BETHEL PARK SMALL PROJECTS STORMWATER MANAGEMENT

SMALL PROJECT DEFINITION

Regulated activities that create additional impervious areas of greater than 400 sq. ft. and less than 1,000 sq. ft. The impervious area on a specific property will be measured on a cumulative basis beginning on May 1, 2017.

SMALL PROJECT STORMWATER MANAGEMENT

Table 1 presents the Municipality's stormwater management requirements.

Table 1 – Stormwater Management Requirements

No.	Sq. Ft. of Proposed Impervious Surface	Stormwater Management Requirement
1	< 400	No requirements
2	400 to 1,000 (Small Project)	Capture and detain the first 2" of any storm event
3	> 1,000	Comply with Municipal Ordinance 60.22

Stormwater management for small projects will consist of capturing and detaining the first two inches of any storm event. For small projects, consider the following:

Two inches of rain results in the following volumes that need to be captured and detained:

- 400 sq. ft. * 2 in./(12 in./ft.) * 7.48 gal/cu. ft. = 499 gal., call it 500 gallons of detention storage.
- 1000 sq. ft. * 2 in./(12 in./ft.) * 7.48 gal/cu. ft. = 1247 gal., call it 1250 gallons of detention storage.

Therefore, small project detention requirements range from 500 gallons to 1250 gallons.

Capture and detention can be accomplished by a variety of methods, including, but not limited to:

1. Rain Barrels.
2. Rain Gardens.
3. Stone Sumps (Dry Wells) and Infiltration Trenches (filled with clean, AASHTO No. 3 stone, 40% void space. The void space will be used as the detention volume).
4. Other methods as approved by the municipal staff.
5. A combination of methods.

In all cases, the detention method must be designed to drain all accumulated runoff not less than 24 hours and not more than 72 hours after the end of the storm event. For example, a rain barrel can be drained through a soaker hose. Appropriate soil percolation conditions must be available for stone sumps and rain gardens, and demonstrated by percolation tests.

A maintenance agreement must be signed by the property owner to ensure the proper, continual inspection & maintenance of the capture and detention method.

SUBMITTALS FOR APPROVAL

The property owner must submit the following stormwater management information for review by the Municipality staff:

1. A written description of the proposed project, including the dimensions of all proposed impervious surfaces.
2. A scale drawing showing existing and proposed features of the property.
3. A written description of the proposed stormwater management methods.
4. Dimensioned drawings of the proposed stormwater management methods and their locations.
5. A list of proposed impervious surfaces and their square footage.
6. Supporting documentation, such as assumptions, calculations, rain barrel size, stone size, percolation tests, etc.
7. Draft operation & maintenance agreement.

Construction of the proposed improvements will not begin prior to receiving approval of the stormwater management plan from the Municipality.

APPENDIX C

SMALL PROJECT STORMWATER MANAGEMENT SITE PLAN

This small project stormwater site plan has been developed to assist those proposing residential projects to meet the requirements of the *Allegheny County Stormwater Management Plan* Model Ordinance without having to hire professional services to draft a formal stormwater management plan. This small project site plan is only permitted for projects with earth disturbances between one-quarter (0.25) acre and one (1) acre of earth disturbance (Section 302.B) and using *The Simplified Method* (CG-2 in the BMP Manual[3]) for Volume Control as described in Section 303.B. Additional information can be found in Chapter 6 of the Pennsylvania Stormwater Best Management Practices Manual

A. What is an applicant required to submit?

All requirements of Section 302.B including a brief description of the proposed stormwater facilities, including types of materials to be used, total square footage of proposed impervious areas, volume calculations, and a simple sketch plan showing the following information:

- Location of proposed structures, driveways, or other paved areas with approximate surface area in square feet.
- Location of any existing or proposed onsite septic system and/or potable water wells showing proximity to infiltration facilities.
- County Conservation District erosion and sediment control "Adequacy" letter as may be required by Municipal, County or State regulations.

B. Determination of Required Volume Control and Sizing Stormwater Facilities

By following the simple steps outlined below in the provided example, an applicant can determine the runoff volume that is required to be controlled and how to choose the appropriate stormwater facility to permanently remove the runoff volume from the site. Impervious area calculations must include all areas on the lot proposed to be covered by roof area or pavement which would prevent rain from naturally percolating into the ground, including impervious surfaces such as sidewalks, driveways, parking areas, patios or swimming pools. Sidewalks, driveways or patios that are designed and constructed to allow for infiltration are not included in this calculation.

