the meaning of this definition will also be classified as impervious surfaces.

Regulated Activities – Activities, including earth disturbance activities that involve the alteration or development of land in a manner that may affect stormwater runoff. Regulated activities shall include, but not be limited to:

- Land development subject to the requirements of the Township Subdivision and Land Development Ordinance,
- Removal of ground cover, grading, filling or excavation,
- Construction of new or additional impervious surfaces and associated improvements,
- Installation or alteration of stormwater management facilities and appurtenances thereto,
- Diversion or piping of any watercourse, and
- Any other activities where the Township determines that said activities may affect any existing watercourse's stormwater management facilities or stormwater drainage patterns.

Runoff – Any part of precipitation that flows over the land surface.

Small Project Stormwater Management Plan (Small Project SWM Plan) – A plan prepared and submitted for regulated activities that meet the small project stormwater management plan criteria in the Township Stormwater Management Ordinance.

Stormwater Management Ordinance (SWMO) – The Manheim Township Stormwater Management Ordinance.

Determining What Type of Stormwater Management Submission is Needed

These guidelines are designed to assist preparers of those projects that qualify for a Small Project SWM Plan project (not more than 2,000 square feet of impervious surface coverage, measured cumulatively from December 14, 1998), as well as those activities and projects that may be exempt from the plan preparation and approval requirements of the SWMO. The criteria and requirements for Exemptions and Small Project SWM Plans are listed under Exemptions below.

Where a project qualifies for a Small Project SWM Plan, property owners or their contractors/consultants professionals have the ability through the use of these guidelines, to determine the appropriate stormwater management facilities for their property, project, and budget. The Small Project SWM Plan allows property owners doing small projects to avoid the time and expense involved with doing a formal stormwater management plan.

Exemptions

Under the SWMO, regulated activities require the preparation and submission of an engineered stormwater management plan to be reviewed and approved by the Township. However, certain activities are exempt from the preparation and submission requirements if they meet specified criteria. These activities are exempt if they satisfy specified criteria listed in Section 109.1 of the SWMO:

Exemption Application Not Needed. The following activities do not require submission of an application for exemption:

1. Agricultural activities, as defined by the SWMO, provided that the activities are performed according to the requirements of Chapter 102 and an approved conservation plan.
2. Forest management and timber operations, as defined by the SWMO, provided that the activities are performed according to the requirements of Chapter 102.
3. Domestic landscaping and/or vegetable gardening.
4. Conservation practices being implemented as part of a conservation plan verified by the Lancaster County Conservation District. A copy of the conservation plan and verification of implementation shall be provided to the Township upon request.

Exemption Application Needed. The following activities require submission of an application for exemption:

1. **Installation of additional impervious surface coverage** on a lot where all of the following conditions have been met (**SWMO Section 109.1.E**):
 - a. Additional impervious surface coverage may be exempt if it is to be located on a lot subject to a Township-approved subdivision plan, land development plan, or stormwater management plan which included sufficient stormwater management facilities to handle such future impervious surface.

- b. The stormwater management facilities on the approved stormwater management plan were installed and inspected and approved by the Township staff or Township Engineer.
- c. There have been no amendments to the design standards of the SWMO between the date of approval of the stormwater management plan and the submission of the application to add impervious surface coverage.

1. **High tunnels (SWMO Section 109.1.F)** A person seeking exemption from the plan preparation and submission requirements of the SWMO on the basis that the high tunnel is exempted pursuant to the Storm Water Management Act, as amended by Act 15 of 2018, shall file an *Application for Exemption or Small Project Stormwater Management Plan* and provide all information necessary to demonstrate that the high tunnel meets the definition set forth herein and that the proposed high tunnel meets all of the following requirements:
 - a. The high tunnel or its flooring does not result in an impervious area exceeding 25% of all structures located on the owner's total contiguous land area; and
 - b. The high tunnel meets one of the following:
 - i. The high tunnel is located at least 100 feet from any perennial stream or watercourse, public road or neighboring property line.
 - ii. The high tunnel is supported with a buffer or diversion system that does not directly drain into a stream or other watercourse by managing stormwater runoff in a manner consistent with requirements of this article.
 - c. Nothing in SWMO Section 109.1.F shall be construed to exempt high tunnels from other requirements applicable under federal, state, or Township ordinances, including, but not limited to, the Township Zoning Ordinance.
 - d. Nothing in SWMO Section 109.1.F shall apply to impervious surfaces, including, but not limited to, driveways or parking and loading areas which may be installed in connection with the high tunnel.
2. For lots improved with existing structures at the time of enactment of the previously adopted SWMO, December 14, 1998, installation of 1,000 square feet or less of impervious surface coverage, cumulative from the date of enactment of the SWMO, may be exempt from the plan preparation and submission requirements of the SWMO if the proposed activity meets all of the criteria in this **(SWMO Section 109.1.G)**.
 - a. The **1,000 square foot impervious surface credit** is attributable to the parent tract in existence at the time of enactment of the SWMO. No tract of land subsequently improved with impervious surface coverage or subsequently subdivided from its parent tract shall qualify for an exemption or impervious surface credits.

- b. The 1,000 square foot impervious surface credit will be applied toward the 2,000 square foot impervious surface limit for eligibility to utilize the Small Project Stormwater Management Plan process in SWMO Section 109.2.
- c. No earth disturbance shall take place within environmentally sensitive areas, including, but not limited to, floodplains, wetlands, riparian buffers, existing natural drainageways or slopes greater than 15%.
- d. No impervious surface coverage shall be installed and no grading or excavation shall be conducted within any existing drainage or stormwater easement created by or shown on any recorded plan or document.
- e. Soil disturbance and erosion during construction activity will be minimized, and all disturbed areas will be promptly stabilized with topsoil and vegetation.
- f. Exempted activities creating 5,000 square feet or more of earth disturbance shall submit an Erosion and Sediment Control Plan to the Lancaster County Conservation District for review and approval in accordance with PA Chapter 102.
- g. Runoff shall be directed to pervious areas on the subject property and maximize isolation distances to downstream properties. No runoff shall result in a point discharge closer than twenty (20) feet from an abutting street or neighboring property.
- h. The proposed impervious surface shall not adversely impact any known problem areas or downstream property owners or the quality of runoff entering any municipal separate storm sewer system.
- i. Runoff from the proposed impervious surface after development shall leave the subject property in the same manner as pre-development conditions and shall not create erosion on the subject property or neighboring properties.

3. **Regulated activities involving proposed new or expanded impervious surface coverage associated with agricultural activities**, as defined in the SWMO, may be exempt from the plan processing and submittal requirements of the SWMO if the proposed activities meet all of the following criteria. **(SWMO Section 109.1.H)**

- a. For a parent tract containing not less than 10 acres, installation of 10,000 square feet or less of impervious surface coverage including adjoining vehicular parking and movement area, cumulative from the date of enactment of the previously adopted SWMO, December 14, 1998. The application for processing under SWMO Section 109.1.H shall provide the Township with sufficient information to demonstrate compliance with the following requirements:
 - i. The minimum distance between the proposed impervious area and/or stormwater management facilities' discharge point to the downslope property line of the parent tract is at least one hundred twenty-five (125) feet of overland flow.

