



Volunteer

Professional

Volunteer + Professional

# Stormwater Cistern

Image Source: Adrian Benko, "Rain\_on\_grass2.jpg," 15 May 2005 via Wikimedia, CC BY-SA 3.0.





**The Stormwater Cistern offers Detroiters a moderately “off-the-grid” solution to stormwater collection, management, and reuse.**

**Stormwater collected in the cistern is suitable for any household, business, or outdoor use where potable (drinkable) water is not required, for example irrigation and car washing.**

**This lot design enables households and businesses to take initiative and participate in water conservation activities on their own lot.**

**For more information refer to [DFC-lots.com](https://dfc-lots.com)**

### What is the lot design likely to cost?

The estimated cost of the Stormwater Cistern is over \$5,500 and based on utilizing professional labor. The Field Guide recommends hiring a professional for lot preparation and installation, as the size and scale of the cistern will depend on the individual resident’s stormwater catchment area.

### How much upkeep will this lot design require?

The maintenance of this lot design depends on the complexity of the stormwater cistern system selected. The City of Detroit requires all rain barrels and cisterns installed to include a filtering system. Cisterns usually require monitoring every few months to ensure no sediment or bacteria is contaminating the cistern.

### Will the installation of this lot design require a professional?

The installation will require professional assistance for all steps of this lot design as it requires significant earth moving, earth sculpting, and engineering. Please refer to the Step-By-Step section for guidance and professional installation requirements for the lot design. This will help when you to discuss installation times and costs with the selected professional.

### How long will it take to install this lot design?

This lot design requires a professional for all steps of the installation. Coordinate with the selected professional to determine projected installation time for their completed work. The Field Guide does not recommend undertaking this project on a community volunteer level.

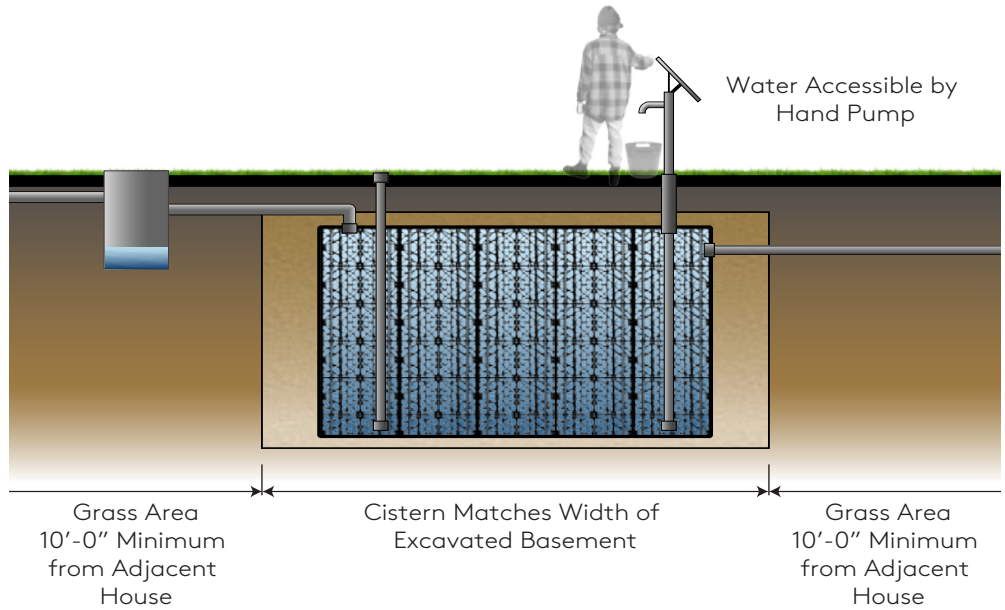
Cost	\$50 - 1,000	\$1,000 - 2,500	\$2,500 - 5,500	<b>\$5,500 +</b>
People	Volunteer	<b>Professional</b>		Volunteer + Professional
Experience	Volunteer experience is not applicable because a professional is recommended.			
Upkeep	Low	<b>Medium</b>		High
Stormwater	Good	Better		<b>Best</b>
Location	<b>Residential or Commercial Lot in Sun or Shade</b>			

