Single-family Residences Stormwater Management Guide

Introduction

Background and Purpose

Land development can permanently alter the way that stormwater runs across the site and neighboring properties due to grading, compaction, and added impervious area. In order to mitigate these impacts, the City of Franklin requires stormwater runoff from developed sites to be managed in a manner which maintains or improves the stormwater quantity from that of the predeveloped site.

The purpose of this manual is to provide guidance for selecting, sizing, and installing stormwater management measures when constructing a single-family home.

What types of Single-family Residence projects require stormwater management?

I. The City of Franklin requires all development and redevelopment to manage stormwater in accordance of Title 23 of the Franklin Municipal Code, except for the following.
   i. Development involving less than 10,000 square feet of land disturbance.
   ii. Development involving less than 5,000 square feet of additional or modified existing impervious surface.
   iii. Development that is not part of a larger common development or contiguous properties that may have been subdivided.

II. Lots classified as critical lots as defined in the City's zoning ordinance and development in critical areas are not exempt from the requirements of this chapter. This includes homes developed or redeveloped within the Central Franklin overlay outlined in the City's zoning ordinance.

What portions of Single-family Residences require stormwater management?

These requirements are intended to capture increased stormwater runoff from impervious area on single-family residences.

Impervious area is defined as a surface composed of any material that impedes or prevents the infiltration of water, which includes, but is not limited to, rooftops, streets, and driveways. Only the main impervious area need to be captured. This includes the rooftop of the home and any accessory structure, driveways, parking areas, and paved patio areas.

The area draining to any stormwater management measure is the **contributing drainage area** and typically consists of 100% impervious area.

What is required to control stormwater?

The stormwater management measures outlined in this guide are approved for use for single-family residences. By posting the required lot bond, the City ensures the property owner installs one of the five measures to be outlined on the plot plan onsite properly.

What types of stormwater management measures can be installed?

This guide details five stormwater management measures that can be installed for single-family residences. A combination of these measures can be utilized to treat the total impervious area on the site. Each measure is already approved for use by the City of Franklin. The five measures are:

1. Dry Wells
2. Modified French Drains
3. Cisterns
4. Rain Gardens
5. Permeable Pavement

Additional measures can be approved by the City of Franklin Engineering department.

How are the measures sized?

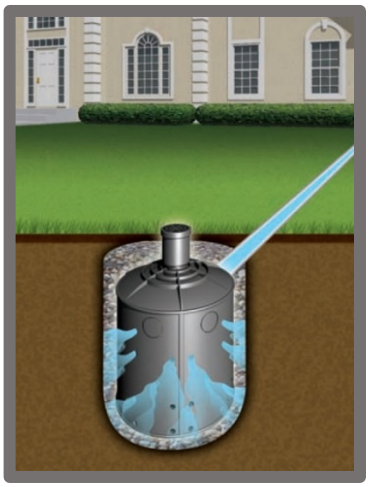
All measures in this guide have been configured by the City of Franklin Engineering Department to allow for sizing to be completed without an engineer. Sizing details for each stormwater management measure are included on the detail page. Sizing is based solely on the contributing drainage area calculated from the plan submitted. Common sizes are shown in the tables provided for each stormwater management measure. To custom-fit a measure to your specific site, utilize the Excel file found on the City of Franklin Engineering website.

What needs to be submitted?

Applicants must develop a plot plan using the checklist included in Appendix A. The following will need to be included in any single-family residence submittal:

- A plot plan showing the size and location of the stormwater management measure
- The City's standard detail for the stormwater management measure
- The lot bond posted with the City of Franklin Building and Neighborhood Services department
- Any sizing calculations used. This can include a print-out of the Excel file or any manufacturers sizing guides
- If a manufactured product is being used, provide all literature from the manufacturer
- A signed and recorded Long Term Maintenance Agreement for the property

DRY WELLS



Dry wells can be comprised of a perforated tank set into the ground and surrounded with stone. These systems intercept and temporarily store stormwater runoff until it can infiltrate into the surrounding native soils.

Alternately, the pit can be filled with stone only. Stormwater enters via a perforated pipe with a perforated standpipe in place of the tank.

Dry Wells are well-suited to receive roof runoff via an inlet grate or a direct connection from the downspouts. Dry wells provide significant reductions in quantity in stormwater runoff.

Location

- Dry wells must be located at least 10 feet from building foundations and 10 feet from property lines.
- Dry wells should be located in the lawn or underneath a pervious surface for ease of access, and should be located as close to the surface as possible.
- Dry wells should not be located:
    - Beneath an impervious surface
    - In an area where the water table is above the bottom of the excavated area
    - Over underground utility lines or services
    - In any exclusive easements shown on plat or recorded with the Registrar

Design

- To reduce the chances of clogging, dry wells should drain only impervious areas. Runoff should be pretreated with a leaf removal option to remove debris.

Typical Sizing. Manufacturers sizing calculations shall be provided with any submittal

Manufactured Dry Well Sizing						
Gravel Bed Depth (inches)	Tank Height (inches)	Tank Inside Diameter (inches)				
		24	30	36	42	48
		Contributing Drainage Area Captured (square feet)				
6	30	258	345	447	563	692
12	30	285	380	490	615	755
6	60	461	622	809	1022	1263
12	60	489	657	852	1075	1325

Gravel Dry Well Sizing					
Pit Depth (inches)	Gravel Filled Pit Diameter (inches)				
	24	30	36	42	48
	Contributing Drainage Area Captured (square feet)				
24	30	46	65	88	114
30	38	58	82	110	142
36	46	69	98	132	171
42	53	81	114	154	199
48	61	92	130	176	228
60	76	115	163	219	285

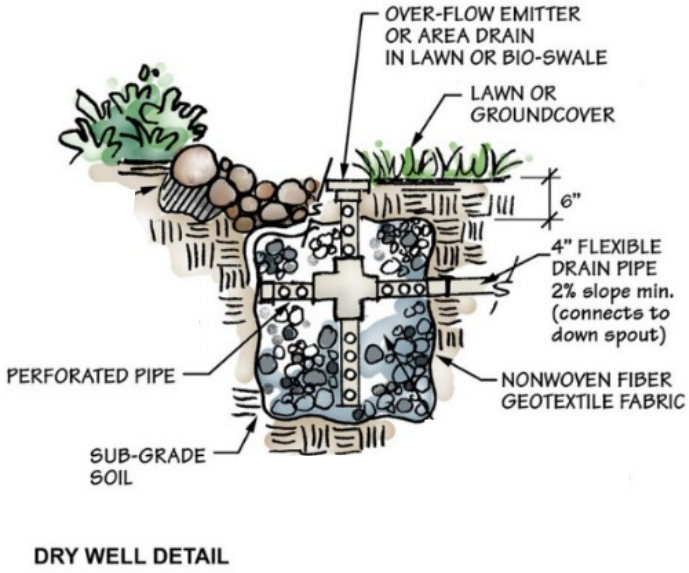
Manufactured Dry Well Construction

1. Review dry well location and sizing on the approved plot plan.
2. After flagging the area in the field, dig the well to the specified dimensions.
3. Till the subgrade to a depth of 3 to 4 inches.
4. Install permeable geotextile fabric around the excavated pit.
5. Place and tamp the bottom 3 inches of #57 stone. #8 stone can be used to level the tank, if needed.
6. Install tank and piping. Test the piping before backfilling to ensure the dry well is functioning properly.
7. Fill the rest of the well area with #57 stone.
8. Place filter fabric over the well. Place 6 inches of topsoil or pea gravel over the filter fabric.

Manufacturer's installation recommendations shall be followed over the City's standard construction sequencing.

Gravel Dry Well Construction

1. Review dry well location and sizing on the approved plot plan.
2. After flagging the area in the field, dig the well to the specified dimensions.
3. Scarify the subgrade to a depth of 3 to 4 inches.
4. Install filter fabric around the excavated pit.
5. Place and tamp the bottom 3 inches of # 57 stone.
6. Install the perforated observation well and cap off the downspout. Test the piping before backfilling to ensure the dry well is functioning properly.
7. Fill the rest of the well area with #57 stone.
8. Place filter fabric over the well. Place 6 inches of topsoil or pea gravel over the filter fabric.



A typical cross section of a gravel dry well. Dimensions may change based on this guide's sizing requirements.

For rooftop runoff, install one or more leaf screen options prior to entering the any dry well to prevent leaves and other large debris from clogging the dry well. For driveway or parking runoff a screened inlet grate over a sump or pea gravel pit can be used to settle out material prior to entering the pipe.

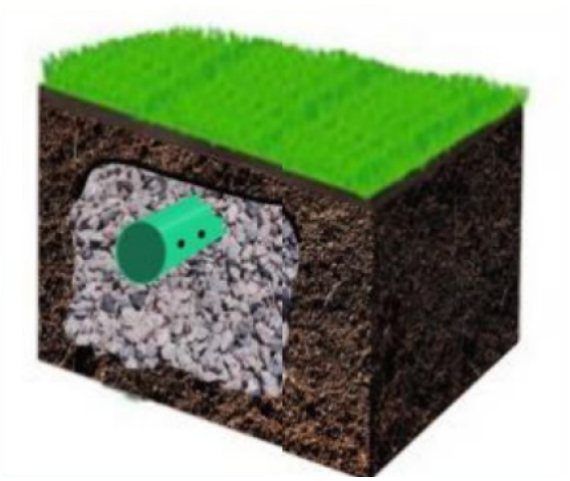
Maintenance

For maintenance in dry wells, inspect these items yearly:

- Gutters and down spouts, removing accumulated leaves and debris. If a leaf screen was installed, inspect to ensure it is clear and functioning.
- Inspect overflow annually to ensure no erosion is occurring.
- Inspect the dry well after a large rain event to ensure the overflow is operating and flow is not causing issues downstream.
- Monitor the surcharge pipe during rain events to ensure stormwater is being routed and held in the dry wells.

MODIFIED FRENCH DRAINS

Modified French Drains (MFD) are shallow trench excavations filled with stone that are designed to intercept and temporarily store stormwater runoff until it infiltrates into the soil. MFDs can provide significant reductions in stormwater runoff. They are particularly well-suited to receive rooftop runoff, but can also be used to capture stormwater runoff from other small impervious areas. The perforated pipe is daylighted or has a pop up drain at its end allowing for overflow of larger storms.



Location

- MFD trenches should be located at least 5 feet from building foundations and 10 feet from property lines and buildings with basements. The high end of the MFD can be adjacent to the building to connect downspouts, but the lower end should be directed away from the structure.
- MFDs should <u>not</u> be located:
    - beneath an impervious (paved) surface;
    - In an area with a water table or bedrock less than two feet below the trench bottom
    - over other utility lines
    - In any exclusive easements shown on plat or recorded with the Registrar

Design

- MFDs should slope away from any structures. They can be serpentine or multi-pronged in construction if sufficient slope is available.
- To reduce the chance of clogging, MFDs should drain only impervious areas, and runoff should be pretreated with at least one of the leaf removal options to remove debris and larger particles.
- The table provides MFD length requirements for different depths. The assumed width in the table is 24 inches.