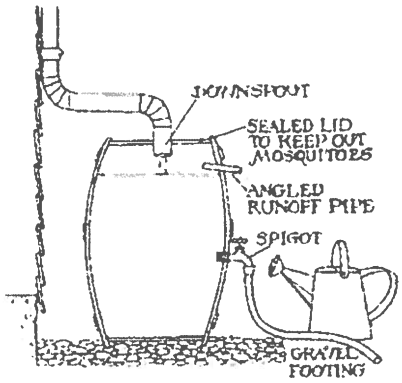
Site Plan Example: Controlling runoff volume from a proposed home site

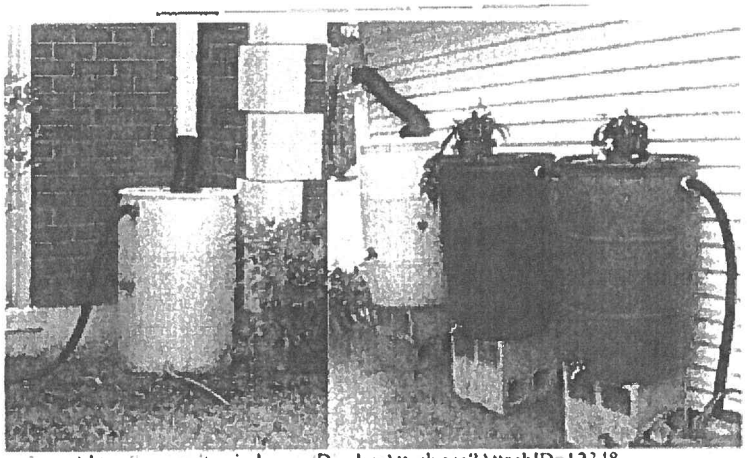
Step 1: Determine Total Impervious Surfaces

Impervious Surface			Area (sq. ft.)
House Roof (Front)	14 ft. x 48 ft.	=	672 sq. ft.
House Roof (Rear)	14 ft. x 48 ft.	=	672 sq. ft.
Garage Roof (Left)	6ft. x 24 ft.	=	144 sq. ft.
Garage Roof (Right)	6 ft. x 24 ft.	=	144 sq. ft.
Driveway	12 ft. x 50 ft.	=	1000 sq. ft.
Walkway	4 ft. x 20 ft.	=	80 sq. ft.

	Total Impervious		3000 sq. ft.

Figure 6: Rain Barrel Diagram and Examples





Sources: (top picture) http://www.citywindsor.ca/DisplayAttach.asp?AttachID=12348
(bottom picture on left) http://repurposinglife.blogspot.com/2009/05/rainwater-harvesting.html
(bottom picture on right) http://www.floridata.com/tracks/transplantedgardener/Rainbarrels.cfm

Sizing Example for a Rain Barrel

1. Determine contributing impervious surface area:

Garage Roof (Right)	6 ft. x 24 ft.	=	144 sq. ft.

2. Determine the amount of rainfall to be captured by the Rain Barrel. A smaller storm, no more than 2", is recommended to calculate the runoff to be captured. This example chose the 1" storm event.

3. Calculate the volume to be captured and reused:
   (144 sq. ft. x 1 inch of runoff) / 12 inches = 12 cu. ft.

4. Size the rain barrel:

   1 cu. ft. = 7. 48 gallons

   12 cu. ft. x 7.48 = 90 gallons

   90 gallons x (0.25*) = 22.5 gallons (*assuming that the rain barrel is always at least 25% full)

   90 gallons + 22.5 gallons = 112 gallons
   The rain barrel or barrels should be large enough to hold at least 112 gallons of water.

Determine trench length: L = 170 sq. ft. / 6 ft. = 28.3 ft.

