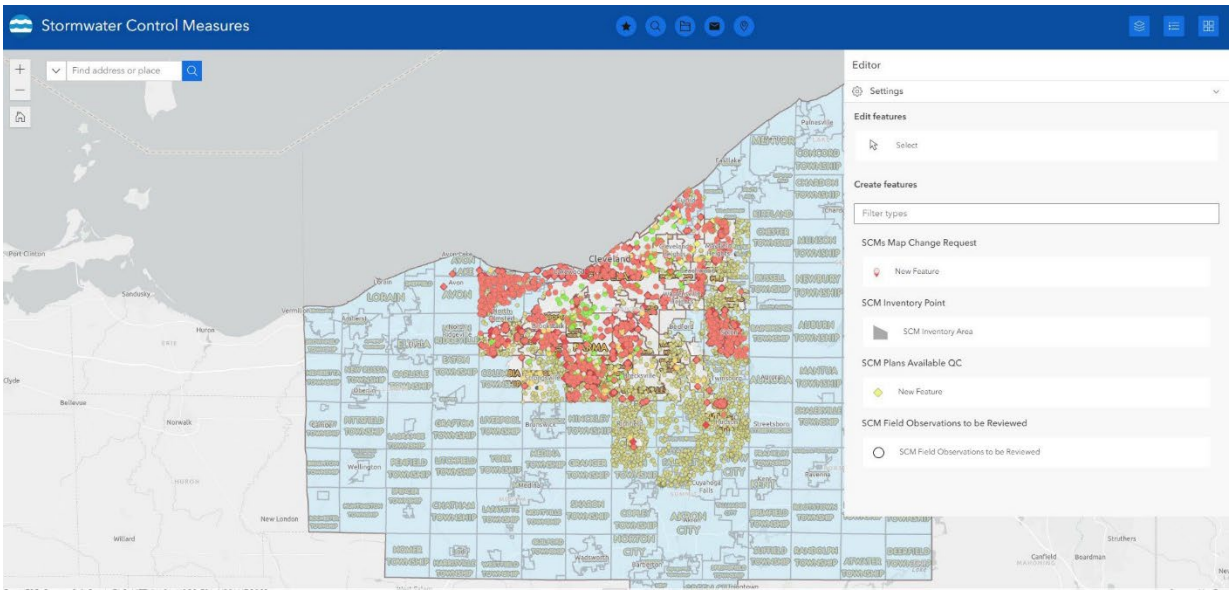
Stormwater Control Measures

Introduction

The purpose of this document is to provide guidelines for editors to ensure consistency and completeness within the Stormwater Control Measures (SCM) dataset. Designated fields have editing enabled while others require a map change request submission. The map change request process gives the District's GIS end-users the ability to effectively communicate errors in the SCM dataset that are not editable. This functionality is available through the Local Stormwater Control Measures Viewer within ArcGIS Online.

If the user does not have a username or is unable to log in, contact GIS@neorsd.org. Users can access this *web app* via a web browser and the *web map* via the Field Maps application on mobile devices. This document provides a brief overview of how to mark an area for an update as well as make edits to edit enabled data. The first part of this guide will refer to accessing the application in a web browser, while the second part covers mobile device access.



Contents

Fields by Layer

Newly Added Fields are Highlighted

SCM Site

Field Name	Description	Required?	Edit Enabled?
Site ID	Unique ID assigned based on 2-digit community code and location assigned by NEORSD GIS.	No	No
Site Name	Building or site location name - sometimes more specific to the phase of the project and may not match the Site Name in the SCM Layer.	No	Yes
Address	Building or site location address number and street name	No	Yes
City	City name	No	Yes
Zip	Zip code	No	Yes
Primary Parcel ID	Parcel ID assigned by County Auditor or by NEORSD GIS SWFT SMP Parcels	No	Yes

Ownership Type	Property owner type	No	Yes
Credit Flag	Flag to indicate if the property has a NEORSD SW credit	No	Yes
Source	Organization data acquired from (NEORSD, CSWCD,SSWCD)	No	Yes
Document Link	Link to include all site plans, reports, assessments, etc.	No	No
Comments	Comments or additional details for SCM site	No	Yes
Attachments	Photo/Image of SCM site	No	Yes