Contributing Impervious Area (square feet)	Depth of Gravel from Top of Pipe (inches)			
	18	24	30	36
	Required Linear feet of MFD			
100	7	5	4	3
500	35	26	21	17
1000	69	52	42	35
2000	139	104	83	69
3000	208	156	125	104
4000	278	208	167	139
5000	347	260	208	174

Construction

1. The sides of the excavation should be trimmed of all large roots.
2. The native soils along the bottom of the MFD should be tilled to a depth of 3 to 4 inches.
3. Fill the trench with clean, washed #57 stone embedding a 6-inch diameter perforated pipe in the top of the stone such that the stone covers the top of the pipe. #57 stone averages ½ inch to 1 ½ inches.
4. The pipe should have a minimum of 3/8-inch perforations, spaced 6 inches on center, and have a minimum slope of 0.5% and a maximum slope of 6%.
5. The perforated pipe must daylight at the downstream end or have a pop-up drain installed at the end of the trench. A splash pad of additional gravel may be needed to prevent erosion.
6. Place filter fabric over gravel to keep soil or pea gravel from migrating into the gravel and filling the pore spaces, leaving four to six inches above the pipe to the ground surface. Cover with top soil and sod or with pea gravel.

For rooftop runoff, install one or more leaf screen options prior to entering the MFD to prevent leaves and other large debris from clogging the MFD. For driveway or parking runoff a screened inlet grate over a sump or pea gravel pit can be used to settle out material prior to entering the pipe.

Maintenance

- Inspect gutters and down spouts, removing accumulated leaves and debris.
- Inspect MFD following a large rainfall event to ensure overflow is operating.

Example of perforated pipes. The rigid PVC pipe should be used to prevent collapsing.

CISTERN

Cisterns are stormwater management measures that store rainwater for later use. Rain is collected from a down spout system, screened to remove trash and leaves, and directed to a storage container for use in the future. Unless an advanced filtration system is used, water stored in the cistern is non-potable. If properly sized and installed, cisterns can provide significant reductions in stormwater runoff rates. Rain barrels are a smaller scale cistern and may be utilized if the volumes of all collective rain barrels are the same as the cistern size required.

Location

Cisterns should drain only impervious areas – preferably rooftops. Pick a location keeping in mind:

- ease in connecting roof drains
- overflow to downslope areas
- level area for base
- location relative to intended water uses
- other utility conflicts
- electrical connections, if applicable
- residential emergency ingress/egress
- in any exclusive easements shown on plat or recorded with the Registrar

Design

- Cisterns can range in sizes from a 55-gallon rain barrel to a 1,500 gallon cistern. The size of the cistern will depend on the contributing drainage area. If the cistern cannot hold the full volume required one alternative is to divert overflow to another measure such as a dry well, modified French drain, or a rain garden.
- Measure contributing drainage area that will drain to the cistern. Multiply the contributing drainage area by 0.6 to determine the volume in gallons the cistern must hold.
- All holding tanks should be opaque to prevent algae growth.
- Pretreatment of water entering the cistern should remove debris, leaves, and other material that can accumulate on impervious surfaces.
- An overflow pipe shall be installed and directed away from neighboring buildings.

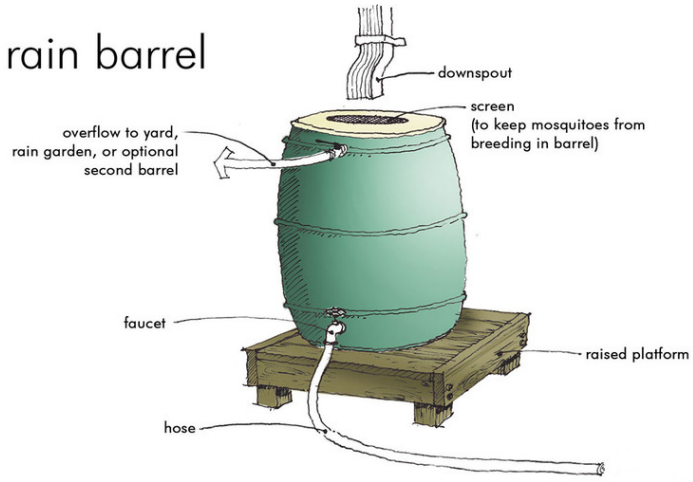
Construction

1. Locate cistern area on the plot plan. Flag and prepare the area(s).
2. Provide a level foundation of compacted earth, blocks, or gravel.
3. Place cistern and review all components and layout from manufacturer.
4. Route downspouts to the cistern. Strap and support the cistern as needed.
5. Install water connections, including the inlet, overflow, and the clean out plug.
6. Extend overflow to a non-eroding location (typically a splash block or gravel pad).

Manufacturer's installation recommendations shall be follows over the City's standard construction sequencing.

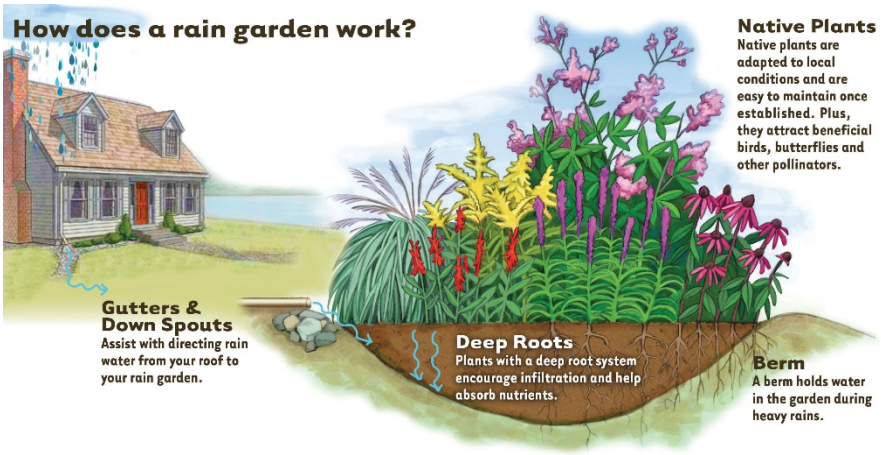
Maintenance

- To maintain the storage capacity of the cistern, rainwater should be used regularly, and a draw-down plan initiated.
- Ensure mosquito screening is tight and free from rips or tears.
- Inspect and, if necessary, clean out the tank annually by scrubbing the inside of the tank and letting the water drain through the low flow plug.
- Check connections on the cistern for leaks.
- Routine checks of the intake and leaf screening components should be done once in the spring and periodically in the fall if there are leaves that fall on the contributing drainage area.



RAIN GARDEN

Rain gardens are small landscaped depressions that area filled with a mixture of soil, sand, and organic material, and are planted with native trees, shrubs, and flowers. They are designed to temporarily store stormwater runoff from impervious surfaces while also reducing pollutants loads in the stormwater. A rain garden can be a beautiful and functional addition to your landscape.



Location

- Rain gardens should be located to receive the maximum amount of stormwater on the property. Smaller rain gardens can be placed in multiple areas around the house.
- Swales, berms, or down spout extensions may be helpful to route runoff to the rain garden.
- Locate the rain garden:
    - At least 10 feet from foundations
    - Outside of Right of Way
    - Outside of any exclusive easements shown on plat or recorded with the Registrar

Design

- The minimum depth of the amended soil in a rain garden is 2 feet. The surface area of the rain garden is sized to be 10% of the impervious area draining to the feature.
    - Surface Area (rain garden) = Contributing drainage area*0.10
- A maximum ponding depth of 6 inches is allowed within rain gardens. On average, rain gardens drain within 48 hours.
- Design rain garden entrance to prevent erosion at stormwater entrance into the rain garden with stones or dense, hardy vegetation.
- For best results, it is suggested to test your soil characteristics as you would for a garden, or contact your local County Extension Office for help
- A mulch layer consisting of 3 inches of hardwood mulch should be included on the surface of the rain garden.
- The overflow from the rain garden should be non-eroding and can consist of a small berm or a grated inlet set at the proper elevation (6” above soil) in the garden.

Construction

1. Route downspouts to the rain garden area.
2. Excavate rain garden area to the approved dimensions after staking and measuring elevations.
3. Scarify subgrade by ripping the bottom soils to a depth of 3 to 4 inches before amended soils are placed.
4. Install the amended soil. DO NOT COMPACT WITH EQUIPMENT.
5. Build the berm on the low end 9 inches above the amended soils. This allows for mulch placement and 6 inches of ponding.
6. Prepare planting holes for any trees and shrubs.
7. Install specified vegetation within the rain garden. See Appendix B.
8. Place 3 inches of hardwood mulch within the rain garden
9. Water all plants accordingly.

If the rain garden is installed before the site is stabilized, divert runoff flow around the rain garden area to minimize sediment accumulation.

Amended Soil

The amended soil should be mainly sand. The typical mixture is 85% sand, 10% topsoil, and 5% organic matter.

Vegetation

- See Appendix B for the approved native vegetation list.
- The vegetation may need irrigation in the first year until it is well established. It may be appropriate to plant more densely than a normal garden to get the benefit of plant soil stabilization.

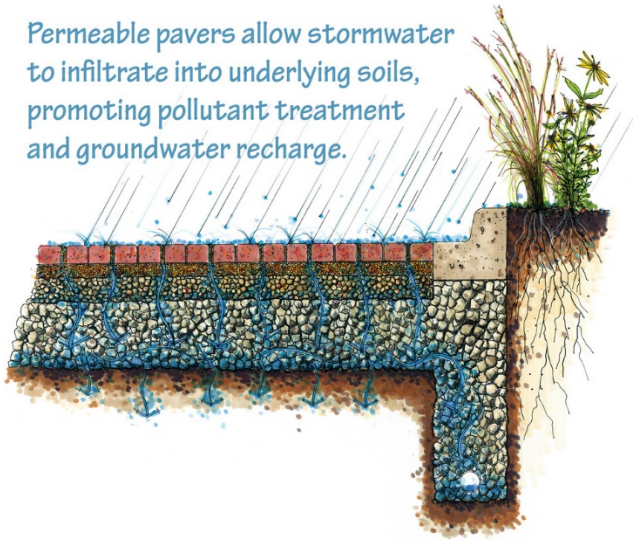
Maintenance

Routine garden maintenance should include:

- Weeding
- Replacing dead plants
- Replenishing mulch as needed
- Areas around the rain garden should be inspected for erosion. Sediment accumulation in the rain garden can cause standing water for longer than they typical 48 hours.