- ii. There shall be no disturbance of land within floodplains, wetlands, environmentally sensitive areas, riparian buffers, or slopes greater than 15%.
- iii. No impervious surface coverage shall be installed and no grading or excavation shall be conducted within any existing drainage or stormwater easement created by or shown on any recorded plan or document.
- iv. Runoff from the proposed new or expanded impervious surface coverage shall be diverted entirely away from animal management, waste management, crop farming, and any other source of pollutants.
- v. Exempted activities creating 5,000 square feet or more of earth disturbance shall submit an Erosion and Sediment Control Plan to the Lancaster County Conservation District for review and approval in accordance with PA Chapter 102.

If an Exemption Application is needed, the following must be submitted:

- Completed *Application for Exemption or Small Project Stormwater Management Plan*
- Site Plan and any information necessary to show that the applicable criteria listed above will be met for the proposed activity
- Application fee (invoiced at time of approval): \$50.00
- Zoning Permit Application
- Building Permit Application, if applicable

The application and accompanying documentation will be reviewed to confirm that the proposed activity qualifies for an exemption. If approved, the Township will use the application as a record of total cumulative impervious surface coverage installed since December 14, 1998.

Small Project Stormwater Management Plans

If the proposed activity does not qualify for an exemption but meets the following Small Project SWM Plan criteria, the Small Project SWM Plan processing procedures in Section 109.2 of the SWMO may be followed. Although this streamlined process does not allow for a full exemption from the submission of a stormwater management plan, the worksheets and sample BMP details included in these *Guidelines* are provided to help property owners or their contractors/consultants prepare a Small Project Stormwater Management Plan.

The primary criteria for this process are as follows:

1. The project:
 - (a) meets all of the standards found in SWMO Section 109.2,
 - (b) does not involve the alteration of stormwater facilities or watercourses, and

- (c) proposes regulated activities that create new impervious coverage no greater than 2,000 square feet, cumulative from the date of enactment of the SWMO, December 14, 1998.
- 2. Lots that have a 1,000 square foot exemption under SWMO Section 109.1.G shall have the 1,000 square foot impervious surface credit first applied toward the 2,000 square foot impervious surface limit for eligibility to utilize the Small Project Stormwater Management Plan process.
- 3. No activity utilizing the Small Project SWM Plan process shall violate or cause to be violated the Federal Clean Water Act or any regulation issued thereunder, an NPDES permit, any recorded Stormwater Management or Operations and Maintenance Agreement, or any requirement applicable to a municipal separate storm sewer system (MS4).
- 4. No project is exempt from complying with any state or federal requirements applicable if the subject property is located in a high quality (HQ) or exceptional value (EV) watershed.
- 5. Regulated activities that meet the above criteria may be required to manage stormwater runoff and comply with the plan preparation and submission requirements of the SWMO should the Township determine that there is a potential for stormwater runoff to adversely affect adjacent or downstream public or private properties.
- 6. Regulated activities creating 5,000 square feet or more of earth disturbance shall submit an Erosion and Sediment Control Plan to the Lancaster County Conservation District for review and approval in accordance with PA Chapter 102.

For confirmation that the Small Project SWM Plan is appropriate for the project, contact the Township Planning and Zoning Department.

Small Project Stormwater Management Plan Requirements

The Small Project SWM Plan depicts the existing conditions of a property, location of proposed new impervious surfaces, stormwater BMPs, and routing or grading to convey the runoff to the BMPs. Depicting the relationship between the proposed activities and distances to things like property lines, streams, buildings and other structures will help determine the type of BMPs that can be used.

It is the applicant's responsibility to prepare and submit the Small Project SWM Plan with the application package, but assistance may be available from the Township to obtain access to property maps or GIS information with some existing features. Please note that the larger or more complex the project is, the more appropriate it may be for a contractor, surveyor, or other professional to prepare the plan and to consider having a professional evaluate the viability and potential economic benefits of modeling, designing and installing stormwater BMPs.

The Small Project SWM Plan must depict the following site features, be drawn to scale, and provide the following information. Additional information may be required if necessary.

- Property owner name, address, email and phone number
- Property address
- Tax account number
- Name, address, email and phone number of plan preparer (if not the owner)
- Property boundary with dimensions
- Location and dimensions of all existing and proposed structures
- Location and dimensions of all existing and proposed impervious surfaces (patio, deck, walkway, driveway, walls, etc.) regardless of material type and construction method
- Site conditions (grassed areas, agricultural fields, direction of slope and stormwater flow on property)
- Location of all roof downspouts and where they discharge
- Measurement of the distance from the downspout discharge points to the closest property line(s)
- Natural features such as streams, wetlands, floodplains, steep slopes, tree lines and other vegetation on the property and within 50 feet of the property line for lots smaller than 5 acres
- Distance from proposed structures or downspouts along the stormwater flow path to any stream or wooded area
- Location of well and/or septic system, if applicable
- Surface and subsurface utilities
- Existing and proposed easements (gas, electric, stormwater, water, sewer, etc.)
- Location and size of proposed stormwater BMPs
- Details of BMPs as necessary for construction
- Any other pertinent information that may be significant to the project site

Other considerations for Small Project SWM Plans:

- Soil testing is highly recommended to select and apply the appropriate stormwater BMPs. The use of soil maps, infiltration tests, and/or perc tests may provide the applicant basic information about soil characteristics.
- Proposed BMPs must be designed to handle flows from the contributing area.
- The site shall not have any pre-existing stormwater drainage-related problems (as verified by the Township), at the discretion of the Township.
- Water quality shall be protected by Chapter 93 of the PA Code.
- Manheim Township will inspect all BMPs during and after construction/installation.
- Infiltration BMPs should not be constructed nor receive runoff until the entire contributory drainage area has achieved final stabilization.
- Ensure that infiltration in geologically susceptible areas such, but not limited to, carbonate geology/karst topography do not cause adverse impacts. The Small Project Stormwater Management Plan should incorporate steps to ensure that salt or chloride will not contaminate the groundwater.
- Selected BMPs shall be designed, constructed and maintained in accordance with the manufacturer's recommendations, the *PA Stormwater Management BMP Manual*, or other written guidance acceptable to Manheim Township.
- Proposed sump pumps shall discharge to infiltration or vegetated BMPs to the maximum extent practicable, with maximum separation from downstream property lines in order to avoid adverse impacts to adjacent and downstream properties.

Selecting a Stormwater BMP

The minimum size of a BMP is determined by the amount of stormwater that must be managed and the type of BMP used. However, there are other considerations that should be evaluated when deciding which BMP is best for the property and construction project, such as size, maintenance responsibilities, existing soil conditions, and constraints of the site.