SCM Inventory Area

Field Name	Description	Required?	Edit Enabled ?
Site ID	Unique ID assigned based on 2-digit community code and location assigned by NEORSD GIS.	Yes	Yes
Site Name	Building or site location name - sometimes more specific to the phase of the project and may not match the Site Name in the SCM Layer.	Yes	Yes
SCM ID	Unique ID assigned based Site_ID and a number given on the order the SCM entered the database.	Yes	Yes
SCM Type	Type of stormwater control measure: see definitions and examples at the end of this document.	Yes	Yes
SCM Type - Other	Proprietary system description or other SCM Type.	No	Yes
SCM Location	The description of where the SCM is located on the site.	No	Yes
Install Year	Year of SCM installation or most recent year on as-built plans.	No	Yes
City	City name	Yes	Yes
Subwatershed	Populated using RSS Subwatershed layer & domain. Can also be manually populated.	Yes	Yes
Source	The organization the data was acquired from (NEORSD, CSWCD, SSWCD).	No	Yes
Source ID	ID of SCM used by the Source - either ID in fulcrum or on as-built plans	No	Yes

Flood Control	Design criteria used for SCM (Post=Pre (typically prior to 2003), Critical Storm (typically 2003 or later), Other).	No	Yes
Flood Control Volume (ft3)	The volume of water in cubic feet the SCM holds at [flood control] level	No	Yes
Max Embankment Elevation	The elevation of the top of the embankment/berm/edge of the SCM.	Yes	Yes
Emergency Spillway Elevation	The elevation of the emergency spillway.	No	Yes
Outlet Structure Rim Elevation	The elevation of the top/rim of the outlet structure (i.e. a catch basin, storm manhole, etc.).	No	Yes
Max Storm Event	The maximum storm event that the basin can hold.	No	Yes
Max Storm Elevation	The elevation/water level of the maximum storm event.	No	Yes
Critical Storm	The design storm used to control peak discharge - this field should only be populated if Critical Storm is selected for Flood Control	No	Yes
Total Storage Volume (ft3)	The total storage in cubic feet the SCM can hold (i.e. the volume up to the embankment elevation or the emergency spillway elevation)	Yes	Yes
WQv (ft3)	The volume of water treated in cubic feet for water quality SCMs (SCMs installed 2003 or later should have WQv)	No	Yes
WQv depth (in)	The depth of water treated in inches for water quality SCMs; the P value in the WQv calculation (SCMs installed 2003-2017 = 0.75″)(SCMs installed 2018-present = 0.9″).	No	Yes
Water Quality Orifice	Indicates if the control measure has a water quality orifice (Y/N).	No	Yes
Primary Spillway Elevation	The elevation of the WQv orifice and/or the level at which the water begins to be treated.	No	Yes
Primary Spillway Diameter / Water Quality Orifice Size (in)	Size of the water quality orifice diameter in inches.	No	Yes
Area Treated (acres)	The area of land draining to the SCM in areas (can often be found in the WQv calculation).	Yes	Yes

Impervious Area Treated (acres)	The area of impervious surface (hard surfaces) draining to the SCM in acres.	No	Yes
Discharge Point	Where is the practice discharging from the site? Choices are Surface Waters (Waters of the State), MS4 (regulated storm sewer or urbanized), non-MS4 (non-regulated sewer or non-urbanized), or CSO (Combined Sewer Overflow - only in Cleveland, Lakewood, and Euclid).	Yes	Yes
Type of Outlet Structure	Catch basin, catch basin with weir, catch basin with interior riser, catch basin with exterior riser, headwall & pipe, pipe, weir, other.	Yes	Yes
Plans Available	Are the as-built plans for this SCM attached? - Not Reviewed (this is used to identify SCMs that we have not checked to see if there are plans) - Under Review - See QC Layer (this is used if we are in the process of reviewing our sources for plans and waiting to get them linked) - Yes (this is used if the plans are attached - NOTE: if there was a general stating a SITE had plans, all the SCMs on that SITE were updated to YES; however, there is a chance some SCMs on a SITE were not included in that set of plans and this designation should be changed so we know plans are needed.)	N/A	Yes
LTOM Available	Is the Long-term operations and maintenance manual attached? Any best management practices for how to maintain the SCM?	No	Yes
Drainage Area Delineation	Is the drainage area delineation (or watershed) for the SCM available in the plans attached?	No	Yes
Stage-Area Relationship Available	Is the table the storage area (or volume) at each elevation with the SCM available in the plans attached?	No	Yes
Outlet Works Drawings Available	Is there a detailed diagram or set of drawings showing the primary spillway, emergency spillway from the upstream side of an impoundment, over or through the impoundment, and any energy dissipator on the downstream side that helps transition flow back to the stormwater system outlet structure design available in the plans attached?	TBD	Yes
Review Status	Indicates the status of review.	N/A	Yes