# Stormwater Cistern

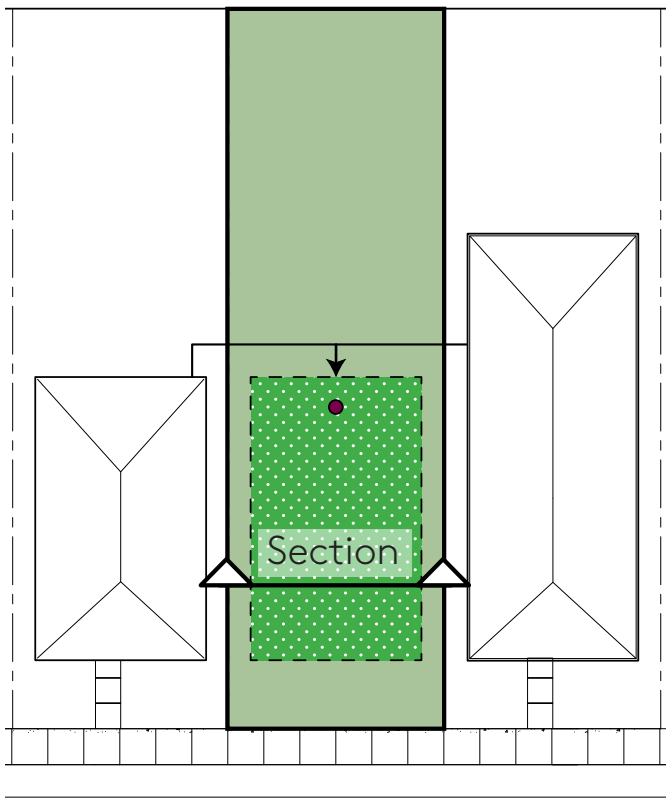
## Example of Below-Ground Stormwater Cistern



1 - Installation of below-ground cistern



## Where Do I Grow?



The Stormwater Cistern can be constructed on a single residential or commercial lot and utilized by one or two neighboring properties.

- Stormwater Cistern (Below ground)
- Hand Pump
- Grass or Optional Groundcover

## Before You Start

### 'Construction Ready'

This lot design assumes that you have prepared the lot to a 'construction ready' state.

'Construction Ready' refers to a lot that is clean and clear of trash, hazardous objects, unwanted trees, brush and vegetation, fences, and other unwanted structures.

It may be necessary to remove grass in preparation for your lot design. Refer to the Remove Your Grass box located on the right hand side of this page for more information.

Is there an available water source near your lot? Consider how and where you will access water during and after construction to ensure that your plants can establish.

If your lot is not ready for construction, refer to the [Clean + Green](#) lot design.

You can find the lot design at [DFC-lots.com](http://DFC-lots.com).

### Call Before You Dig

Locate underground utilities before beginning your lot design. MISS DIG provides a free service to Michigan residents by locating and marking utilities on requested properties. Call (800) 482-7171 or 811 at least three days before you plan to start digging on your lot.

### Test Your Soil

Harmful pollutants have made their way into many urban soils. To proceed with awareness, consider having your soil tested before construction. Two great options are available:

Soil testing is free to members of Keep Growing Detroit's Garden Resource Program. Call (313) 757-2635 for more information or visit [detroitagriculture.net](http://detroitagriculture.net).

If you are not yet a member, you can work directly with Michigan State University's (MSU) Extension Program. They have a Home Lawn and Garden Soil Test Mailer for \$25. For more information call (888) 678-3464 or visit [msusoiltest.com](http://msusoiltest.com).

If you are concerned about the presence of lead or other contaminants in your soil, call the Michigan Department of Health and Human Services at (866) 691-5323 or (800) 424-LEAD.

### Remove Your Grass

Need to remove grass in areas where you are constructing your lot design?

There are many ways to remove unwanted grass. The first is to remove the grass and its root system by digging up the grass. Another option is to cover your lot with cardboard or a plastic tarp to smother your grass in darkness. It will take several weeks, but after being covered, the dead grass will be easier to remove.

### Till Safely

Before you till, inspect your lot for signs of buried concrete or rubble that was not removed during the cleanup stage. Large debris can ruin tiller blades.