Several stock stormwater BMP construction details and sizing calculations are provided in these *Guidelines* for the property owner or contractor to use. These stormwater BMPs have been deemed to be of a nature and cost that will accomplish the goals of the Manheim Township Stormwater Management Ordinance while not unduly burdening property owners. If an alternative BMP is desired, the *PA Stormwater Management Best Management Practices Manual* should be consulted. If the applicant desires to utilize a BMP not included in the Township's *Guidelines*, Township Planning and Zoning staff should be consulted to determine whether a Small Project SWM Plan utilizing the BMP will be acceptable. Taking advantage of combined decades of experience, the Planning and Zoning staff will be able to provide guidance regarding the feasibility of alternative BMPs.

Submittal of the Small Project Stormwater Management Plan Application

A complete Small Project SWM Plan application submission must include the following. The Township reserves the right to require additional information if necessary to evaluate the application.

Small Project Stormwater Management Plan Application Checklist

- Completed *Application for Exemption or Small Project Stormwater Management Plan*
- Small Project Stormwater Management Plan (site plan) that depicts the information listed under Small Project Stormwater Management Plan Requirements below. The site plan may be prepared by computer or by hand but must be drawn to scale. Examples are provided in this guide. **The examples are provided as guidance only and shall not be used for the Site Plan. The Site Plan shall be prepared according to the conditions and details of the subject property. Applications submitted using an example as the Site Plan will not be accepted.**
- Construction details and sizing calculations worksheet of the specific BMP to be installed. Sample construction details and worksheets are provided in this guide.
- Draft *Stormwater Management Agreement and Declaration of Easement for Small Project Stormwater Management Plan*
- Application Fee: \$600.00 payable at time of application submittal

The Township Planning and Zoning staff will review the application submission to determine that it is complete and contains sufficient information to evaluate the proposed Small Project SWM Plan. Staff may conduct a site visit, discuss the Plan with the applicant and/or their consultant and consult with the Township engineer, if necessary, in the course of their review. If revisions to the Plan are necessary, review comments will be provided to the applicant. The applicant shall address the review comments and submit any documents or information to the Township for further review.

Stormwater Management Agreement and Declaration of Easement for Small Project Stormwater Management Plan

It is the property owner's responsibility to properly maintain BMPs installed as part of the project and to inform any future buyers of the function, operation and maintenance of BMPs on the property prior to its sale. The *Stormwater Management Agreement and Declaration of Easement for Small Project Stormwater Management Plan* outlines the responsibilities of the property owner for the BMP(s) as well as the rights of the Township to inspect the facility and enforce the maintenance requirements.

Once the Township's review comments have been addressed, the completed, signed and notarized *Stormwater Management Agreement and Declaration of Easement for Small Project Stormwater Management Plan*, including Exhibit A (the approved Small Project Stormwater Management Plan and BMP Operations & Maintenance Plan) must be submitted to the Township for review and signature. (The *Stormwater Management Agreement and Declaration of Easement for Small Project Stormwater Management Plan* template is provided as part of this *Guidance* document.) Upon approval and signature of the *Agreement* by the Township, the applicant shall record the *Agreement* at the Lancaster County Office of the Recorder of Deeds so it will be available to future property owners and title searches. A copy of the recorded *Agreement* and recording receipt shall be provided to the Township.

Once the Agreement is recorded and necessary documents are provided to the Township, the Small Project SWM Plan Permit will be issued, and construction can begin. The Township will conduct inspections during construction of the stormwater BMPs and after construction is completed. The number of inspections is dictated by the type of BMP on the Plan; Township staff will provide guidance regarding the inspection schedule when the Permit is issued.

Stormwater BMP Construction Details and Sizing Calculations

Example A: Structures without Gutters – Infiltration Trench

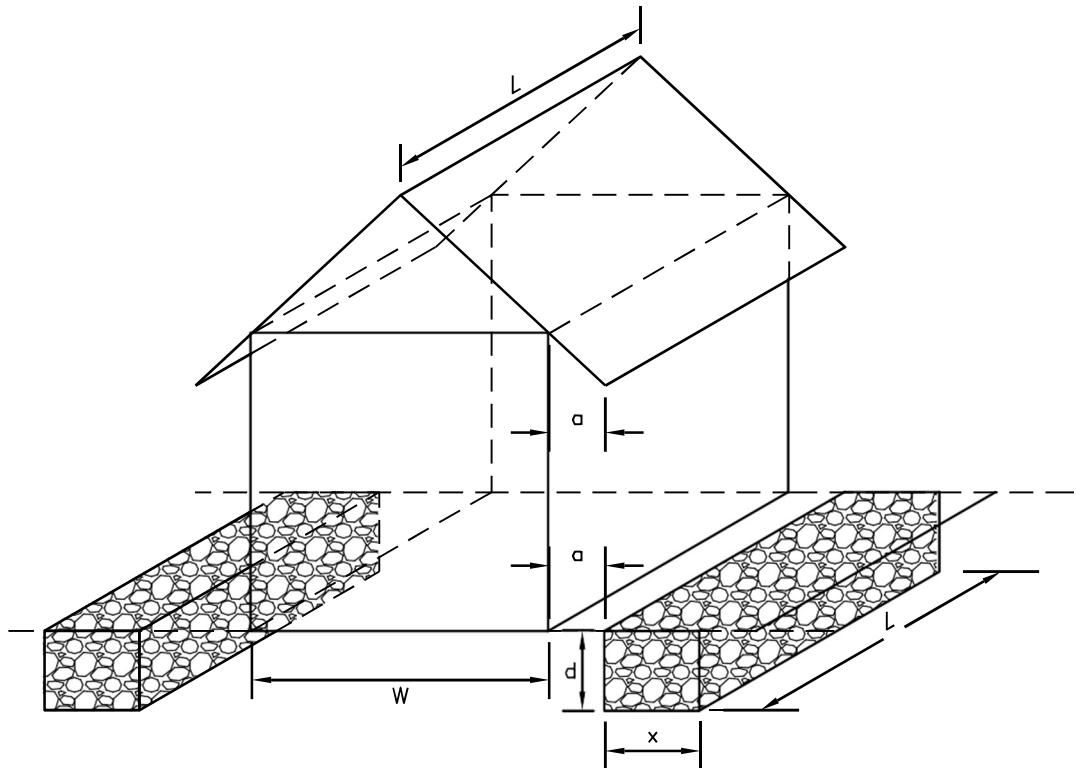
Example B: Structures without Gutters – Stone Seepage Bed