PERMEABLE PAVEMENT

Permeable pavement systems such as permeable pavers and pervious concrete are an alternative to traditional paving surfaces, such as concrete or asphalt, that decrease the amount of stormwater runoff around your home. The permeable pavement system allows stormwater runoff to pass through the surface and into a stone reservoir, where it is temporarily stored and allowed to infiltrate into the native soils, if applicable. They are well suited for parking areas, patios, and driveways.



Location

- Permeable pavement systems should be located at least 5 feet from building foundations and 10 feet from buildings with basements.
- Permeable pavement should not be placed above any underground utilities. Call 811 or locate before you dig.
- Place permeable pavement outside of any exclusive easements shown on plat or recorded with the Registrar

Design

Contributing Drainage Area (sqft)	Depth of Lower Stone Storage Layer (Reservoir) (inches)				
	4	6	8	10	12
	Area of Permeable Pavement (square feet)				
100	63	42	31	25	21
500	313	208	156	125	104
1000	625	417	313	250	208
2000	1250	833	625	500	417
3000	1875	1250	938	750	625
4000	2500	1667	1250	1000	833
5000	3125	2083	1563	1250	1042

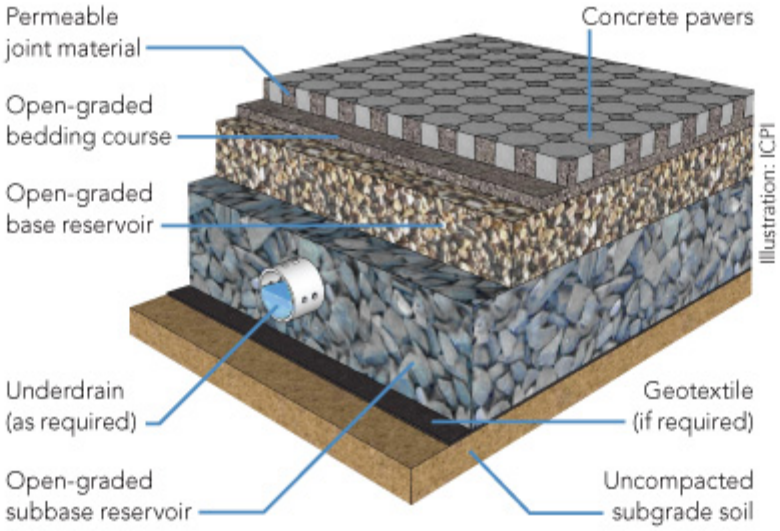
Construction

1. Review layout on plot plan and stake area with elevations.
2. Excavate the area. Scarify subgrade to a depth of 3 to 4 inches.
3. Install permeable filter fabric to separate the soil subgrade and the stone.
4. Install stone subbase, or storage layer consisting of #57 stone. This base course acts as the reservoir and must be compacted for structural stability of the pavement.
5. A small bobcat may be used for placement of stone paver areas.
6. Install any concrete curbing and the bedding course. The bedding course consists of 2 to 3 inches of #8 stone. This layer creates a smooth surface for the pavement to set on.
7. Install permeable pavement. The pavement can either be permeable pavers or pervious concrete. Pervious concrete is installed by licensed installers and in a similar manner to conventional concrete. Permeable pavers are laid on the bedding material and a crushed aggregate, typically a #8 stone, is swept into joints between pavers.

Maintenance

Maintenance is very important for permeable pavement systems. Over time, if not maintained, these features can clog and lose all stormwater management benefits.

- Remove accumulated sediment and debris from joint spaces and pores seasonally.
- Observe permeable pavement surface during rain events for ponding. Areas where ponding occurs usually are clogged with sediment and debris.
- Sweep and blow the pavement surface seasonally. New joint aggregate may be needed after sweeping or blowing.
- Repair or replace any area on the pavement surface that has been damaged.



Appendix A: Site Plan Checklist

Lot Number: _____ Site Address: _____

Subdivision: _____ _____

Applicant (PE): _____ Owner: _____

Email: _____ Email: _____

Phone: _____ Phone: _____

Company: _____

Address: _____ COF Project # (Plat)": _____

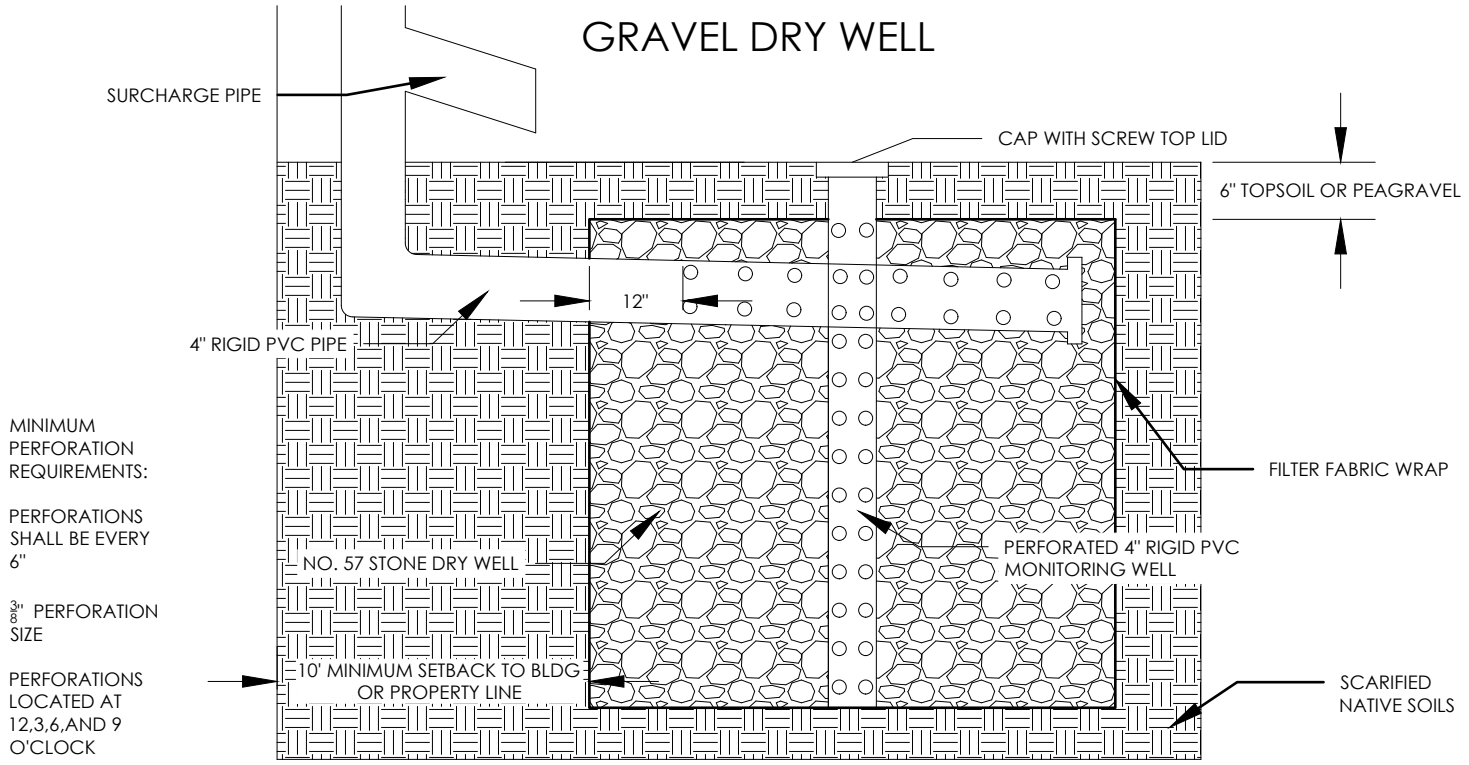
_____ Grading Permit # (if applicable): _____

Critical Lot Checklist *Submittals should include three (3) paper copies of the listed items **All plans are required to be sealed, signed, and dated by professionally licensed engineer in the State of Tennessee in accordance with state law and City of Franklin requirements.		
A. General Information		
1	Subdivision Name, address, and lot number of Proposed Development	
2	Name and address of owner	
3	Name and address of builder	
4	Names, addresses, telephone numbers, email addresses, and seals of all professionals participating in the development application process (TN Professional Engineer License Required)	
5	Site Location / Vicinity Map	
6	Date	
7	North Arrow	
8	1" = 20' (max) graphic scale site/grading plan (24x26" sheets)	
9	Show house foot print area (SF), Lot area (SF), and house to lot ratio	
10	Total impervious area and impervious to lot ratio	
11	Provide owner's name, or reference deed where vacant, lot status (built, vacant, etc.) of all adjacent properties.	
12	Where adjacent lot(s) are affected by grading or other, provide written affidavit prior to obtaining permit.	
B. General Site Layout		
1	Show and label all existing and proposed property lines, easements, and setback lines	
2	Show finish floor elevations and footprint for house, garage, patio, porch, etc.	
3	Show and label existing and proposed water, sewer, and stormwater utilities connections services and mainline utility type & size	
4	No permanent structure/fixture/fill material/or obstruction is permitted in a drainage easement with an open stormwater conveyance. HVAC pad is not permitted in any easement.	
5	No portion of retaining walls to be located in utility, drainage, or access easements	
C. Site Grading and Drainage		
1	Provide and label existing and proposed site contours (2' interval)	
2	Existing contours to extend a minimum of 10' beyond site's legal boundary and to the roadways centerline	
3	Proposed grading remains within legal limits or written approval by affected owner provided on plans	
4	Provide spot elevations at critical locations (Stair connections, concrete slabs, outfalls, sidewalks, walls, etc.)	
5	Provide spot elevations along and around the home as to ensure proper drainage away from home	
6	Provide spot elevations and drainage arrows at critical drainage areas	
7	Indicate ditches with flow lines and spot elevations	