	- Not Reviewed (the default value, if the SCM plans have not been reviewed and attributes have not been populated) - Need Info (if the SCM plans have been reviewed but all the required attributes to be COMPLETE are not populated) - Complete (Status can be COMPLETE if the following fields are filled in: site ID, scm type, city, area treated, discharge point, type of outlet structure, and drainage area delineation available. If any of those fields are missing, status should be NEED INFO.)		
Comments	Notes on SCM Inventory	N/A	

SCM Field Observations – To Be Reviewed

Field Name	Description	Edit Enabled
Status	Identifies if the SCM still needs to be reviewed	Yes
Priority	The order in which the SCM should be reviewed and checked with priority 1 is the highest and 5 is the lowest.	Yes
City	City name	Yes
Subwatershed	Populated using the RSS Subwatershed layer & domain	Yes
Watershed	WAC Watershed	Yes
Soil & Water Conservation District	Responsible Soil & Water Conservation District	Yes
SCM Type	Type of stormwater control measure: see definitions at the end of this document	Yes
Comments	Notes providing additional details on SCMs, if plans can be acquired from City, etc	Yes

SCM Plans Available QC

Field Name	Description	Required?	Edit Enabled?
SCM ID	The SCM ID should match the SCM being referenced	No	Yes
NEORSD Credits	Status for checking NEROSD credit files for as-built plans	No	Yes
NEORSD Credits Review Date	Date last checked NEORSD credit locations	No	Yes
CCDPW 2018 Files	Status for checking NEORSD CCDPW 2018 files for as- built plans	No	Yes
CCDPW 2018 Files Review Date	Date last checked CCDPW 2018 folder	No	Yes
Reference Polygon Layer	Status for checking the NEORSD Ref Poly layer for as-built plans	No	Yes
Reference	Date last checked the NEORSD Ref Poly layer	No	Yes
Polygon Review Date		No	Yes
SWCD	Status for checking with the responsible Soil & Water Conservation District for as-built plans	No	Yes
SWCD Review Date	Date last checked with SWCD	No	Yes
Community	Status for checking with the responsible Community for as-built plans	No	Yes
Comments		No	Yes

SCM Drainage Area

Field Name	Description	Edit Enabled
SCM ID	The SCM ID should match the SCM being referenced	Yes
City	City name	Yes
Subwatershed	Populated using the RSS Subwatershed layer & domain	Yes
Drainage Area (Acres)	The total drainage area of the SCM in acres	Yes
Impervious Area Treated (Acres)	The total impervious area treated by the SCM in acres	Yes
Comments	Notes providing additional details	Yes

SCM Map Change Request

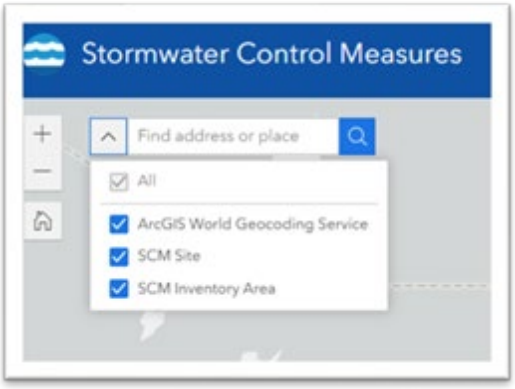
Field Name	Description	Edit Enabled
Layer	The layer with the error or change needed	Yes
Site ID	The Site ID should match the Site being referenced	Yes
SCM ID	The SCM ID should match the SCM being referenced	Yes
Issue	Indicates the issue: • New Documents • Remove Extra Pages • Incorrect Documents Linked • Not a Control Measure • Site ID Error • SCM ID Error • Site Geometry Error • Archive Site • Archive SCM	Yes
Notes	Additional information about the error or change needed	Yes
Recommendation	Recommended change	Yes