Example C: Structures with Gutters – Infiltration Pit

Example D: At Grade Impervious Surface – Infiltration Trench with Berm

Example E: Rain Garden

Rain Garden Native Planting List



KEY

L = LENGTH OF STRUCTURE = LENGTH OF SEEPAGE TRENCH (FT.)
W = WIDTH STRUCTURE (FT)
a = EAVE OVERHANG (FT) = TRENCH DISTANCE FROM STRUCTURE (FT)
x = WIDTH OF SEEPAGE TRENCH (FT)
d = DEPTH OF SEEPAGE TRENCH (FT) = 2'

REQUIRED STORAGE VOLUME

Impervious Area (SF)	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
Total Required Storage (CF)	83	100	117	133	150	167	183	200	217	233	250	267	283	300	317	333
Required Storage Volume Per Pit (CF)	42	50	58	67	75	83	92	100	108	117	125	133	142	150	158	167

Required Pit Size

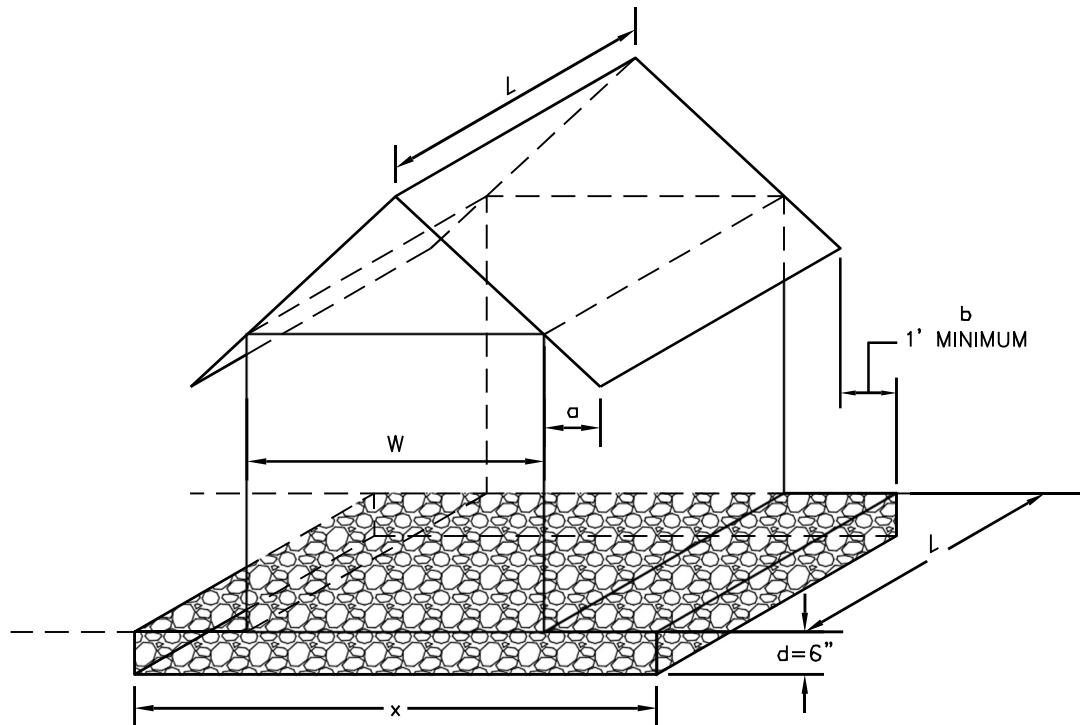
		Pit Width (x)									
		1	2	3	4	5	6	7	8	9	10
Pit Length (L)	10	8	16	24	32	40	48	56	64	72	80
	15	12	24	36	48	60	72	84	96	108	120
	20	16	32	48	64	80	96	112	128	144	160
	25	20	40	60	80	100	120	140	160	180	-
	30	24	48	72	96	120	144	168	192	-	-
	35	28	56	84	112	140	168	196	-	-	-
	40	32	64	96	128	160	192	-	-	-	-
	45	36	72	108	144	180	-	-	-	-	-
	50	40	80	120	160	-	-	-	-	-	-
	55	44	88	132	176	-	-	-	-	-	-

NOTES

1. TRENCH MUST BE PROVIDED ON EACH SIDE OF STRUCTURE.
2. SIDE OF TRENCH TO BE WRAPPED IN CLASS 1 GEOTEXTILE.
3. TRENCH TO BE FILLED WITH CLEAN STONE (3/4" MIN. SIZE).
4. TRENCH TO BE CONSTRUCTED AT 0% SLOPE ON UNDISTURBED SOIL.
5. TRENCH TO BE CHECKED REGULARLY TO MAINTAIN PROPER OPERATION.

SAMPLE A: STRUCTURES WITHOUT GUTTERS - INFILTRATION TRENCH

Note this BMP may be used for roofed structures only.



KEY

L = LENGTH OF STRUCTURE = LENGTH OF SEEPAGE BED (FT.)

W = WIDTH OF STRUCTURE (FT)

a = EAVE OVERHANG (FT)

b = DISTANCE FROM EAVE OVERHANG TO EDGE OF SEEPAGE BED (FT) = 1' MINIMUM

x = WIDTH OF SEEPAGE BED (FT)

$$x = W + 2 \text{ FT}$$

d = DEPTH OF SEEPAGE BED = 6"