When tilling, wear appropriate safety gear, such as covered boots with socks, long pants, safety glasses, dust mask, and ear protection. Make sure you understand the safe operating procedures of your tiller. Refer to the user's manual.

# Stormwater Cistern Step-By-Step

## Let's Start

**Want to create the Stormwater Cistern? The Field Guide recommends hiring a professional for all tasks. Here are a few guiding principles to help you understand the tasks involved in the lot design. Only undertake installing the design yourself if you have professional construction experience.**

Check off tasks as you go along.

## Guiding Principles

### Professional Recommended:

- Types of Cisterns**
- Harvest Rain**
- Find Catchment Area**
- Select Cistern Use**
- Install a Rain Barrel**
- Maintain Cistern**

## Types of Cisterns

A cistern is a waterproof receptacle that stores water for future use. Cisterns are usually designed to catch stormwater. There are two main types of cisterns: above-ground and below-ground.

Above-ground cisterns are cheaper to install than below-ground cisterns; however, if a house is going to be removed on the lot next door, talk to a professional about how to utilize the unfilled basement area for cistern placement. An electrical hand pump will be required with below-ground cistern.

If you decide to add a cistern to your lot, you will need to engage a professional to help ensure the design is engineered and installed to an adequate standard. Residents and community members can play important roles in planning, researching, and fund-raising for this project.

If you are considering installing a cistern, here are a few variable to explore with the assistance of a professional:

- Rainfall Availability
- Roof-Catchment Area
- Cistern Size and Usage
- Rain Barrels

## Harvest Rain

Detroit's annual rainfall is 32 to 34 inches. 98% of the storms are 2 inches or less. Keep in mind not all rain water can be captured for reuse.

Ask your professional or lot engineer to estimate the amount of annual rainfall that can be collected from your roof-catchment area. A professional can help you estimate what size and type of cistern is best for long-term benefits, such as reducing your water bill.

## Exploring Stormwater Cistern

### ○ Find Catchment Area

It is important to purchase the correct size cistern according to your needs and the water availability of your catchment area. Speak to a professional to find out what size, shape and location works best for your catchment area. The following are a few guiding principles on cistern catchment areas:

- If your catchment area is relatively small, consider a small cistern or rain barrel.
- Cisterns should be located close to the water source being used, typically the house.
- Below-ground cisterns are recommended in colder climates like Michigan. This will help prevent the water from freezing during the winter and will provide cool water during summer months.
- Cisterns should be at least ten feet from sewage and drainage lines and 50 feet away from non-watertight sewer lines, drains, septic tanks, and animal stables.
- Avoid placing cisterns in areas subject to flooding.
- Remember to contact Miss Dig at 811 to determine if there are any subsurface infrastructure conflicts on your lot.
- Above-ground cisterns can be used for both water harvesting and detention storage by oversizing the cistern and then poking a hole in the upper side of the cistern. The volume below the hole is a permanent water storage for water reuse applications. The volume above the hole is temporary detention storage as the hole acts as a flow regulator to slowly release the water.

### ○ Select Cistern Use

It is important to know how you would like to use the water from your cistern. **Are you planning to re-use water for household uses or landscape irrigation?**

Currently, the plumbing and building codes in Detroit present a major barrier to using cistern-stored water for traditional household uses. If you are still interested in re-using water for household use, speak to a professional or consider the [Laundry to Landscape](#) lot design, available on the Field Guide web site, as a possible alternative.

**The Field Guide recommends using the cistern for landscape irrigation.** The following are a few guiding principles to help you estimate the size of cistern you may need:

- To estimate the proper cistern size, use one gallon for every one inch of rain fall. Catchment area (square feet) x 1/12 (1 inch shown in feet) x 0.90 (runoff coefficient) x 7.48 (cubic feet shown in gallons). For example a 1,000 square foot catchment area would produce about 560 gallons of water in a one-inch rain event. (Information on cistern landscape irrigation calculation has been obtained from the [Rainwater Cisterns](#) document by the City of Chicago Department of Environment.)
- Lawn, shrubs, plants, and trees require roughly one inch of water per week. For example, a 3,000 square foot lot would require 1,800 gallons of water per week; therefore, you would need a 1,800 gallon cistern for your lot.
- Another way to figure out the size of the cistern needed is to look at your water bill and calculate monthly water use. This should give you an accurate measure of water supply and demand.