Using The SCM Application

Sign in to ArcGIS Online by going to https://neorsd.maps.arcgis.com (Google Chrome recommended for best performance). The **Local Stormwater Control Measures Viewer** app can be accessed by performing a search in the search tab or by clicking the "Groups" tab, then selecting the Stormwater Control Measures group. The web app will be displayed in the Feature Group Content. Open the web app.

Search Data

The Search widget provides the ability to find features or locations based on specific layers and locators. To search, type a word or phrase in the search box and press Enter,



click the search button and choose from a list of suggestions that appear based on matching records.

The search widget is in the upper left corner and provides the options to search by different fields:

Search by SCM Site Parcel ID, Site Name, Site ID, Address or Coordinates.

Filter Data

The filter widgets limit the visibility of features on the map. Multiple filters can be applied at the same time.

For filter to be applied, the toggle switch must be turned on. 

SCM Inventory Point

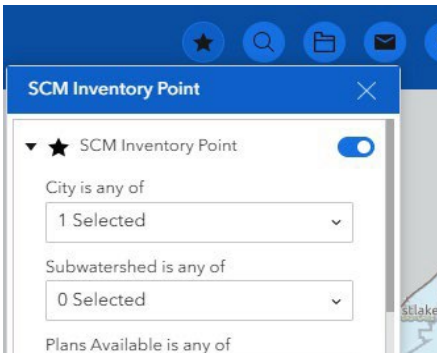
SCM Field Observations to be

Reviewed CDPP Plan Review

SCM Plans Available

QC Map Change

Request

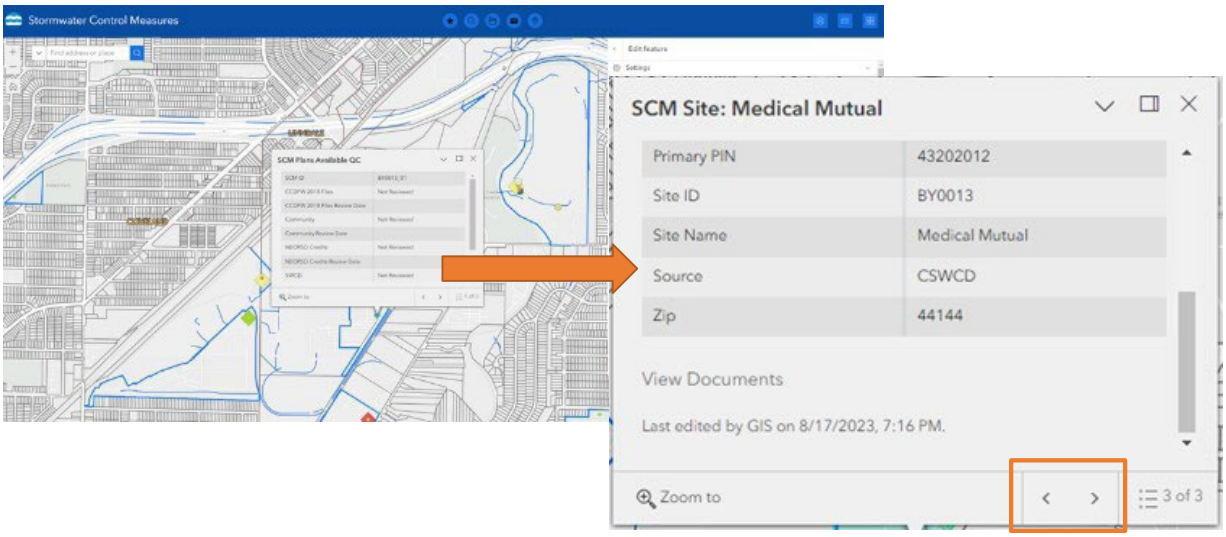


To clear all filters, select Reset Filter button at the bottom of each window. 