REQUIRED STORAGE VOLUME

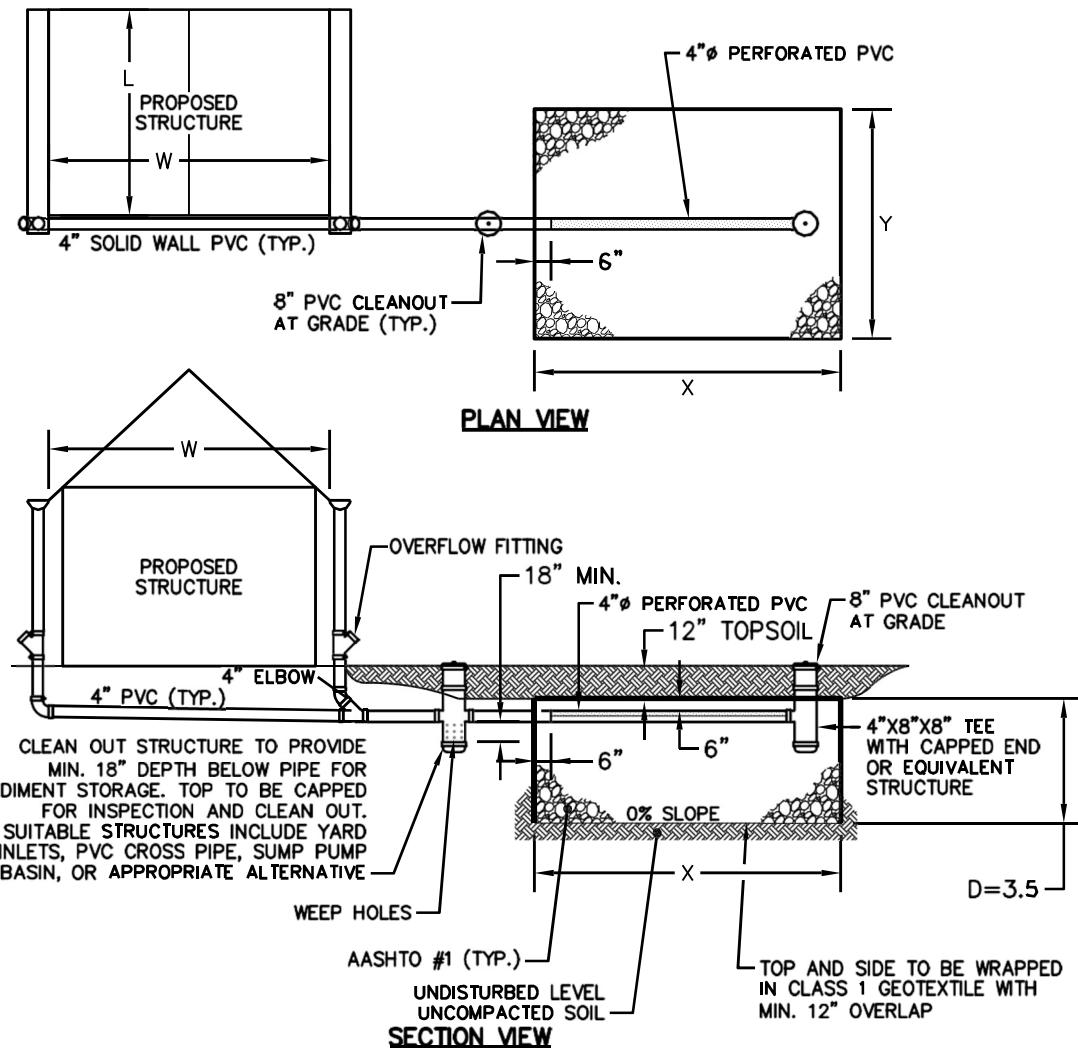
Impervious Area (SF)	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
Required Storage Volume Per Pit (CF)	42	50	58	67	75	83	92	100	108	117	125	133	142	150	158	167

NOTES

- 1.) SIDE OF BED TO BE WRAPPED IN CLASS 1 GEOTEXTILE.
- 2.) BED TO BE FILLED WITH CLEAN STONE (3/4" MIN. SIZE).
- 3.) BED TO BE CONSTRUCTED AT 0 % SLOPE ON UNDISTURBED SOIL.
- 4.) BED TO BE CHECKED REGULARLY TO MAINTAIN PROPER OPERATION.

Note this BMP may be used for sheds only.

SAMPLE B: STRUCTURES WITHOUT GUTTERS - STONE SEEPAGE BED



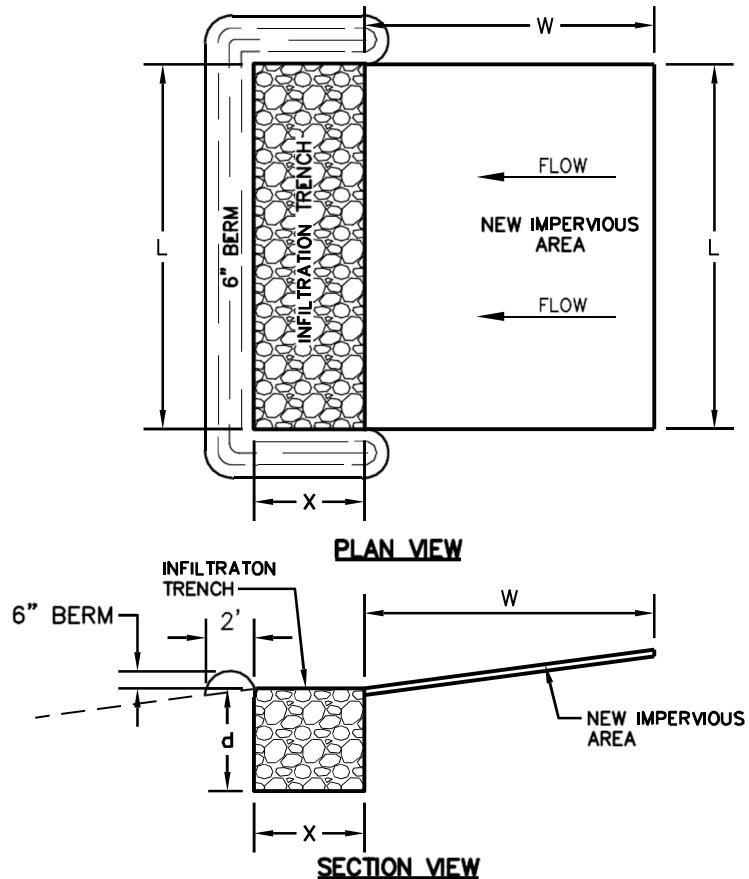
REQUIRED STORAGE VOLUME																
Impervious Area (SF)	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
Required Storage Volume Per Pit (CF)	42	50	58	67	75	83	92	100	108	117	125	133	142	150	158	167

		Required Pit Size									
		Pit Width (x)									
		5	6	7	8	9	10	11	12	15	20
Pit Length (Y)	5	35	42	49	56	63	70	77	84	105	140
	6	42	50	59	67	76	84	92	101	126	168
	7	49	59	69	78	88	98	108	118	147	196
	8	56	67	78	90	101	112	123	134	168	-
	9	63	76	88	101	113	126	139	151	189	-
	10	70	84	98	112	126	140	154	168	-	-
	11	77	92	108	123	139	154	169	185	-	-
	12	84	101	118	134	151	168	185	-	-	-
	15	105	126	147	168	189	-	-	-	-	-
	20	140	168	196	-	-	-	-	-	-	-

NOTES

1. BOTTOM OF BED ELEVATION TO BE 4.5' BELOW SURFACE TO ACCOUNT FOR 1' OF TOPSOIL OVER INFILTRATION BED.
2. PIPE TO BE APPROPRIATELY SIZED TO CARRY ROOF WATER. PVC PIPE SHALL HAVE A MIN. DIAMETER OF 4".
3. PIPING AND CLEANOUTS TO BE CENTERED WITHIN INFILTRATION BED.
4. BED TO BE CHECKED REGULARLY TO MAINTAIN PROPER OPERATION.