## Exploring Stormwater Cistern

### ○ Install a Rain Barrel

If you are not interested in installing a large-scale cistern, a simpler alternative to collecting rain water is to connect your downspout to a rain barrel.

**An average rain barrel collects about 55 gallons of water, and its overflow can be designed to connect to a rain garden.**

A 55 gallon rain barrel will provide enough water to maintain small residential gardens. Residents must use water in the rain barrel regularly so it has capacity to collect water during the next rainfall. An alternative is to attach a soaker hose to the rain barrel. The soaker hose lets the water out very slowly and can be placed strategically to allow the barrel to irrigate nearby plants. Underneath the roof soffit where plants usually do not get enough rain water is a good location for placing a soaker hose. This arrangement helps empty rain barrels and prepares them for the next stormwater collection.

The Field Guide recommends connecting with the [Sierra Club of Detroit](#) to learn more about rain barrels.

### ○ Maintain Cistern

Cistern water should be used regularly. Visually inspect your cistern for leaks or damages on a seasonal basis.

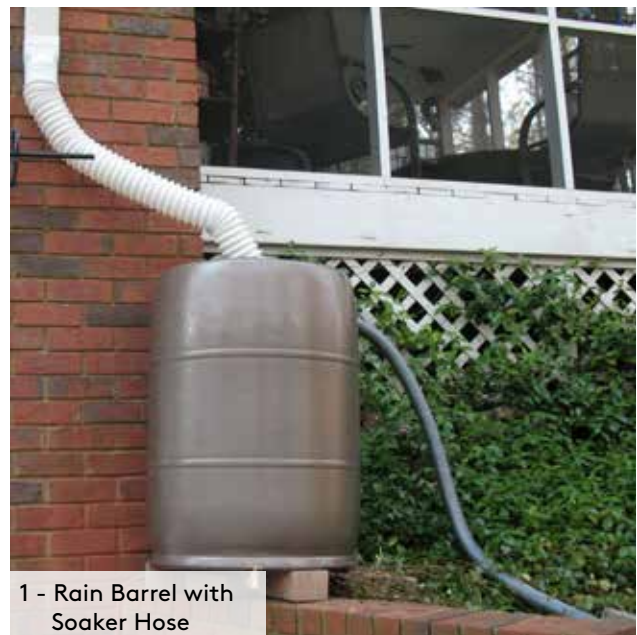
In the winter months, empty above-ground cisterns. Check the cistern's screens, filters, and hoses for debris. More complex cisterns will require additional maintenance.

### Understanding the Plan

The lot design plan on the following page illustrates key elements related to a below-ground cistern and their potential location on a 30 by 100 lot.