8	Label ditch slopes where slope is in excess of 14%	
9	Design should comply with Franklin Municipal Code 23-106(3) *Green Infrastructure – Runoff Reduction Requirements*	
Critical Lot Checklist *Submittals should include three (3) paper copies of the listed items **All plans are required to be sealed, signed, and dated by professionals licensed in the state of Tennessee in accordance with state law and City of Franklin requirements.		
D. Driveway and Sidewalk		
1	Provide width dimension of driveway (min. width 12')	
2	Show location and dimension of garage door(s)	
3	Provide driveway street connection radii label (min. radius 5')	
4	Provide label of driveway entering the garage radius (min. radius 14')	
5	Label slope and depth of driveway pad from garage door to back of pad (2% max, 24' min)	
6	Standard vehicle able to straightforwardly enter garage in one motion, and be able to back out of garage and head out to street straightforwardly in two motions	
7	Provide 6" curb along driveway adjacent to steep slopes (in excess of 3:1) or retaining wall	
8	Label driveway centerline slope (14% maximum)	
9	Maximum grade change along driveway is 8% for a crest and 12% for a sag, over a 10' span	
10	Maximum cross slope of driveway is 5% (excluding transition from street)	
11	Label critical elevation points or slope between street and sidewalk (5% max slope)	
12	Label critical elevation points or cross slope of sidewalk (2% max cross slope)	
13	Grade of sidewalk matches grade of paralleling street	
E. Retaining Walls		
1	Label top and bottom elevation of retaining wall elevations at high, low, and transition points	
2	Top of wall shall be a minimum 3" above ground surface or other safety measure, specify on plans	
3	Stormwater shall not be designed to flow over retaining wall	
4	Maximum height of wall shall not exceed 6 ft.; 3 ft. max for walls in front yard	
5	Wall designs in excess of 4' in height shall be submitted to Building and Neighborhood Services for approval	
6	Retaining walls holding soil back, away from home, shall be placed no closer than twice the wall's height away	
F. Erosion Prevention and Sediment Control		
1	Provide and design EPSC according to City of Franklin general notes for Erosion Control	
2	Provide appropriate erosion control measures and show their locations	
3	Tree protection shown for all trees, to remain, within 5' of disturbed area	
4	Indicate removal of all specimen trees (24" or larger)	
5	Provide details for all erosion control, soil stabilization, and tree protection methods utilized	
6	Provide an area for topsoil storage as well as an area for concrete truck washout	
7	Provide detail for stormwater swale (18" min bottom width, max 3:1 side slope)	
8	Provide a level spreader or comparable energy dissipating BMP at swale/ditch outfalls	
9	Provide permanent method of energy dissipation at downspouts and other high concentration areas.	
10	Indicate each BMP as 'Permanent' or 'Temporary'	

Appendix B: City Approved Details

GRAVEL DRY WELL



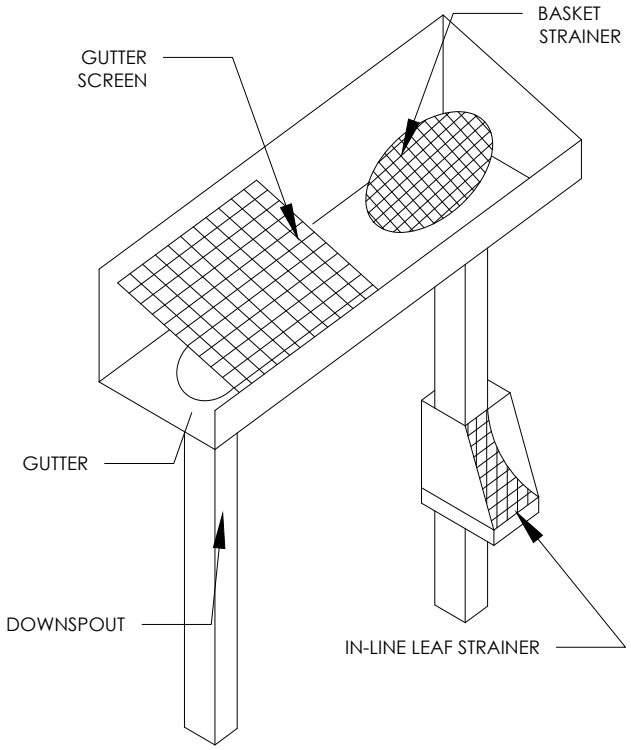
SEE SITE PLAN FOR LAYOUT AND SIZING REQUIRED.

CONSTRUCTION SEQUENCING:

1. REVIEW DRY WELL LOCATION AND SIZING ON THE APPROVED PLOT PLAN.
2. DIG THE WELL TO THE APPROVED DIMENSIONS AFTER FLAGGING THE AREA IN THE FIELD.
3. SCARIFY SUBGRADE BY RIPPING THE BOTTOM SOILS TO A DEPTH OF 3 INCHES PRIOR TO STONE PLACEMENT.
4. SCHEDULE GIP INSPECTION WITH CITY STORMWATER INSPECTOR AT (615) 791-3254.
5. INSTALL PERMEABLE GEOTEXTILE FABRIC AROUND THE WELL.
6. PLACE AND TAMP THE BOTTOM 3 INCHES OF 57 STONE.
7. INSTALL THE PERFORATED OBSERVATION WELL AND CAP OFF DOWNSPOUT.
8. INSTALL ADDITIONAL 57 STONE AROUND THE TWO PERFORATED PIPES. TEST THE PIPING BEFORE BACKFILLING.
9. FILL THE REST OF THE WELL WITH 57 STONE.
10. PLACE FILTER FABRIC OVER THE WELL. PLACE 6 INCHES OF TOPSOIL OR PEA GRAVEL ON THE FILTER FABRIC. IF TOPSOIL IS USED, STABILIZE THE AREA WITH SOD.

MAINTENANCE:

- INSPECT GUTTERS AND DOWNSPOUTS, REMOVING ACCUMULATED LEAVES AND DEBRIS.
- IF APPLICABLE, INSPECT THE PRETREATMENT DEVICES FOR SEDIMENT AND LEAF ACCUMULATION. REMOVE ACCUMULATED TRASH, SEDIMENT, AND DEBRIS.
- INSPECT THE DRY WELL AFTER A LARGE RAIN EVENT TO ENSURE THE OUTFALL IS OPERATING AND FLOW IS NOT CAUSING ISSUES DOWNSTREAM.
- MONITOR THE SURCHARGE PIPE TO ENSURE STORMWATER IS BEING ROUTED AND HELD TO THE DRY WELLS.



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GRAVEL DRY WELL
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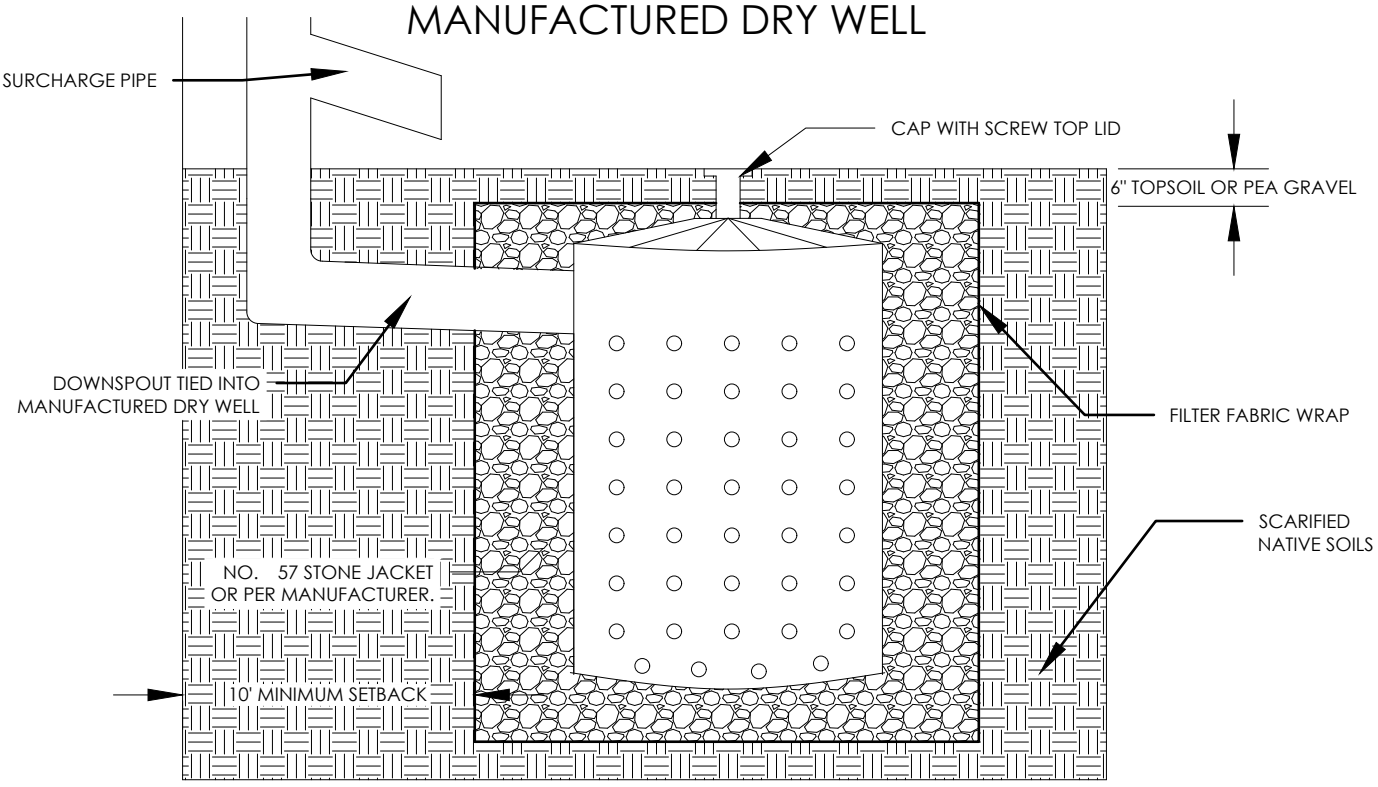
MANUFACTURED DRY WELL



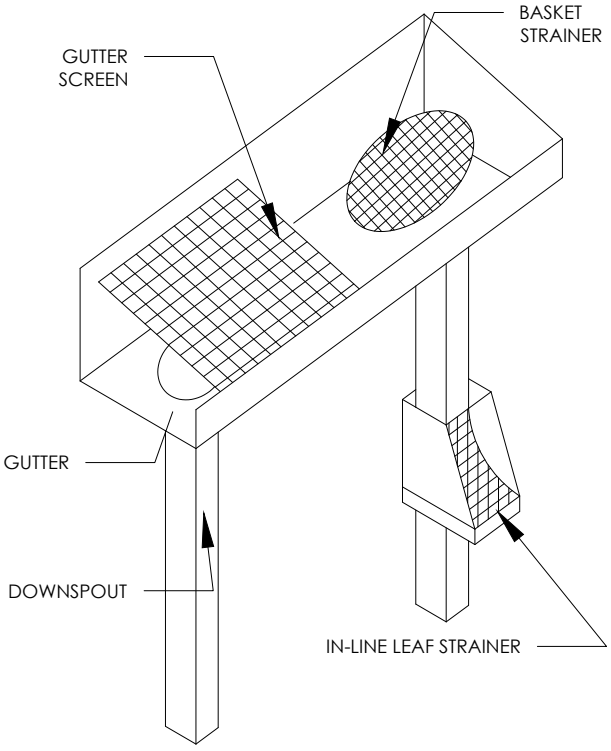
SEE SITE PLAN FOR LAYOUT AND SIZING REQUIRED.