SAMPLE C: STRUCTURES WITH GUTTERS - INFILTRATION PIT



KEY

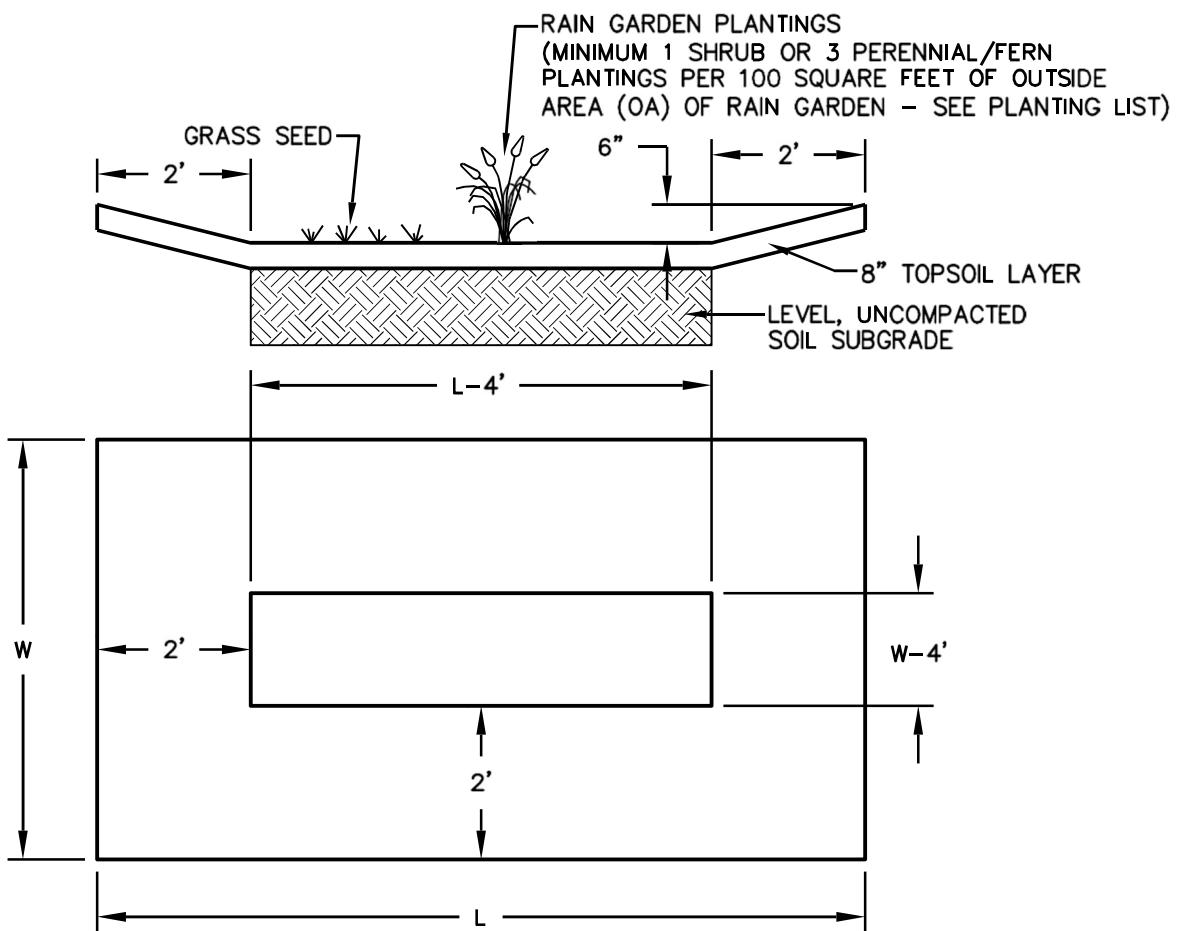
L = LENGTH OF NEW IMPERVIOUS SURFACE (FT) = LENGTH OF INFILTRATION TRENCH
 W = WIDTH OF NEW IMPERVIOUS SURFACE TRENCH
 X = WIDTH OF SEEPAGE TRENCH (FT)
 d = DEPTH OF SEEPAGE TRENCH (FT) = 3'

NOTES

- 1.) SIDE OF TRENCH TO BE WRAPPED IN PENNDOT CLASS 1 GEOTEXTILE.
- 2.) TRENCH TO BE FILLED WITH CLEAN STONE (3/4" MIN. SIZE).
- 3.) TRENCH TO BE CONSTRUCTED AT 0% SLOPE ON UNDISTURBED SOIL.
- 4.) TRENCH TO BE CHECKED REGULARLY TO MAINTAIN PROPER OPERATION.
- 5.) 6" BERM MAY BE REMOVED AS DEEMED APPROPRIATE BY THE MUNICIPALITY

Required Storage Volume															
Impervious Area Width (Ft) - W	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
Required Pit Width (Ft) - X	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3	7.0	7.7	8.4	9.1	9.8	10.5

SAMPLE D: AT GRADE IMPERVIOUS SURFACE - INFILTRATION TRENCH WITH BERM



REQUIRED STORAGE VOLUME																
Impervious Area (SF)	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
Required Storage Volume of Rain Garden (CF)	42	50	58	67	75	83	92	100	108	117	125	133	142	150	158	167
Required Rain Garden Size																
Length (L)	Width (x)															
	10	11	12	13	14	15	18	20	25	30						
10	34	38	42	46	50	54	66	74	94	114						
11	38	43	47	52	56	61	74	83	106	128						
12	42	47	52	57	62	67	82	92	117	142						
13	46	52	57	63	68	74	90	101	129	156						
14	50	56	62	68	74	80	98	110	140	170						
15	54	61	67	74	80	87	106	119	152	-						
18	66	74	82	90	98	106	130	146	186	-						
20	74	83	92	101	110	119	146	164	-	-						
25	94	106	117	129	140	152	186	-	-	-						
30	114	128	142	156	170	-	-	-	-	-						

SAMPLE E: RAIN GARDEN

Rain Garden Native Planting List

Perennials and Ferns:

Blue false indigo (*Baptisia australis*)
Blue flag iris (*Iris versicolor*)
Blue star (*Amsonia tabernaemontana*)
Blue vervain (*Verbena hastata*)
Boltonia (*Boltonia asteroides*)
Boneset (*Eupatorium perfoliatum*)
Bottlebrush grass (*Hystrich patula*)
Broomsedge (*Andropogon virginicus*)
Cardinal flower (*Lobelia cardinalis*)
Cinnamon fern (*Osmunda cinnamomea*)
Culvers root (*Veronicastrum virginicum*)
Golden ragwort (*Senecio aureus*)
Goldenrod (*Solidago patula*, *S. rugosa*)
Great blue lobelia (*Lobelia siphilitica*)
Green bullrush (*Scirpus atrovirens*)
Horsetail (*Equisetum* species)
Marsh marigold (*Caltha palustris*)
Mistflower (*Eupatorium coelestinum*)
Monkey flower (*Mimulus ringens*)
New England aster (*Aster novae-anglia*)
New York aster (*Aster novi-belgii*)
Obedient plant (*Physotegia virginiana*)
Royal fern (*Osmunda regalis*)
Seedbox (*Ludwigia alternifolia*)
Sensitive fern (*Onoclea sensibilis*)
Sneezeweed (*Helenium autumnale*)
Soft rush (*Juncus effusus*)
Swamp milkweed (*Asclepias incarnata*)
Swamp rose mallow (*Hibiscus moscheutos*)
Swamp sunflower (*Helianthus angustifolius*)
Switchgrass (*Panicum virgatum*)
Threadleaf coreopsis (*Coreopsis verticillata*)
Tussock sedge (*Carex stricta*)
White turtlehead (*Chelone glabra*)
Woolgrass (*Scirpus cyperinus*)