View Feature Attributes

The Feature Info widget displays attributes for selected features. Select a feature directly in the map viewer and the pop up will automatically open.

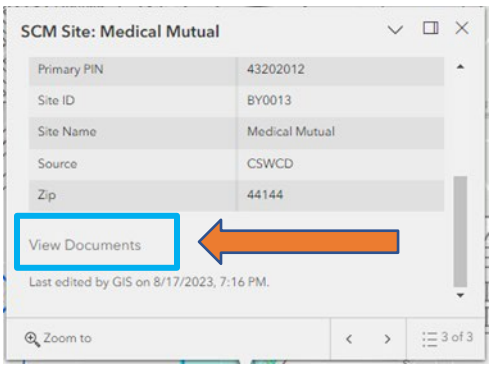
If multiple features are stacked on top of one another, using the arrow icons in the bottom right in the pop-up box to scroll through the stacked records



View Documents

Documents have been gathered from multiple sources and are linked to the SCM Site layer. Available documents include as-built plans, inspection reports, photos, etc. Follow the steps above to open the pop up and scroll to the SCM Site layer.

Select “View Documents” at the bottom of the window. Access is restricted to users with login information (different from AGO login). Please contact GIS@neorsd.org for access.

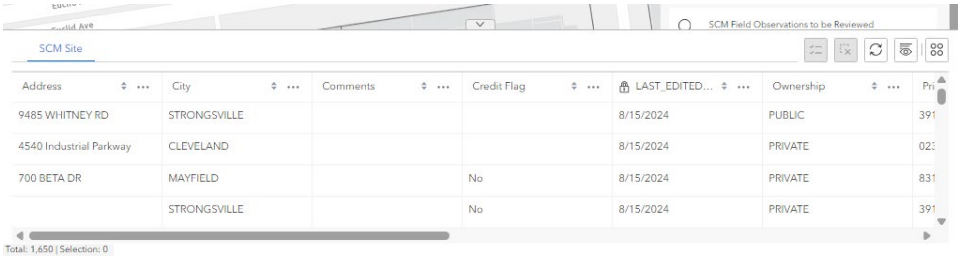


Creating and Editing SCM Inventory Areas in the Application

Inventory areas need to be created when new SCM Sites are created and if there are new SCMs found in plans for an existing SCM. Editing inventory area shapes is appropriate when the SCM blatantly does not match the plans (i.e. wrong location, wrong shape, etc.). When editing inventory area shapes, double check to make sure that you are looking in the correct location, verify the number of SCMs in that location, and make a note of the change you made in whatever tracking system you are using.

Helpful Tips

- Use the latest Nearmap imagery as your base layer when drawing and editing inventory areas.
- Having trouble finding the SCM Site using the search bar within the application/AGO Map?
- If the SCM Site does not have a name yet, click the tab at the bottom of the map to open the table.
- Look for the correct SCM Site ID and select it. Then, select the "zoom to selection" button in the top right corner.