CONSTRUCTION SEQUENCING:

1. REVIEW DRY WELL LOCATION AND SIZING ON THE APPROVED PLOT PLAN.
2. DIG THE WELL TO THE APPROVED DIMENSIONS AFTER FLAGGING THE AREA IN THE FIELD..
3. SCARIFY SUBGRADE BY RIPPING THE BOTTOM SOILS TO A DEPTH OF 3 INCHES PRIOR TO STONE PLACEMENT.
4. SCHEDULE GIP INSPECTION WITH CITY STORMWATER INSPECTOR AT (615) 791-3254.
5. INSTALL PERMEABLE GEOTEXTILE FABRIC AROUND THE WELL.
6. PLACE AND TAMP THE BOTTOM 3 INCHES OF 57 STONE. NO 8 STONE CAN BE USED FOR LEVELING THE TANK.
7. INSTALL THE TANK AND PIPING. TEST THE PIPING BEFORE BACKFILLING.
8. FILL THE REST OF THE WELL WITH 57 STONE.
9. PLACE FILTER FABRIC OVER THE WELL. PLACE 6 INCHES OF TOPSOIL OR PEA GRAVEL ON THE FILTER FABRIC. IF TOPSOIL IS USED, STABILIZE THE AREA WITH SOD.

MAINTENANCE:

- INSPECT GUTTERS AND DOWNSPOUTS, REMOVING ACCUMULATED LEAVES AND DEBRIS.
- IF APPLICABLE, INSPECT THE PRETREATMENT DEVICES FOR SEDIMENT AND LEAF ACCUMULATION. REMOVE ACCUMULATED TRASH, SEDIMENT, AND DEBRIS.
- INSPECT THE DRYWELL AFTER A LARGE RAIN EVENT TO ENSURE THE OVERFLOW IS OPERATING AND FLOW IS NOT CAUSING ISSUES DOWNSTREAM.
- MONITOR THE SURCHARGE PIPE TO ENSURE STORMWATER IS BEING ROUTED AND HELD TO THE DRY WELLS.



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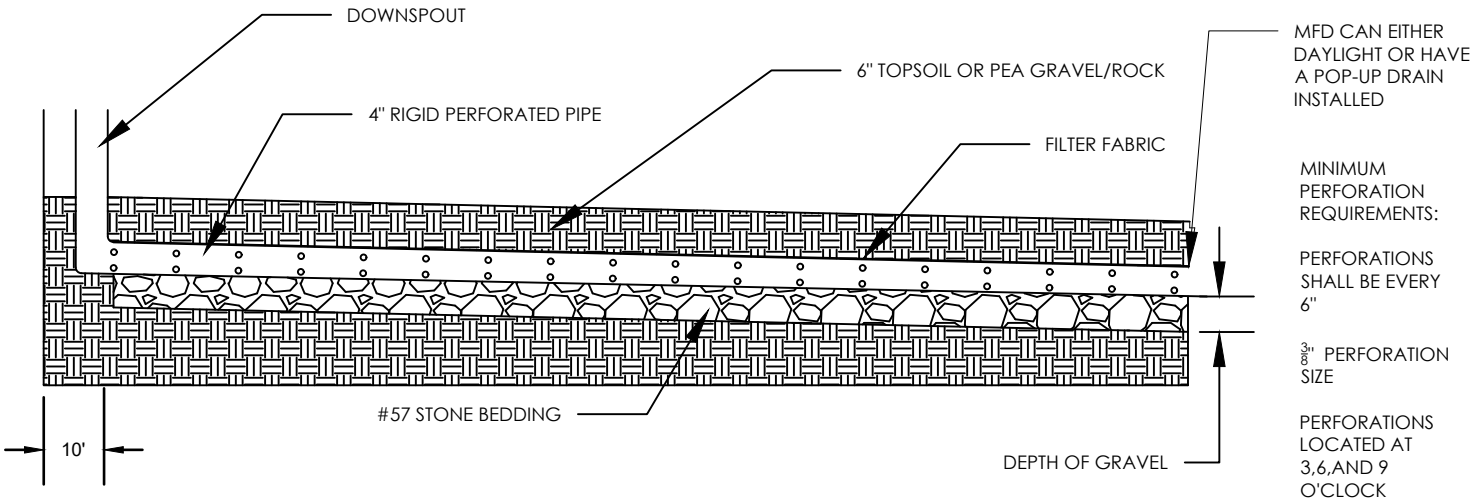
MODIFIED FRENCH DRAIN



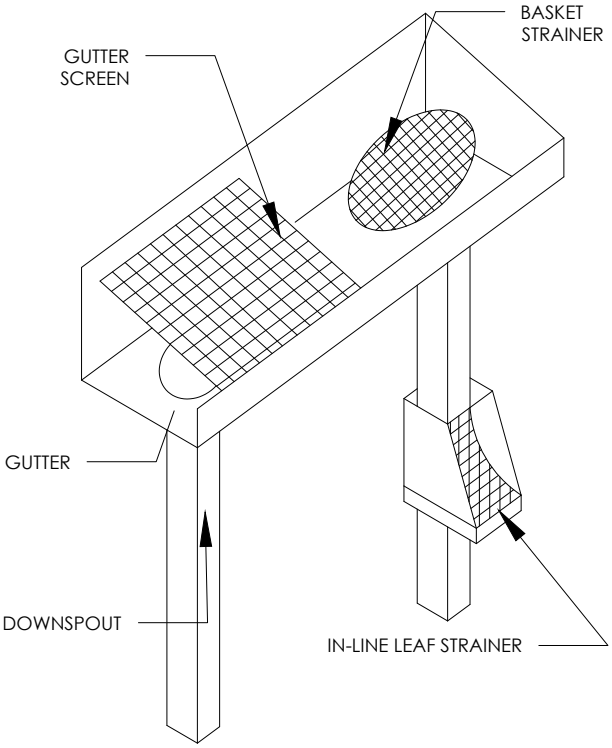
SEE SITE PLAN FOR LAYOUT AND SIZING REQUIRED.

CONSTRUCTION SEQUENCING:

1. REVIEW THE MANUFACTURED FRENCH DRAIN (MFD) LAYOUT ON THE APPROVED PLOT PLAN.
2. MEASURE ELEVATIONS AND LAY OUT THE MFD TO THE REQUIRED DIMENSIONS, MARKING THE ROUTE OF THE DRAIN.
3. EXCAVATE DITCH TO THE DEPTH OF THE GRAVEL PLUS AN ADDITIONAL 9 INCHES TO ACCOUNT FOR TOPSOIL AND HALF OF THE SIX INCH PIPE DEPTH. LEVEL THE BOTTOM OF THE DITCH TO REDUCE SETTLING. CALL CITY STORMWATER INSPECTOR AT (615)-791-3254.
4. ROUTE DOWNSPOUTS TO THE TRENCH DRAIN.
5. PLACE AND HAND TAMP THE GRAVEL TO THE PLANNED DEPTH. THE DRAIN WILL SIT IN THE TOP SIX INCHES OF THE BASE, BEING JUST COVERED WITH THE GRAVEL BASE.
6. PLACE FILTER FABRIC OVER THE TOP OF THE PIPE AND STONE.
7. PLACE TOP SOIL AND SOD OR LANDSCAPING ROCK.
8. THE MODIFIED FRENCH DRAIN CAN EITHER DAYLIGHT TO GRADE OR DRAIN TO A POP UP DRAIN.

MAINTENANCE:

- INSPECT GUTTERS AND DOWNSPOUTS, REMOVING ACCUMULATED LEAVES AND DEBRIS, CLEANING LEAF REMOVAL SYSTEMS.
- IF APPLICABLE, INSPECT PRETREATMENT DEVICES FOR SEDIMENT ACCUMULATION. REMOVE DEBRIS AND TRASH.
- INSPECT THE MANUFACTURED FRENCH DRAIN FOLLOWING A LARGE RAIN EVENT TO INSURE OVERFLOW IS OPERATING AND FLOW IS NOT CAUSING PROBLEMS OFF THE PROPERTY.



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MODIFIED FRENCH DRAIN
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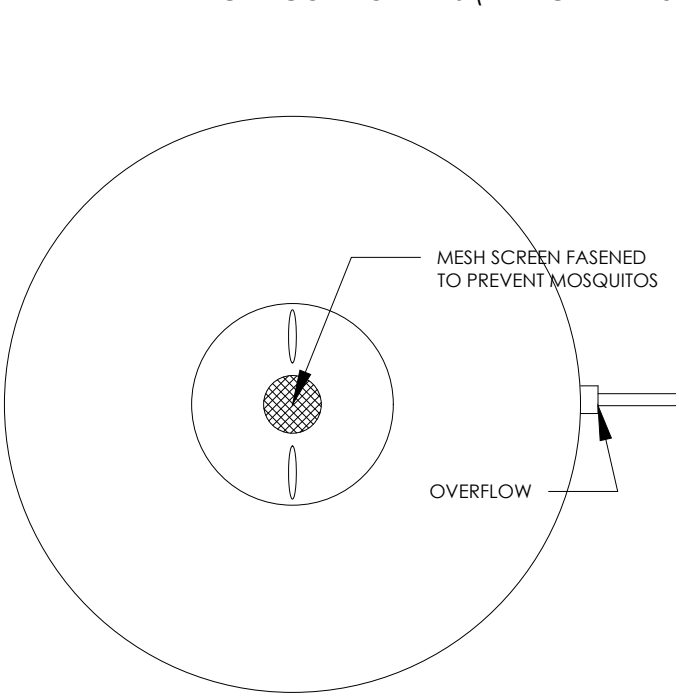
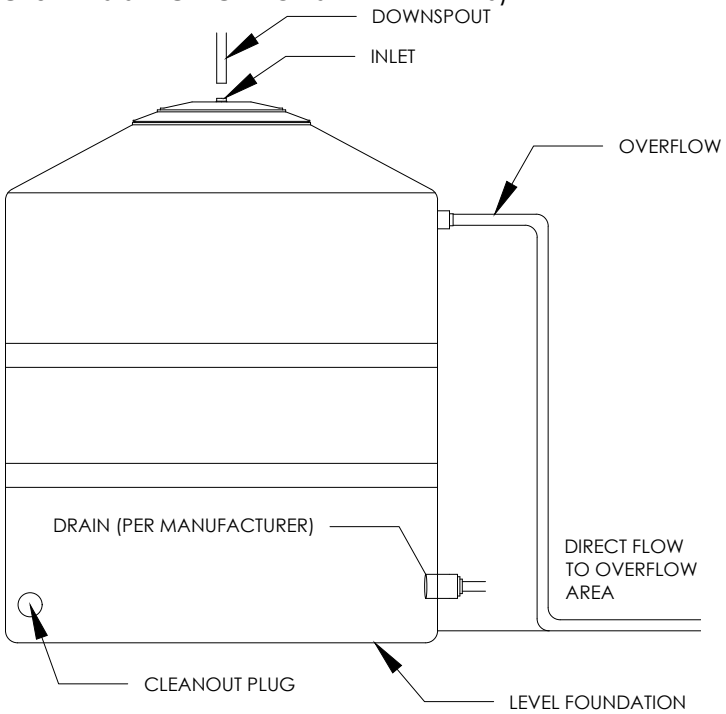
CISTERN