Shrubs:

American beautyberry (*Callicarpa americana*)
Arrowwood (*Viburnum dentatum*)
Black chokeberry (*Aronia melanocarpa*)
Broad-leaved meadowsweet (*Spirea latifolia*)
Buttonbush (*Cephalanthus occidentalis*)
Elderberry (*Sambucus canadensis*)
Inkberry (*Ilex glabra*)
Narrow-leaved meadowsweet (*Spirea alba*)
Ninebark (*Physocarpus opulifolius*)
Possumhaw (*Viburnum nudum*)
Red-osier dogwood (*Cornus sericea*)
St. Johnswort (*Hypericum densiflorum*)
Silky dogwood (*Cornus amomum*)
Smooth alder (*Alnus serrulata*)
Spicebush (*Lindera benzoin*)
Swamp azalea (*Rhododendron viscosum*)
Swamp rose (*Rosa palustris*)
Sweet pepperbush (*Clethra alnifolia*)
Wild raisin (*Viburnum cassinoides*)
Winterberry (*Ilex verticillata*)
Virginia sweetspire (*Itea virginica*)

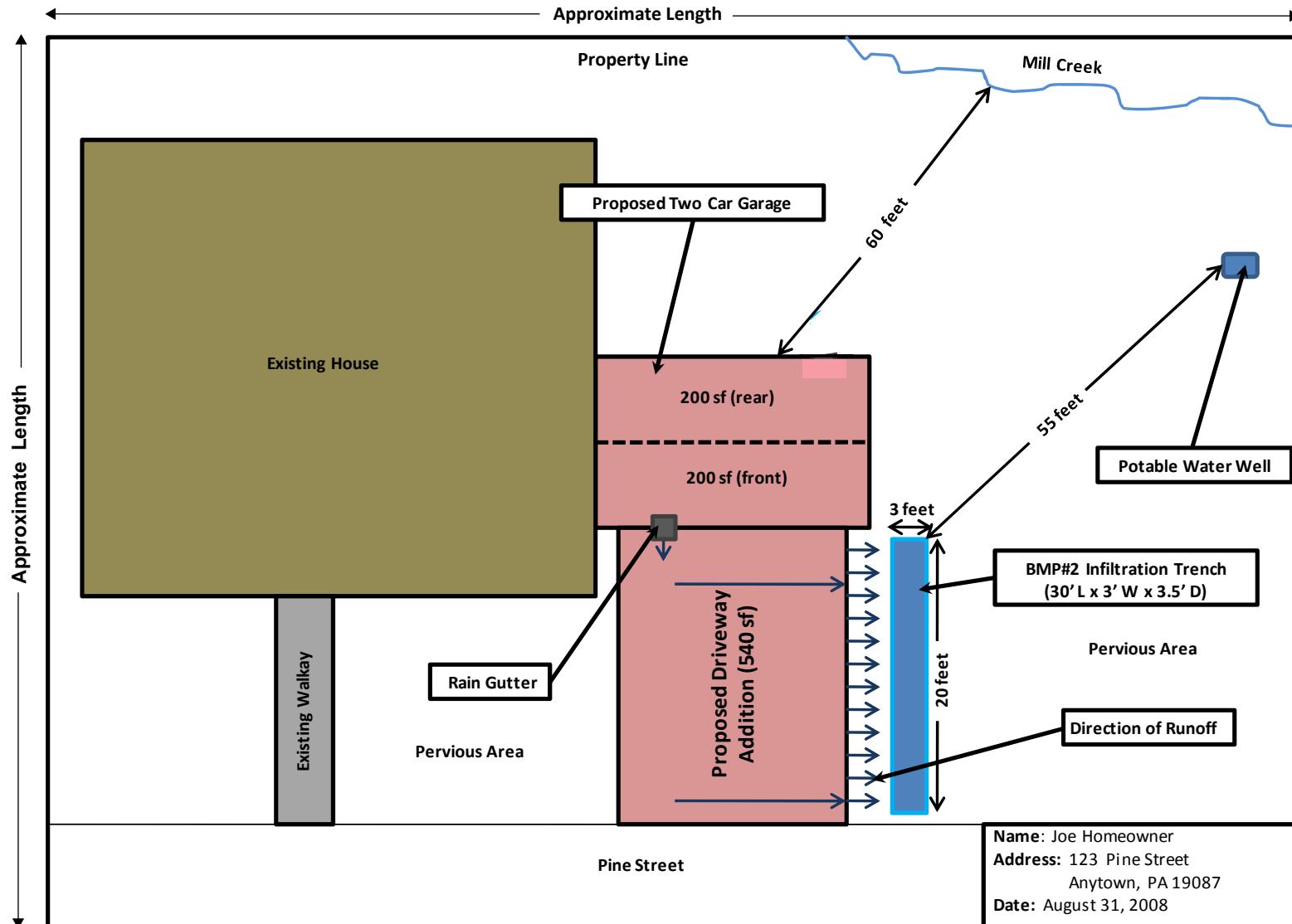
Small Project SWM Plan Site Plan Examples

Example 1: Simple Small Project Stormwater Management Site Plan – Infiltration Trench with Berm