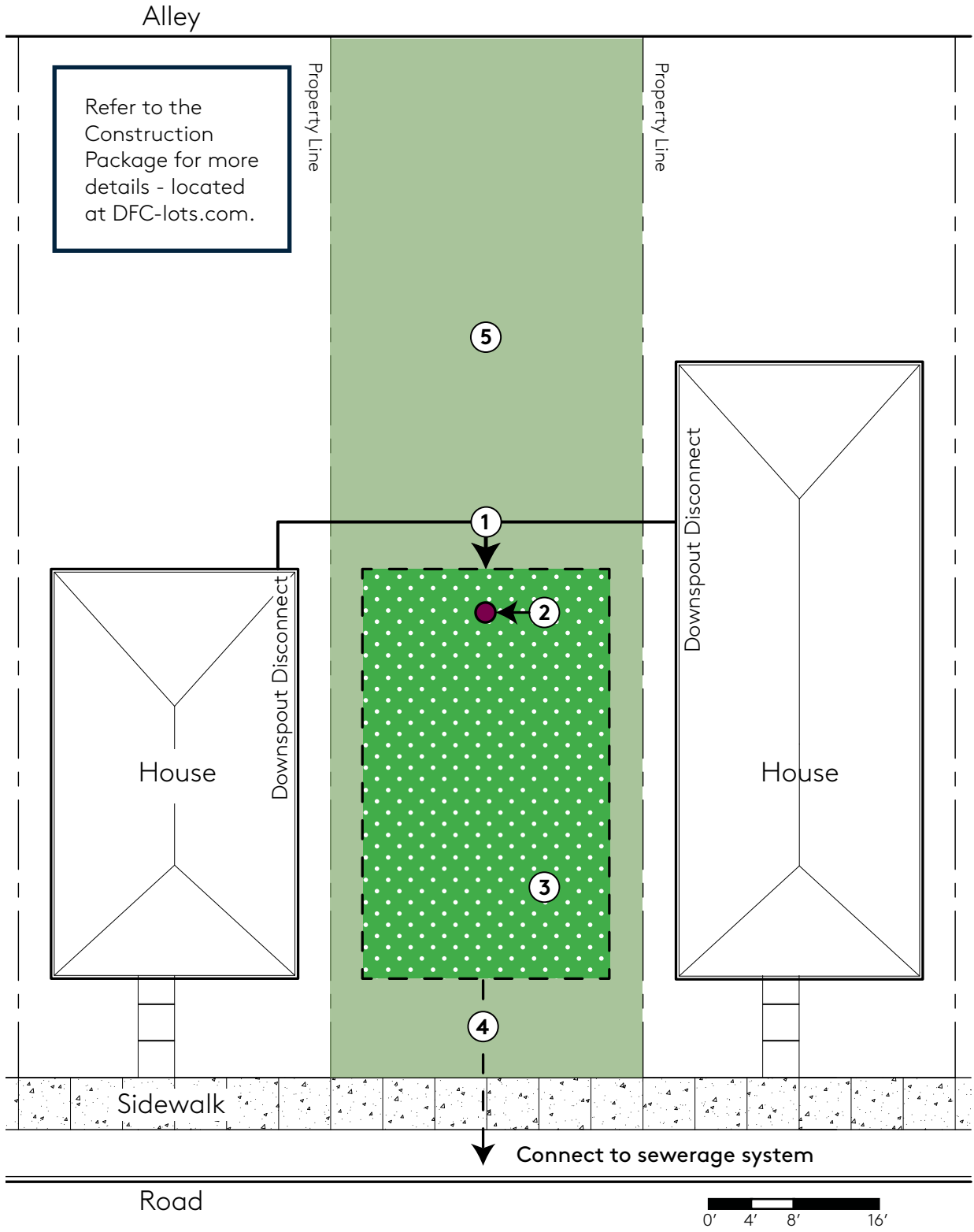
If possible, the Field Guide recommends utilizing the demolition process to construct the cistern in a basement hole before it is filled. This method can save time and money otherwise involved in excavation.

The plan also shows a hand pump which can be added to the cistern to pump water for use. The pump should be placed in the location that works best with your landscape.



1 - Rain Barrel with Soaker Hose

# Stormwater Cistern Lot Design



- 1 Sedimentation Trap (Below ground)
- 2 Hand Pump
- 4 Below ground Drain (Culvert)
- 5 Grass or Optional Groundcover
- 3 Stormwater Cistern (Below ground)



## Did You Know?

### Professionals Can Help!

The Field Guide to Working With Lots provides a Construction Package for each lot design. The Construction Package includes information and details required for a professional to construct this design. On the Field Guide web site, use the [Construction Package](#) link located near the top of this lot design page to download and print. Your selected professional will then be able to provide a cost estimate and schedule based on the condition of your lot and the design you select.

### Want to Hire Locally?

DFC-lots.com has a growing list of Detroit-based professionals and suppliers of landscape materials and services.