TYPICAL COMPONENTS (ATTACH MANUFACTURER'S SPECIFICATIONS AND DETAILS)



TOP VIEW



SIDE VIEW

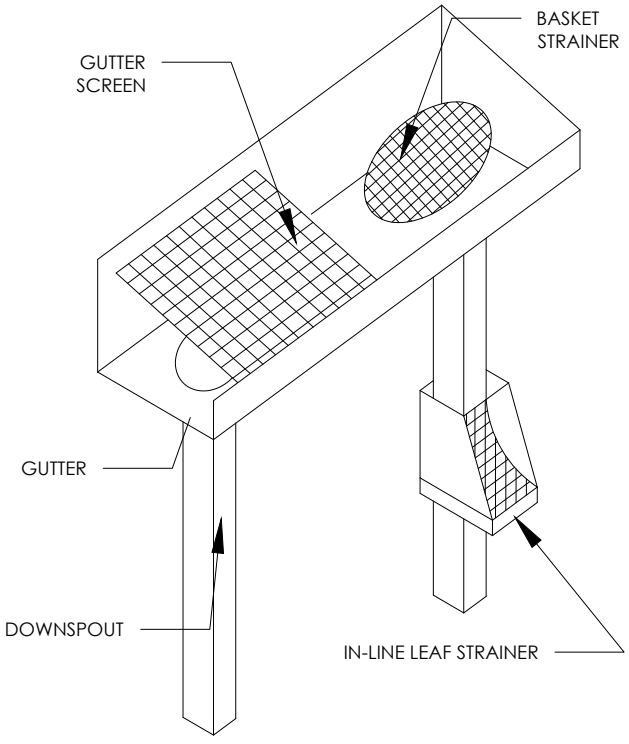
SEE SITE PLAN FOR LAYOUT AND SIZING REQUIRED.

CONSTRUCTION SEQUENCING:

1. LOCATE CISTERN AREA ON THE PLOT PLAN. FLAG AND PREPARE THE AREA.
2. PROVIDE A LEVEL FOUNDATION OF COMPACTED EARTH, BLOCKS, OR GRAVEL.
3. PLACE CISTERN AND REVIEW ALL COMPONENTS AND LAYOUT FROM MANUFACTURER.
4. ROUTE DOWNSPOUTS TO THE CISTERN. STRAP AND SUPPORT THE CISTERN AS NEEDED.
5. INSTALL WATER CONNECTIONS INCLUDING THE INLET, OVERFLOW, AND THE CLEAN OUT PLUG.
6. EXTEND OVERFLOW TO AN ADEQUATE NON-ERODING POINT AT LEAST 10 FEET AWAY FROM PROPERTY LINES AND EASEMENTS.
7. TEST CISTERN BY RUNNING WATER THROUGH THE SYSTEM.

MAINTENANCE:

- TO MAINTAIN THE STORAGE CAPACITY OF THE CISTERN, STORED RAINWATER SHOULD BE USED REGULARLY.
- ROUTINE CHECKS OF THE INLET AND LEAF SCREENING, OR PRETREATMENT, COMPONENTS SHOULD BE DONE ONCE IN THE SPRING AND PERIODICALLY THROUGH THE FALL IF LEAVES FALL IN THE CONTRIBUTING AREA.
- INSPECT, AND IF NECESSARY, CLEAN OUT TANK ANNUALLY BY SCRUBBING AND LETTING WATER DRAIN THROUGH THE LOW FLOW PLUG. CHECK CONNECTIONS FOR LEAKS. INSPECT OVERFLOW FOR EROSION.



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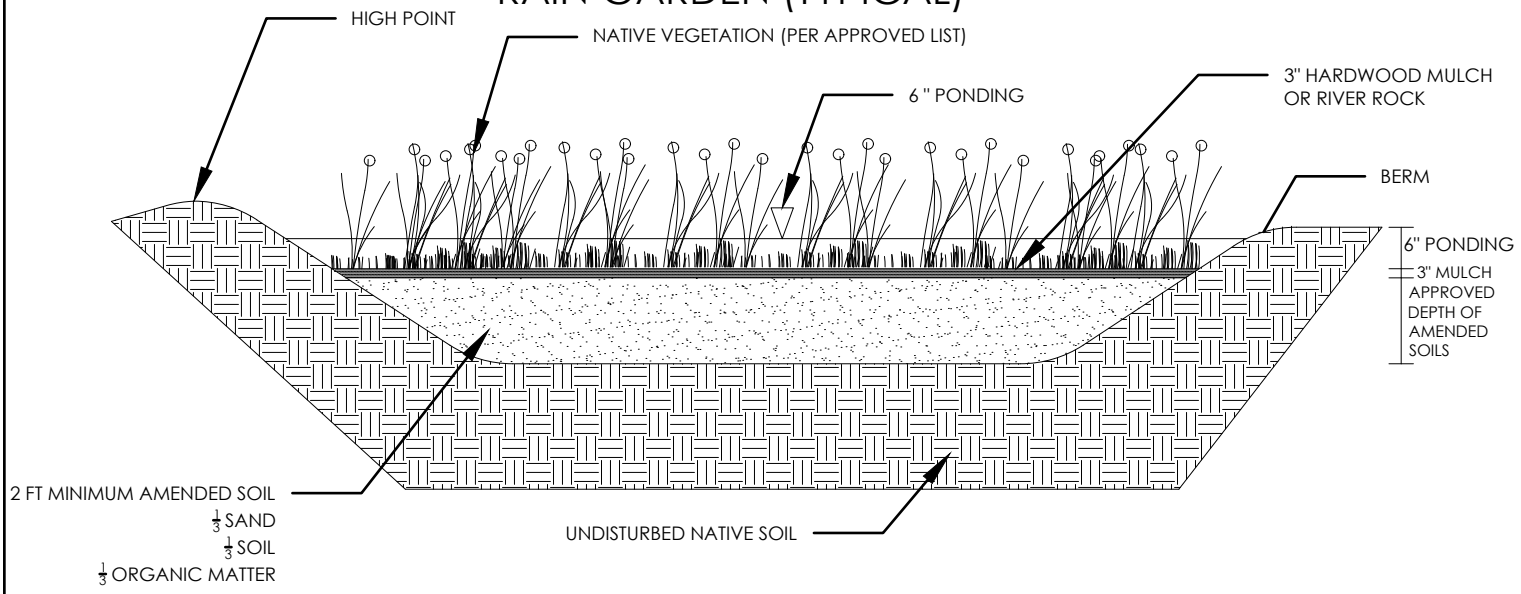
RAIN GARDEN (TYPICAL)



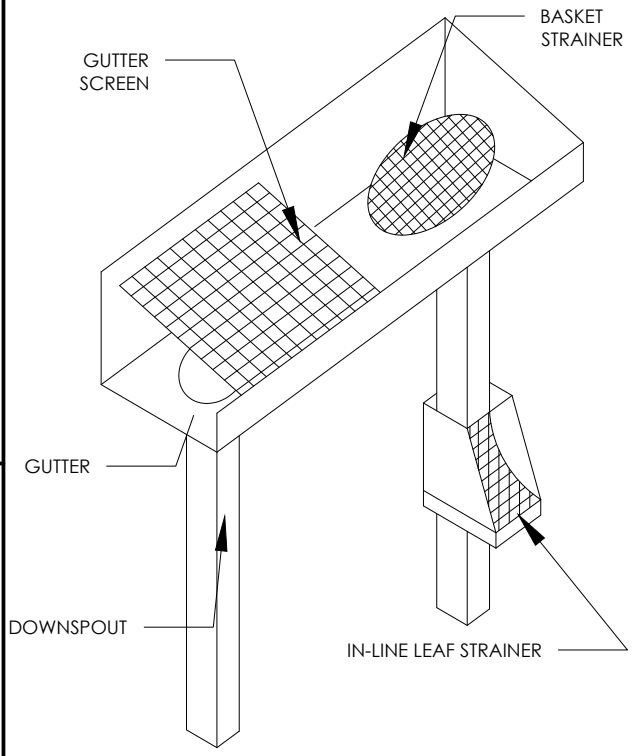
SEE SITE PLAN FOR LAYOUT AND SIZING REQUIRED.

CONSTRUCTION SEQUENCING:

1. ROUTE DOWNSPOUTS TO THE RAIN GARDEN AREA.
2. EXCAVATE RAIN GARDEN AREA TO THE APPROVED DIMENSIONS AFTER STAKING AND MEASURING ELEVATIONS.
3. SCARIFY SUBGRADE BY RIPPING THE BOTTOM SOILS TO A DEPTH OF 3 INCHES PRIOR TO AMENDED SOIL PLACEMENT.
4. SCHEDULE INSPECTION WITH CITY STORMWATER INSPECTOR AT (615) 791-3254.
5. MIX TOPSOIL, SAND, AND ORGANIC MATTER TOGETHER TO MAKE THE AMENDED SOIL. ORGANIC MATTER CAN BE COMPOST, MULCH, OR LEAVES.
6. FILL THE RAIN GARDEN WITH THE AMENDED SOILS. BUILD THE BERM ON THE LOW END 9 INCHES ABOVE THE PLACED AMENDED SOILS. THIS ALLOWS FOR THE MULCH PLACEMENT AND 6 INCHES OF PONDING.
7. PLANT THE RAIN GARDEN WITH NATIVE PLANTS FROM THE APPROVED BIORETENTION/RAIN GARDEN PLANT LIST WITHIN THE SINGLE FAMILY MANUAL.
8. PLACE 3 INCHES OF MULCH WITHIN RAIN GARDEN. SHREDDED HARDWOOD MULCH TENDS TO FLOAT LESS THAN PINE STRAW.
9. WATER ALL PLANTS THOROUGHLY.

MAINTENANCE:

- IRRIGATE THE VEGETATION WITHIN THE RAIN GARDEN AS NEEDED IN THE FIRST YEAR.
- REMOVE WEEDS SEASONALLY TO PREVENT OVERGROWTH.
- CUT BACK NATIVE VEGETATION TO PREVENT OVERGROWTH.
- REPLACE DISEASED AND DYING PLANTS.
- REMOVE OLD MULCH AND ADD NEW MULCH ANNUALLY.
- REPAIR ANY ERODED AND UNSTABLE AREAS AROUND THE RAIN GARDEN.
- MONITOR THE RAIN GARDEN DURING AND AFTER RAIN EVENTS. A RAIN GARDEN SHOULD DRAIN WITHIN 24 HOURS. THE AMENDED SOIL MAY BE CLOGGED.