Final infiltration trench dimensions: 3 ft. (D) x 6 ft. (W) x 28.3 ft. (L)

2. Rain Garden

A Rain Garden is a planted shallow depression designed to catch and filter rainfall runoff. The garden captures rain from a downspout or a paved surface. The water sinks into the ground, aided by deep rooted plants that like both wet and dry conditions. The ideal location for a rain garden is between the source of runoff (roofs and driveways) and the runoff destination (drains, stream, low spots, etc.).

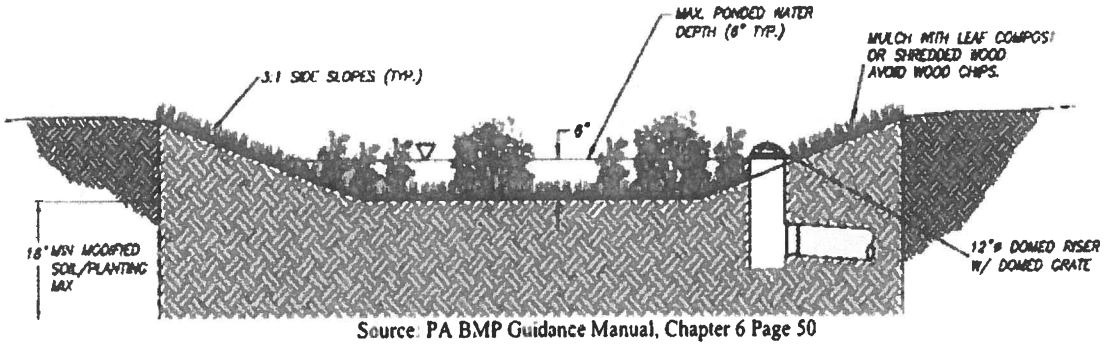
Design Considerations:

- A maximum of 3:1 side slope is recommended.
- The depth of a rain garden can range from 6 - 8 inches. Ponded water should not exceed 6 inches.
- The rain garden should drain within 72 hours.
- The garden should be at least 10-20 feet from a building's foundation and 25 feet from septic system drainfields and wellheads.
- If the site has clay soils, soil should be amended with compost or organic material.
- Choose native plants. See http://pa.audubon.org/habitat/PDFs/RGBrochure_complete.pdf for a native plant list. To find native plant sources go to www.pawildflower.org.
- At the rain garden location, the water table should be at least 2' below the soil level. If water stands in an area for more than one day after a heavy rain you can assume it has a higher water table and is not a good choice for a rain garden.

Maintenance:

- Water plants regularly until they become established.
- Inspect twice a year for sediment buildup, erosion and vegetative conditions.
- Mulch with hardwood when erosion is evident and replenish annually.
- Prune and remove dead vegetation in the spring season.
- Weed as you would any garden.
- Move plants around if some plants would grow better in the drier or wetter parts of the garden.

Figure 4: Rain Garden Diagram



Source: PA BMP Guidance Manual, Chapter 6 Page 50

Sizing Example for Rain Garden

1. Pick a site for the rain garden between the source of runoff and a low lying area, a.k.a., a drainage area.

2. Perform an infiltration test to determine the depth of the rain garden:
   - Dig a hole 8" x 8"
   - Fill with water and put a popsicle stick at the top of the water level.
   - Measure how far it drains down after a few hours (ideally 4 hours).
   - Calculate the depth of water that will drain out over 24 hours.

3. Determine total impervious surface area to drain to rain garden:

House Roof (Front)	14 ft. x 48 ft.	=	672 sq. ft.

4. Sizing the rain garden:
   For this example, let's say the infiltration test determined 6" of water drained out of a hole in 24 hours. The depth of the rain garden should be set to the results of the infiltration test so 6" is the depth of the rain garden. The sizing calculation below is based on controlling 1" of runoff. First divide the impervious surface by the depth of the rain garden.

672 sq. ft. / 6 (depth of rain garden in inches) = 112 sq. ft.

In order to control 2" of runoff volume, the rain garden area is multiplied by 2.

112 sq. ft. * 2 = 224 sq. ft.

The rain garden should be about 225 sq. ft. in size and 6" deep.