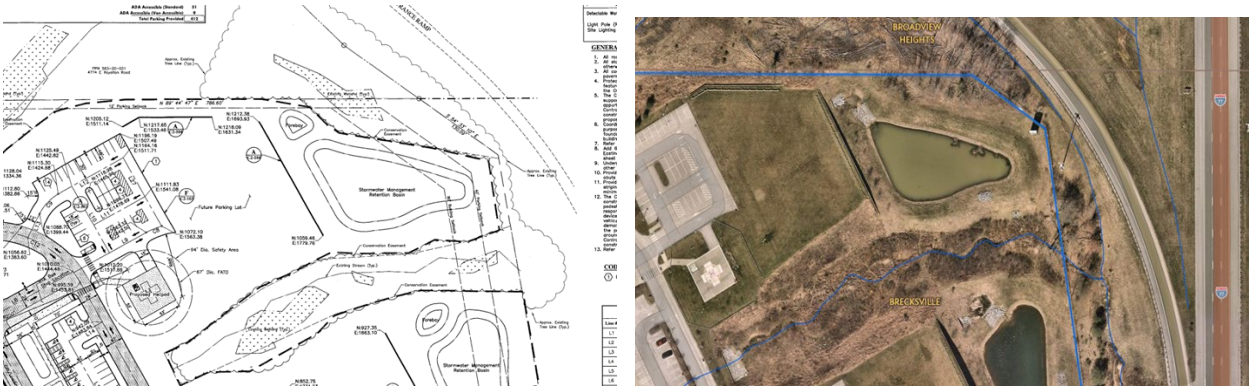


Creating SCM Inventory Area polygons and adding information.

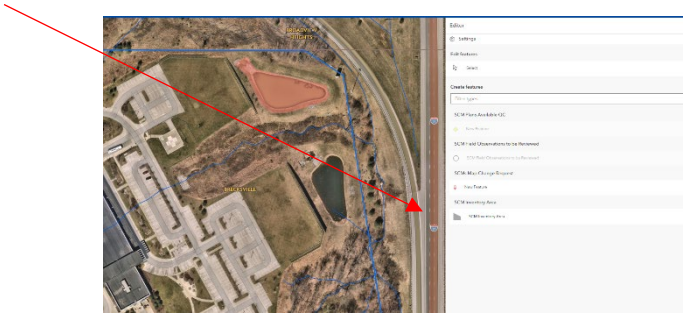
Sign in to ArcGIS Online by going to https://neorsd.maps.arcgis.com (Google Chrome recommended for best performance). The **Local Stormwater Control Measures**

Viewer app can be accessed by performing a search in the search tab or by clicking the "Groups" tab, then selecting the Stormwater Control Measures group. The web app will be displayed in the Feature Group Content. Open the web app.

1. Identify an SCM in the plans and locate in the SCM Application.
   this can be done using the search bar referenced in the above section or zooming in on the location.



2. Select the "Inventory Area" Layer on the vertical toolbar to the right.



3. The **Create features** pane will open and then you can click anywhere on the map to start drawing.

4. Once you complete the drawing, double click to finish. The fields for the newly created SCM Inventory Area polygon will pop up within the **Create features** pane.

5. Fill in the Form with the required information. Some Fields are required in order to create the Inventory Area.

   Required initial fields.

   i. **Site ID** (BK0009)-Read Only, you cannot edit the site ID in AGO, so this will have to be filled out in Pro or by the NEORSD GIS Contact.

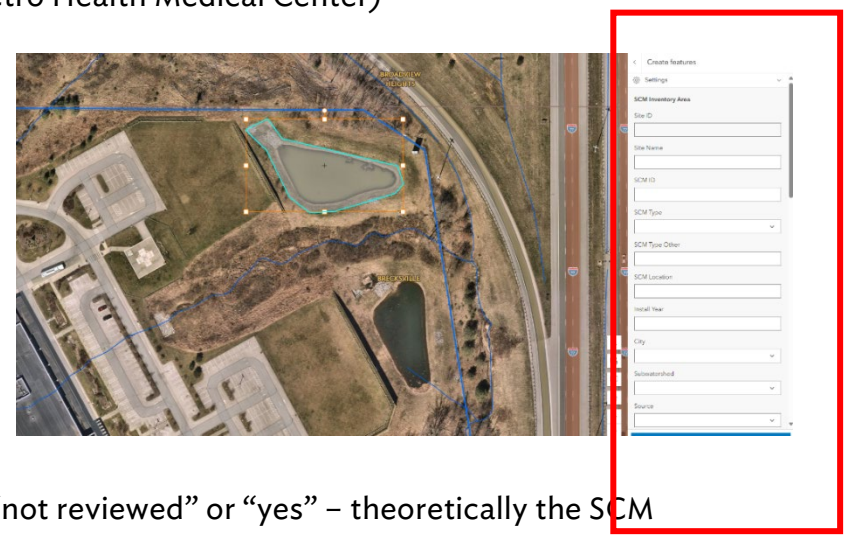
   ii. **Site Name** (ex. Metro Health Medical Center)

   iii. **SCM ID** (ex. BK0009_01)

   iv. **SCM Type** (ex. Dry Extended Detention Basin)

   v. **City** (ex. Brecksville)

   vi. **Subwatershed** (ex. Chippewa Creek)