PRETREATMENT OPTIONS DETAIL

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DIRECTOR OF ENGINERING

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RAIN GARDEN
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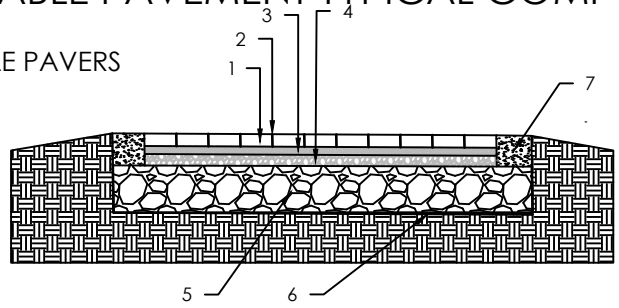
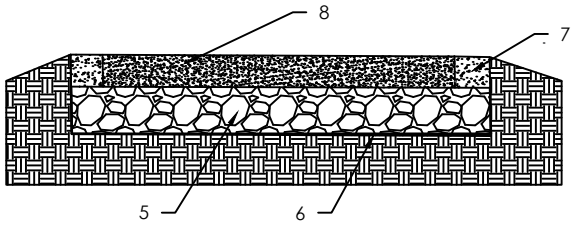
PERMEABLE PAVEMENT TYPICAL COMPONENTS

PERMEABLE PAVERS



PERVIOUS CONCRETE



PERVIOUS CONCRETE INSTALLATION SHALL BE PERFORMED PER ACI 522.1-13: SPECIFICATION FOR PERVIOUS CONCRETE PAVEMENT.

1	CONCRETE PERMEABLE PAVERS
2	¼" JOINTS NO. 8 STONE
3	2" BEDDING LAYER NO. 8 STONE
4	3" GRADED BASE NO. 57 STONE
5	12" STONE SUBBASE NO. 2 STONE
6	GEOTEXTILE FILTER FABRIC U.S. FABRIC INC. 200 NON-WOVEN (ENVIRONMENTAL) (OR APPROVED EQUAL)
7	RIBBON CURB (SEE C.O.F. STANDARD CURB DETAIL)
8	PERVIOUS CONCRETE PER ACI STANDARD

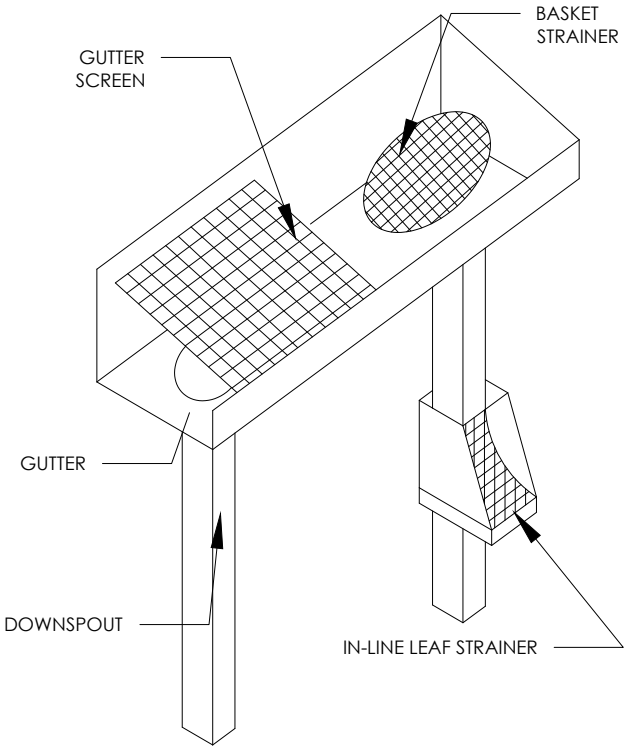
CONSTRUCTION SEQUENCING:

1. REVIEW PAVER LAYOUT ON THE APPROVED PLOT PLAN. STAKE THE AREA WITH ELEVATIONS.
2. EXCAVATE THE AREA. SCARIFY SUBGRADE BY RIPPING THE BOTTOM SOILS TO A DEPTH OF 3 INCHES PRIOR TO STONE PLACEMENT.
3. SCHEDULE GIP INSPECTION WITH CITY STORMWATER INSPECTOR AT (615) 791-3254.
4. INSTALL PERMEABLE GEOTEXTILE FABRIC.
5. INSTALL STONE SUBBASE.
6. A SMALL BOBCAT LOADER MAY BE USED FOR PLACEMENT OF ADDITIONAL SECTIONS AVOIDING THE UNDERDRAIN PIPE INSTALLATIONS, IF UTILIZED.
7. INSTALL CURBING AND BEDDING LAYER.
8. SCHEDULE GIP INSPECTION WITH CITY STORMWATER INSPECTOR AT (615) 791-3254.
9. INSTALL PERMEABLE PAVEMENT.
10. SWEEP NO. 8 STONE WITHIN THE JOINTS UNTIL FILLED AND EVEN.

MAINTENANCE:

- REMOVE ACCUMULATED SEDIMENT AND DEBRIS FROM THE JOINTS AND SURFACE SEASONALLY.
- OBSERVE THE PERMEABLE PAVEMENT SYSTEM DURING AND AFTER RAIN EVENTS FOR EXCESSIVE PONDING. UNCLOG THE PAVEMENT IS PONDING IS OBSERVED.
- VACUUM, SWEEP, OR BLOW THE PERMEABLE PAVEMENT SURFACE SEASONALLY TO KEEP SEDIMENT AND DEBRIS FROM ACCUMULATING AT THE SURFACE. REPLACE JOINT STONE AS NEEDED.
- INSPECT THE PAVEMENT SURFACE FOR CRACK AND DETERIORATION ANNUALLY. REPAIR AND REPLACE AS NEEDED.

SEE SITE PLAN FOR LAYOUT AND SIZING REQUIRED.



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PERMEABLE PAVEMENT
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Appendix C: Native Plant List

Popular Native Perennials for Rain Garden – Full Sun						
Latin Name	**Common Name**	**Size**	**Spacing**	**Moisture**	**Color**	**Height**
Asclepias incarnate	Marsh milkweed	Plugs – 1 gal.	1 plant/24" o.c.	Wet	Pink	3-4'
Asclepias	Purple milkweed	Plugs – 1 gal.	1 plant/18" o.c.	Moist	Purple	3'
Asclepias syriaca	Common milkweed	Plugs – 1 gal.	1 plant/18" o.c.	Moist-dry	Orange	2-5'
Asclepias tuberosa	Butterfly milkweed	Plugs – 1 gal.	1 plant/18" o.c.	Dry-moist	Orange	2'
Asclepias verdis	Green milkweed	Plugs – 1 gal.	1 plant/18" o.c.	Moist	Green	2'
Asclepias verdicillata	Whorled milkweed	Plugs – 1 gal.	1 plant/18" o.c.	Moist	White	2.5'
Aster laevis	Smooth aster	Plugs – 1 gal.	1 plant/18" o.c.	Moist	Blue	2-4'
Aster novae-angliae	New England aster	Plugs – 1 gal.	1 plant/24" o.c.	Wet-moist	Blue	2-5'
Aster sericeus	Silky aster	Plugs – 1 gal.	1 plant/18" o.c.	Dry	Purple	1-2'
Chamaecrista	Partridge pea	Plugs – 1 gal.	1 plant/18" o.c.	Dry	Yellow	1-2'
Conoclinium	Mist flower	Plugs – 1 gal.	1 plant/18" o.c.	Moist-dry	Blue	1-2'
Coreopsis lanceolata	Lance-leaf coreopsis	Plugs – 1 gal.	1 plant/18" o.c.	Moist-dry	Yellow	6-8'
Echinacea pallida	Pale purple coneflower	Plugs – 1 gal.	1 plant/18" o.c.	Dry	Purple	2-3'
Echinacea purpurea	Purple coneflower	Plugs – 1 gal.	1 plant/18" o.c.	Moist-dry	Purple	3-4'
Eupatorium	Boneset	Plugs – 1 gal.	1 plant/24" o.c.	Wet	White	3-5'
Eupatorium	Sweet Joe-Pye Weed	Plugs – 1 gal.	1 plant/24" o.c.	Wet-moist	Purple	3-6'
Iris virginica	Flag Iris	Plugs – 1 gal.	1 plant/18" o.c.	Moist-Wet	Blue	2'
Liatris aspera	Rough blazingstar	Plugs – 1 gal.	1 plant/18" o.c.	Moist-dry	Purple	2-5'
Liatris microcephalla	Small-headed	Plugs – 1 gal.	1 plant/18" o.c.	Moist-dry	Purple	3'
Liatris spicata	Dense blazingstar	Plugs – 1 gal.	1 plant/24" o.c.	Wet-moist	Purple	1.5'
Liatris squarrulosa	Southern blazingstar	Plugs – 1 gal.	1 plant/18" o.c.	Moist-dry	Purple	2-6'
Lobelia cardinalis	Cardinal flower	Plugs – 1 gal.	1 plant/18" o.c.	Wet-moist	Red	2-4'
Monarda didyma	Bee balm	Plugs – 1 gal.	1 plant/24" o.c.	Wet-moist	Red	3'
Monarda fistulosa	Wild bergamot	Plugs – 1 gal	1 plant/18" o.c.	Moist	Purple	1-3'
Oenethera fruticosa	Sundrops	Plugs – 1 gal	1 plant/18" o.c.	Moist-dry	Yellow	
Penstemon digitalis	Smooth white	Plugs – 1 gal	1 plant/24" o.c.	Wet	White	2-3'
Penstemon hirsutus	Hairy beardtongue	Plugs – 1 gal	1 plant/18" o.c.	Dry	White	1-3'
Penstemon smallii	Beardtongue	Plugs – 1 gal	1 plant/18" o.c.	Moist	Purple	1-2'
Pycanthemum	Slender mountain mint	Plugs – 1 gal	1 plant/18" o.c.	Moist	White	1.5-2.5'
Ratibida piñata	Gray-headed	Plugs – 1 gal	1 plant/18" o.c.	Moist	Yellow	2-5'
Rudbeckia hirta	Black-eyed Susan	Plugs – 1 gal	1 plant/18" o.c.	Moist-dry	Yellow	3'
Salvia lyrata	Lyre-leaf sage	Plugs – 1 gal	1 plant/18" o.c.	Moist	Purple	1-2'
Solidago nemoralis	Gray goldenrod	Plugs – 1 gal.	1 plant/18" o.c.	Dry	Yellow	2'
Solidago rugosa	Rough-leaved	Plugs – 1 gal.	1 plant/18" o.c.	Wet	Yellow	1-6'
Veronacastrum	Culver's root	Plugs – 1 gal.	1 plant/24" o.c.	Dry	White	3-6'
Veronia veboracensis	Tall ironweed	Plugs – 1 gal.	1 plant/24" o.c.	Wet-moist	Purple	3-4'

Plant material size and grade to conform to "American Standards for Nursery Stock" American Association of Nurserymen, Inc. latest approved revision, ANSI Z-60-1