3. Dry Well (a.k.a., Seepage Pit)

A Dry Well, sometimes called a Seepage Pit, is a subsurface storage facility that temporarily stores and infiltrates stormwater runoff from the roofs of structures. By capturing runoff at the source, Dry Wells can dramatically reduce the increased volume of stormwater generated by the roofs of structures. Roof leaders connect directly into the Dry Well, which may be either an excavated pit filled with uniformly graded aggregate wrapped in geotextile, or a prefabricated storage chamber or pipe segment. Dry Wells discharge the stored runoff via infiltration into the surrounding soils. In the event that the Dry Well is overwhelmed in an intense storm event, an overflow mechanism (surcharge pipe, connection to a larger infiltration are, etc.) will ensure that additional runoff is safely conveyed downstream.

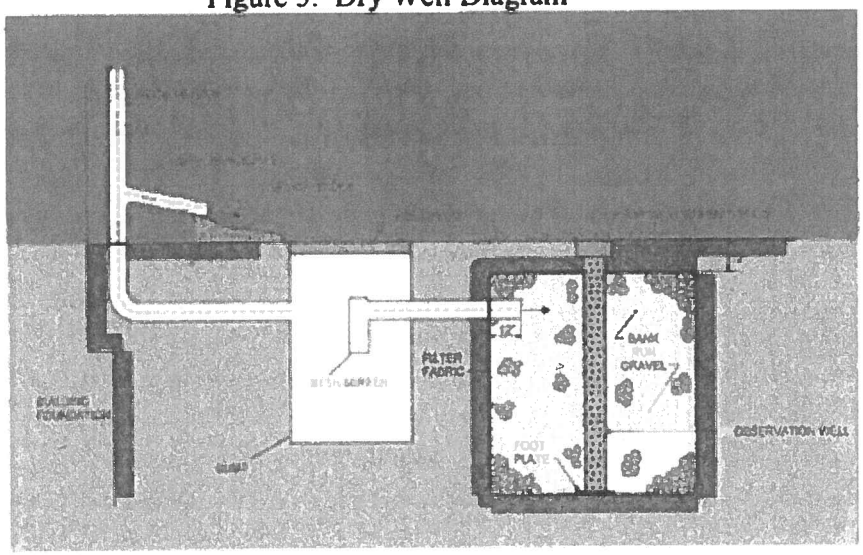
Design Considerations:

- Dry Wells typically consist of 18 to 48 inches of clean washed, uniformly graded aggregate with 40% void capacity (AASHTO No. 3, or similar). "Clean" gravel fill should average one and one-half to three (1.5 – 3.0) inches in diameter.
- Dry Wells are not recommended when their installation would create a significant risk for basement seepage or flooding. In general, 10 - 20 feet of separation is recommended between Dry Wells and building foundations.
- The facility may be either a structural prefabricated chamber or an excavated pit filled with aggregate.
- Depth of dry wells in excess of three-and-a-half (3.5) feet should be avoided unless warranted by soil conditions.
- Stormwater dry wells must never be combined with existing, rehabilitated, or new septic system seepage pits. Discharge of sewage to stormwater dry wells is strictly prohibited.
- As shown in Figure 5, the installation should include a surcharge or overflow pipe.

Maintenance:

- Dry wells should be inspected at least four (4) times annually as well as after large storm events.
- Remove sediment, debris/trash, and any other waste material from a dry well.
- Regularly clean out gutters and ensure proper connections to the dry well.
- Replace the filter screen that intercepts the roof runoff as necessary.

Figure 5: Dry Well Diagram



Source PA BMP Guidance Manual, Chapter 6, Page 65

Sizing Example for Dry Wells:

1. Determine contributing impervious surface area:

House Roof (Rear)	14 ft. x 48 ft.	=	672 sq. ft.

2. Determine required volume control:

   (672 sq. ft. x (2 inches of runoff / 12 inches/ft.) = 112 cu. ft.