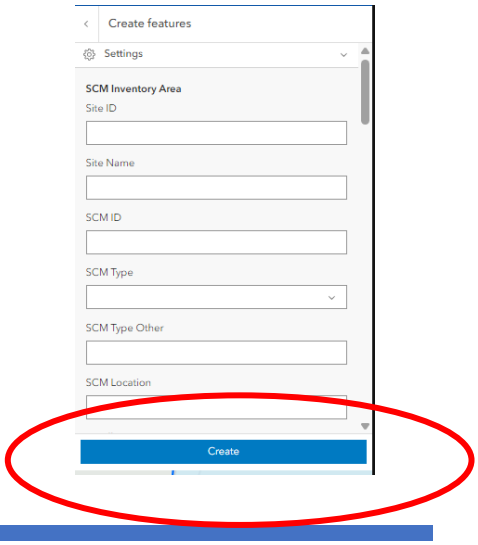


   vii. **Plans Available** ("not reviewed" or "yes" – theoretically the SCM Plans Available QC layer should automatically populate this once that point has been updated)

   viii. **Review Status** ("not reviewed")

   ix. All other Fields will be filled out as needed based on the SCM type and the Information provided by the plans.

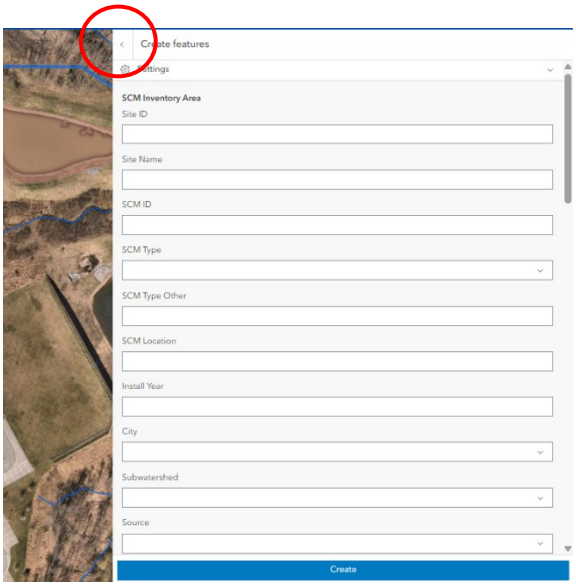
6. After the above Is complete, select **Create** at the bottom of the window.



Discard Edits

To Discard edits before you create the new area select the back arrow at the top of the pane. This will bring up the option to Continue editing or Discard Edits.

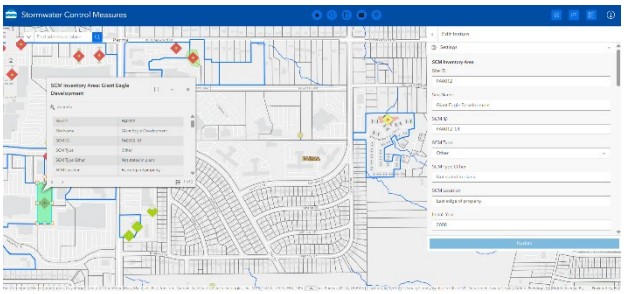
*If the area was created by mistake, a map change request will have to be made. (Review that section further down).



Editing SCM Inventory Area polygons and Fields

Sign in to ArcGIS Online by going to https://neorsd.maps.arcgis.com (Google Chrome recommended for best performance). The Local Stormwater Control Measures Viewer app can be accessed by performing a search in the search tab or by clicking the "Groups" tab, then selecting the Stormwater Control Measures group. The web app will be displayed in the Feature Group Content. Open the web app.

- Select the desired Inventory Area polygon by clicking on it.
- The Area will then be highlighted, and the form will pop up on the right.