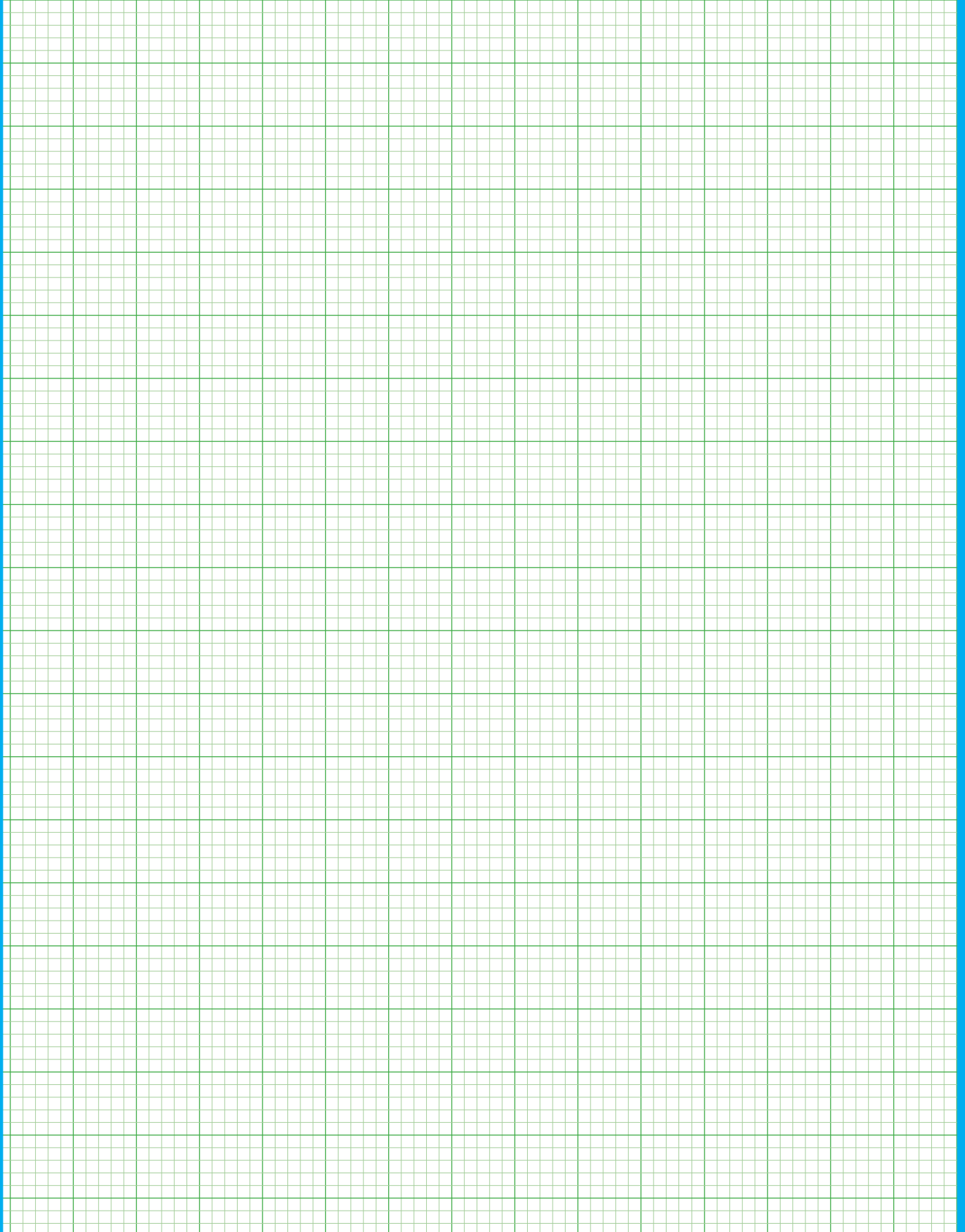
Still unsure of where to start?

Call (313) 294-LOTS or email [fieldguide@detroitfuturecity.com](mailto:fieldguide@detroitfuturecity.com) for assistance.

### Helpful Facts

- Cisterns and rain barrels keep stormwater on your lot for reuse instead of entering the City's sewerage system.
- Using water stored in a cistern can save money on your water bill.
- Collecting rainwater in a cistern or rain barrel can help reduce the risk of basement flooding.
- Plants prefer rain water to tap water. Tap water contains chlorine that can inhibit the health of your plants.

## Draw Your Lot



## Stormwater Cistern Field Notes



**DETROIT  
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**A FIELD GUIDE**

**Visit [DFC-lots.com](http://DFC-lots.com)  
#DFClots**

Image Source: Massimo Catarinella, "Raindrops on a window of a building in Amsterdam, The Netherlands." 06 December 2008 via Wikimedia, CC BY-SA 3.0.