   112 cu ft. / 0.4 = 280 cu. ft. (assuming the 40% void ratio in the gravel bed)

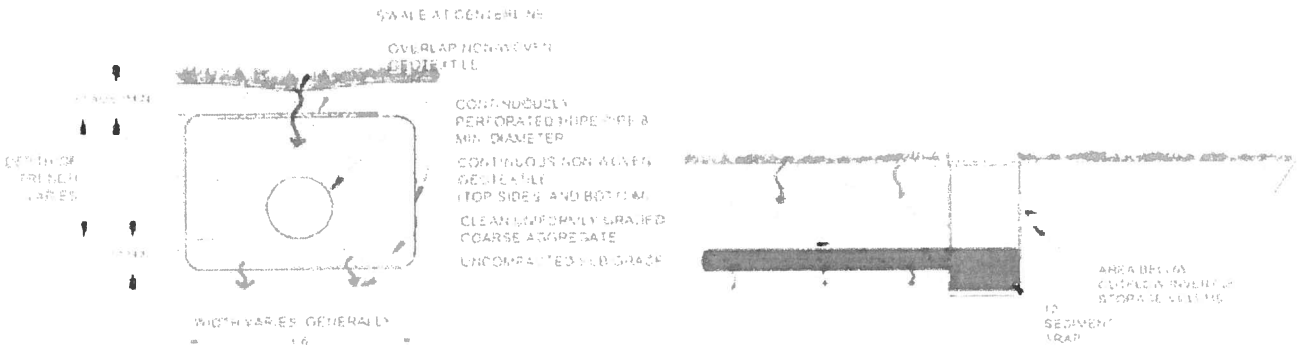
3. Sizing the dry well:

   Set the depth to 3.5 ft.; Set the width equal to the length for a square chamber.

   3.5 ft. x L x L = 280 cu. ft.; LxL = 280 cu. ft. / 3.5 ft.; thus LxL= 80 sq. ft.; L=9 (approx)

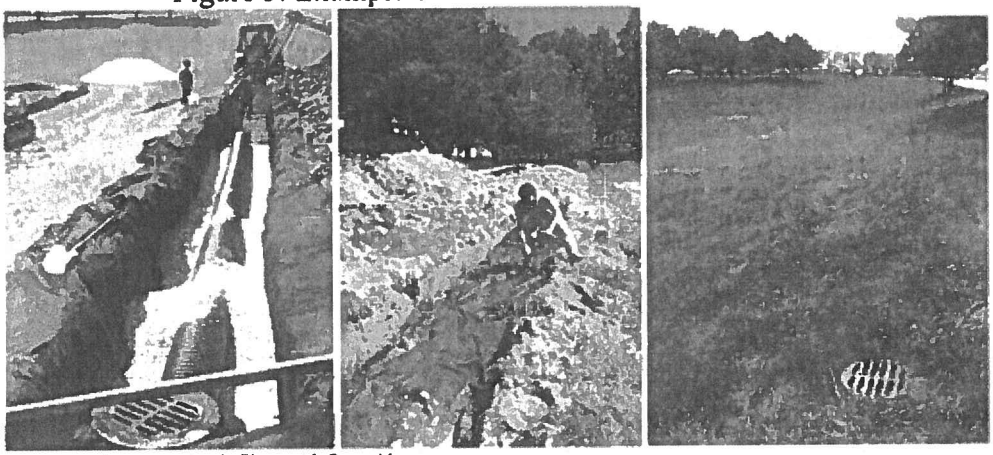
   Dimensions = 3.5 ft. (D) x 9 ft. (L) x 9 ft. (W)

Figure 2: Infiltration Trench Diagram



Source: PA BMP Guidance Manual, Chapter 6, page 42

Figure 3: Example of Infiltration Trench Installation



Source: PA BMP Guidance Manual, Chapter 6, Page 46

Sizing Example for Infiltration Trench

1. Determine Total Impervious Surface to drain to Infiltration Trench:

Garage Roof (Left)	6 ft. x 24 ft.	=	144 sq. ft.
Driveway	12 ft. x 50 ft.	=	1000 sq. ft.
Walkway	4 ft. x 20 ft.	=	80 sq. ft.