Popular Native Perennials for Rain Garden – Shade						
Latin Name	**Common Name**	**Size**	**Spacing**	**Moisture**	**Color**	**Height**
Aquilegia canadensis	Wild columbine	Plugs – 1 gal.	1 plant/18" o.c.	Moist-dry	Pink	1-2.5'
Athyrium filix-femina	Lady Fern	1 gal.	1 plant/18" o.c.	Moist	Green	3'
Arisaema triphyllum	Jack-in-the-pulpit	Plugs – 1 gal.	1 plant/18" o.c.	Moist	Green	1.5-2.5'
Arisaema dricontium	Green dragon	Plugs – 1 gal.	1 plant/18" o.c.	Wet-moist	Green	3'
Asarum canadense	Wild ginger	Plugs – 1 gal.	1 plant/18" o.c.	Wet-moist	Red-brown	0.5-1'
Aster cardifolius	Blue wood aster	Plugs – 1 gal.	1 plant/18" o.c.	Moist-dry	Blue	1-3'
Aster novae-angliae	New England aster	Plugs – 1 gal.	1 plant/24" o.c.	Moist-dry	Blue/ purple	3-4'
Aster oblongifolius	Aromatic Aster	Plugs – 1 gal.	1 plant/24" o.c.	Moist-dry	Blue/ purple	1.5-3'
Coreopsis major	Tickseed coreopsis	Plugs – 1 gal.	1 plant/18" o.c.	Moist-dry	Yellow	3'
Dryopteris marginalis	Shield Fern	1 gal.	1 plant/18" o.c.	Moist	Green	2-3'
Geranium maculatum	Wild geranium	Plugs – 1 gal.	1 plant/18" o.c.	Moist	Pink	2'
Heuchera americana	Alumroot	Plugs – 1 gal.	1 plant/18" o.c.	Moist-dry	Purple	1'
Iris cristata	Dwarf crested iris	Plugs – 1 gal.	1 plant/18" o.c.	Moist-dry	Purple	4"
Lobelia siphilicata	Great blue lobelia	Plugs – 1 gal.	1 plant/18" o.c.	Wet-moist	Blue	1.5-3'
Lobelia cardinalis	Cardinal flower	Plugs – 1 gal.	1 plant/18" o.c.	Wet-moist	Red	2-4'
Mertensia virginica	Virginia bluebells	Plugs – 1 gal.	1 plant/18" o.c.	Moist	Blue	1.5'
Osmunda cinnamomea	Cinnamon Fern	1 gal.	1 plant/24" o.c.	Wet-moist	Green	3-4'
Phlox divericata	Blue phlox	Plugs – 1 gal.	1 plant/18" o.c.	moist	Blue	0.5-2'
Polemonium reptans	Jacob's ladder	Plugs – 1 gal.	1 plant/18" o.c.	Moist-dry	Blue	15"
Polystichum acrostichoides	Christmas fern	Plugs – 1 gal.	1 plant/24" o.c.	Moist-dry	Evergreen	2'
Stylophoru diphyllum	Wood poppy	Plugs – 1 gal.	1 plant/18" o.c.	Wet -moist	Yellow	1.5'

Plant material size and grade to conform to "American Standards for Nursery Stock" American Association of Nurserymen, Inc. latest approved revision, ANSI Z-60-1.

Popular Native Grasses and Sedges for Rain Garden						
Latin Name	**Common Name**	**Size**	**Spacing**	**Moisture**	**Color**	**Height**
Carex grayi	Gray's Sedge	1 gal.	1 plant/24" o.c.	Moist	Green	3'
Carex muskingumensis	Palm Sedge	1 gal.	1 plant/24" o.c.	Moist	Green	3'
Carex stricta	Tussock Sedge	1 gal.	1 plant/24" o.c.	Moist	Green	3-4'
Chasmanthium latifolium	Upland Sea Oats	Plugs – 1 gal.	1 plant/18" o.c.	Moist-dry	Green	4'
Equisetum hyemale	Horsetail	Plugs – 1 gal.	1 plant/18" o.c.	Wet	Green	3'
Juncus effesus	Soft Rush	Plugs – 1 gal.	1 plant/24" o.c.	Wet-dry	Green	4-6'
Muhlenbergia capallaris	Muhly Grass	1 gal.	1 plant/24" o.c.	Moist	Pink	3'
Panicum virgatum	Switchgrass	1-3 gal.	1 plant/48" o.c.	Moist-dry	Yellow	5-7'
Schizachyrium scoparium	Little Blue Stem	1 gal.	1 plant/24" o.c.	Moist-dry	Yellow	3'
Sporobolus heterolepsis	Prairie Dropseed	1 gal.	1 plant/24" o.c.	Moist-dry	Green	2-3'

Plant material size and grade to conform to "American Standards for Nursery Stock" American Association of Nurserymen, Inc. latest approved revision, ANSI Z-60-1.

Popular Native Trees for Rain Garden							
Latin Name	**Common Name**	**DT-FT**	**Light**	**Moisture**	**Notes**	**Flower Color**	**Height**
Acer rubrum	Red Maple	DT-FT	Sun-shade	Dry-wet	Fall color		50-70’
Acer saccharum	Sugar Maple		Sun-pt shade	Moist	Fall color		50-75’
Ameleanchier Canadensis	Serviceberry		Sun-pt shade	Moist-wet	Eatable berries	White	15-25’
Asimina triloba	Paw Paw		Sun-pt shade	Moist	Eatable fruits	Maroon	15-30’
Betula nigra	River Birch	FT	Sun-pt shade	Moist-wet	Exfoliating bark		40-70’
Carpinus caroliniana	Ironwood		Sun-pt shade	Moist		White	40-60’
Carya aquatica	Water Hickory	FT-DT	Sun	Moist	Fall color		35-50’
Cercus Canadensis	Redbud	DT	Sun-shade	Moist	Pea-like flowers, seed pods	Purple	20-30’
Chionanthus virginicus	Fringetree		Sun-pt shade	Moist	Panicled, fragrant flowers	White	12-20’
Cladratis lutea	Yellowwood	DT	Sun	Dry-moist	Fall color	White	30-45’
Cornus florida	Flowering Dogwood		Part shade	Moist	Red fruit, wildlife	White	15-30’
Ilex opaca	American Holly	DT	Sun-pt shade	Moist	Evergreen	White	30-50’
Liquidambar styraciflua	Sweetgum	DT-FT	Sun-pt shade	Dry-moist	Spiny fruit		60-100’
Magnolia virginiana	Sweetbay Magnolia		Sun-pt shade	Moist-wet	Evergreen	White	10-60’
Nyssa sylvatica	Black Gum		Sun-Shade	Moist	Fall color		35-50’
Oxydendrum arboretum	Sourwood		Sun-pt shade	Dry-moist	Wildlife	White	20-40’
Platanus occidentalis	Sycamore	FT	Sun-pt shade	Moist	White mottled bark		70-100’
Quercus bicolor	Swamp White Oak	DT	Sun-pt shade	Moist-wet	Acorns		50-60’
Quercus nuttalli	Nuttall Oak	DT	Sun	Dry-moist	Acorns		40-60’
Quercus lyrata	Overcup Oak	FT	Sun	Moist	Acorns		40-60’
Quercus shumardii	Shumard Oak	DT	Sun	Moist	Acorns		40-60’
Rhamnus caroliniana	Carolina Buckthorn		Sun	Moist	Black fruit		15-30’
Salix nigra	Black Willow	FT	Sun-pt shade	Moist-wet	White catkins	Yellow	40-60’
Ulmus americana	American Elm	DT-FT	Sun-pt shade	Moist			
Salix nigra	Black Willow	FT	Pt shade	Moist-wet	White catkins	Yellow	40-60’

Size: min. 2” caliper if not reforestation. DT: Drought Tolerant FT: Flood Tolerant

Plant material size and grade to conform to “American Standards for Nursery Stock” American Association of Nurserymen, Inc. latest approved revision, ANSI Z-60-1.

Popular Native Shrubs for Rain Garden								
Latin Name	**Common Name**	**DT FT**	**Light**	**Moisture**	**Spacing (0 C)**	**Notes**	**Flower Color**	**Height**
Aronia arbutifolia	Red Chokeberry	FT	Sun-pt shade	Dry-wet	4’	Red berries, wildlife	White	6-12’
Buddleia davidii	Butterfly Bush	DT	Sun-pt shade	Dry-moist	4’	Non-native	Blue	5’
Callicarpa Americana	American Beautyberry	DT	Sun-pt shade	Dry-wet	5’	Showy purple fruit	Lilac	4-6’
Cephalanthus occidentalis	Button Bush	FT	Sun-shade	Moist-wet	5’	Attracts wildlife	White	6-12’
Clethra alnifolia	Sweet Pepper Bush		Sun-pt shade	Dry-moist	3’	Hummingbird	White	5-8’
Cornus amomum	Silky Dogwood		Sun-shade	Moist-wet	6’	Blue berries, wildlife	White	6-12’
Corylus americana	American Hazelnut		Sun-pt shade	Dry-moist	8’	Eatable nuts, wildlife	Yellow	8-15’
Hamemelis virginiana	Witch-hazel		Sun-pt shade	Dry-moist	8’	Winter bloom	Yellow	10’
Hibiscus moscheutos	Swamp Mallow	FT	Sun	Moist-wet	30”	Cold-hardy	White – red	4-7’
Hydrangea quercifolia	Oakleaf Hydrangea	DT	Pt shade – shade	Moist	4’	Winter texture	White	3-6’
Hypericum frondosum	Golden St. John’s Wort	DT	Sun-pt shade	Dry-moist	30”	Semi-evergreen	Yellow	2-3’
Hypericum prolificum	Shrubby St. John’s Wort	DT	Sun-pt shade	Dry-moist	3’	Semi-evergreen	Yellow	3’
Ilex decidua (dwarf var.)	Possumhaw Viburnum	DT	Sun-pt shade	Moist	4-6’	Red berries		6-14’
Ilex glabra	Inkberry	DT	Sun-pt shade	Moist-wet	3’	Evergreen		4-8’
Ilex verticillata	Winterberry Holly	FT	Sun-pt shade	Moist-wet	3’	Red berries		10’
Itea virginica	Virginia Sweetspire	DT FT	Sun-shade	Moist-wet	4’	Fall color	White	4-8’
Lindera benzoin	Spicebush	DT	Pt shade – shade	Moist-wet	8’	Butterflies, wildlife	Yellow	6-12’
Viburnum dentatum	Arrowwood Viburnum		Sun-shade	Dry-wet	6’	Wildlife	White	6-8’

Size: minimum 3 gal. container or equivalent. DT: Drought Tolerant FT: Flood Tolerant

This list provides plant species; there are multiple varieties within each species.

Plant material size and grade to conform to “American Standards for Nursery Stock” American Association of Nurserymen, Inc. latest approved revision, ANSI Z-60-1.