Example 2: Small Project Stormwater Management Site Plan –

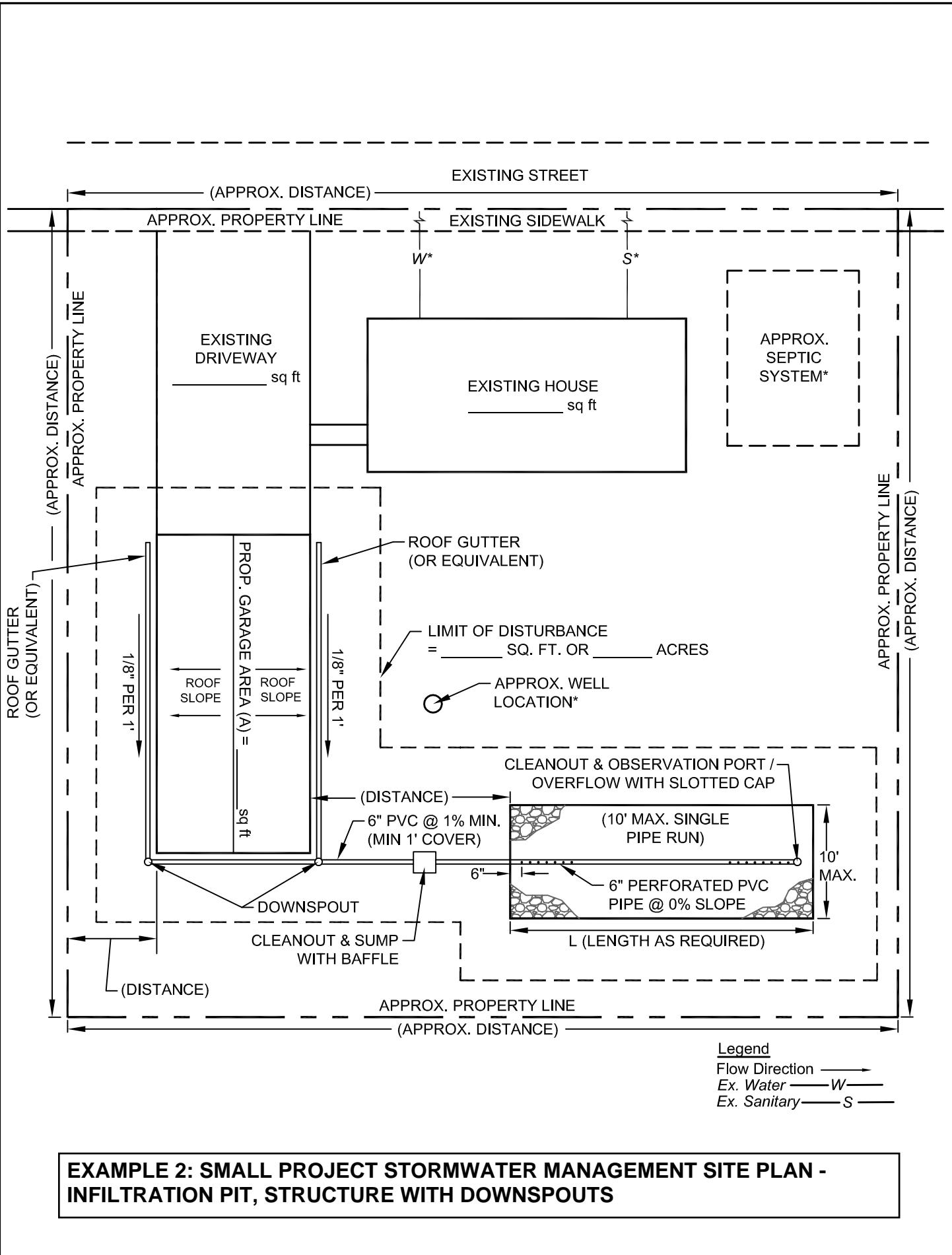
Example 3: Small Project Stormwater Management Site Plan – Hand-Drawn, Multiple BMPs

Note: All site plans must be drawn to scale.

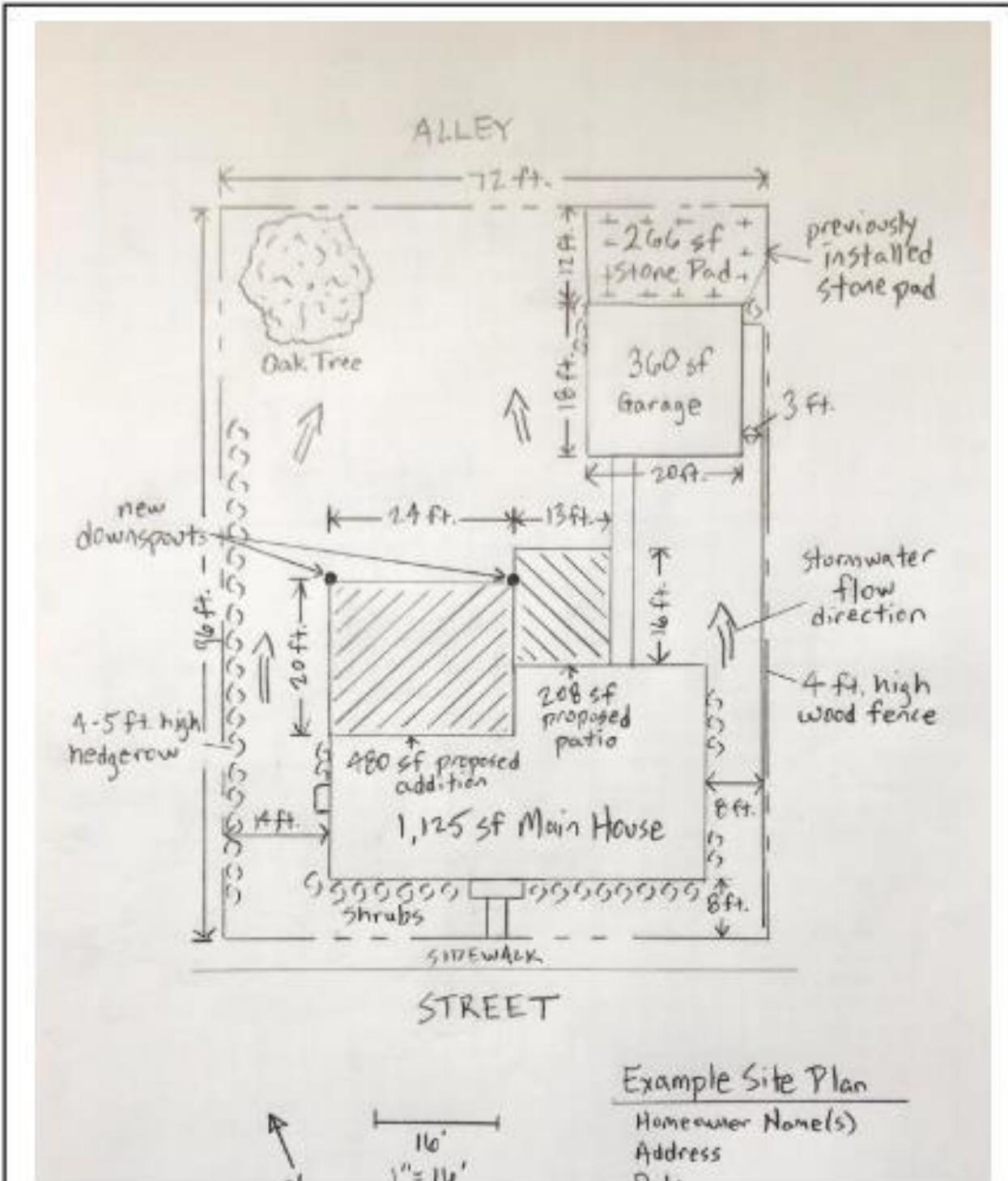


EXAMPLE 1: SIMPLE SMALL PROJECT STORMWATER MANAGEMENT SITE PLAN - INFILTRATION TRENCH WITH BERM

Note site plan must be drawn to scale.



Note site plan must be drawn to scale.



EXAMPLE 3: SMALL PROJECT STORMWATER MANAGEMENT HAND-DRAWN SITE PLAN, MULTIPLE BMPs

Note site plan must be drawn to scale.