2. Determine the required infiltration volume:
   (1224 sq. ft. x 2 inches of runoff)/12 ft. = 204 cu. ft. / 0.4* = 510 cu. ft.
   (*0.4 assumes 40% void ratio in gravel bed)

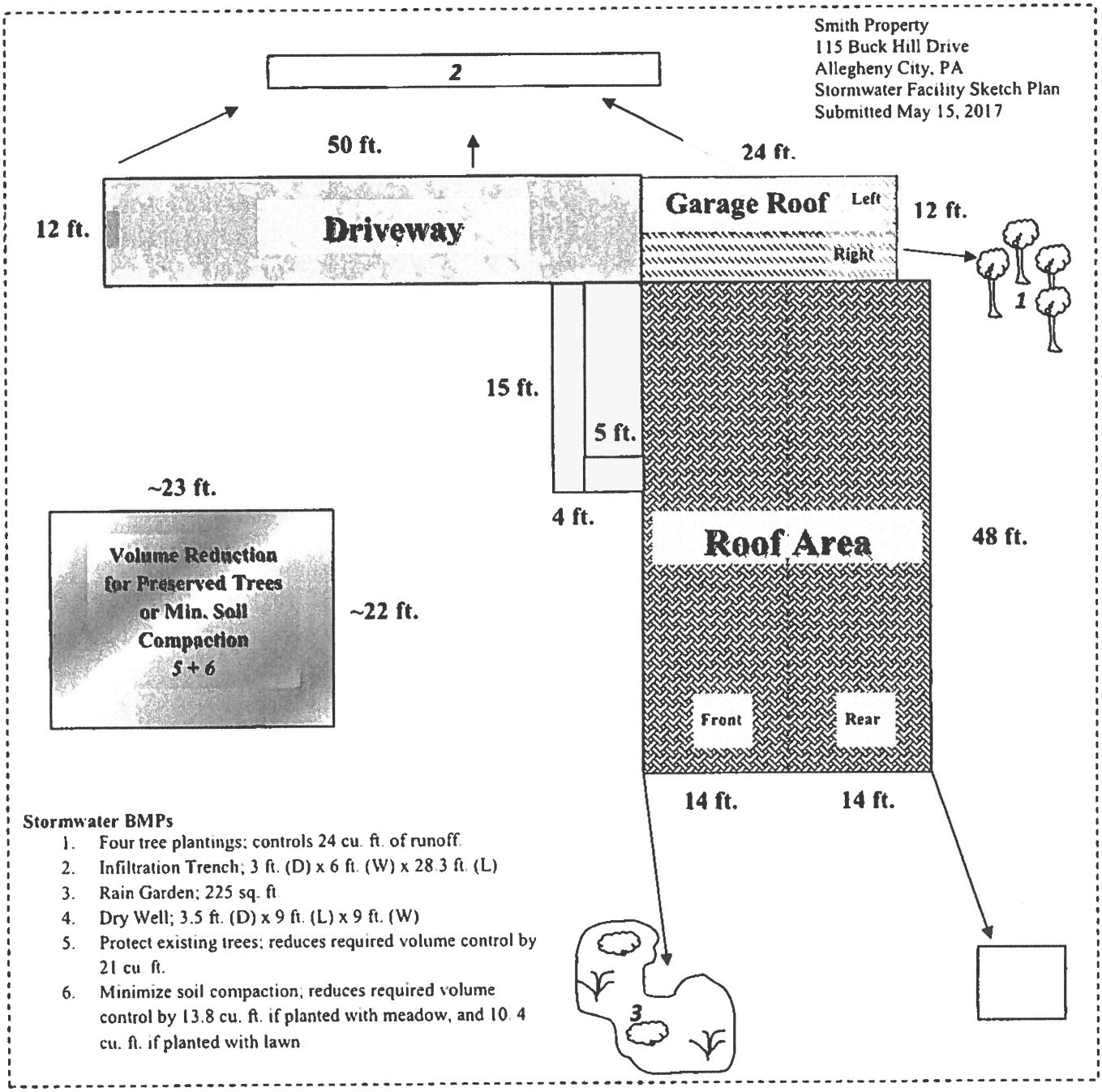
3. Sizing the infiltration trench facility:
   Volume of Facility = Depth x Width x Length

   Set Depth to 3 feet and determine required surface area of trench.

   510 cu. ft. / 3 ft. = 170 sq. ft.

   The width of the trench should be greater than 2 times its depth (2 x D), therefore in this example the trench width of 6 feet selected.

Figure 1: Sample Site Sketch Plan



Step 2: Determine Required Volume Control (cubic feet) using the following equation:

Volume (cu. ft.) = (Total impervious area in square feet x 2 inches of runoff) /12 inches

(3,000 sq. ft. x 2 inches of runoff) /12 inches = 500 cu. ft.