- To Edit the Form, Click on one of the form window field values.
- To edit shape geometry, drag vertices to the correct feature geometry. NOTE: Change the Basemap to the most up-to-date Nearmap aerial imagery in the lower-left corner of the map frame.

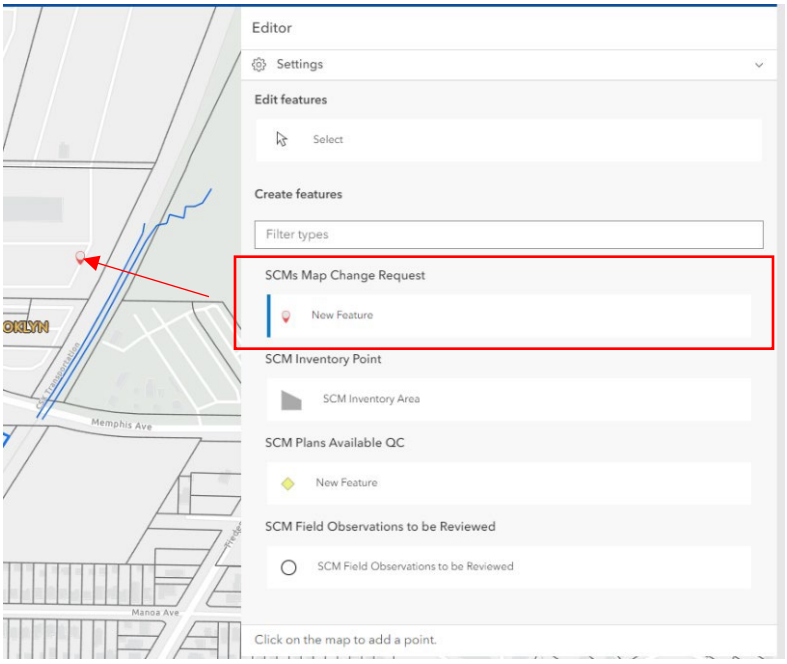
- To save edits, click "update" at the bottom of the **Edit feature** pane.

Map Change Requests

Edit Disabled Fields (Map Change Request)

Editors are required to submit a map change request for fields that do not have editing enabled. It can also be used for sites that need to be split or combined. A map change request should be submitted for new drawings, inspection reports, and photos.

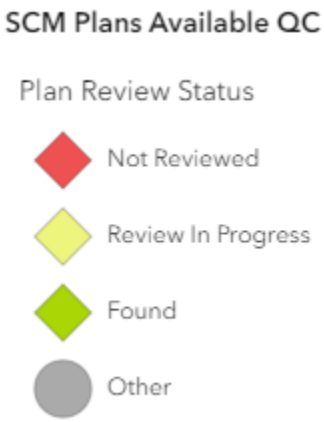
1. Sign in to ArcGIS Online by going to https://neorsd.maps.arcgis.com (Google Chrome is recommended for best performance). The Local Stormwater Control Measures Viewer app can be accessed by performing a search in the search tab or by clicking the "Groups" tab, then selecting the Stormwater Control Measures group. The web app will be displayed in the Feature Group Content. Open the web app.
2. After opening the Local Stormwater Control Measures Viewer app, confirm the map change request layer is turned on in the layer widget as shown below. The Map Change Request layer gives the District's GIS end-users the ability to effectively communicate errors in the SCM layers that are not editable



3. Zoom to the area of interest to locate the error in the dataset. Once in the correct area, users will begin an edit session to place the Map Change Request point in the correct location. Select the "New Feature" from the SCMs Map Change Request point from the menu. Place the point on the map to align with the error.
4. Once the point is placed on the map, the user will be prompted to complete attribute information. Users should complete all information, especially "Notes" to give GIS staff further clarification on the issue. (Status defaults to "Open", leave as is. GIS staff will update the status).
5. The Map Change Request features have attachments enabled. This means users can and are strongly encouraged to attach documents, plans, photos, and field sketches to the points. This is done through the attachment menu located at the bottom of the pop-up window. Users click "Choose File" and locate the documents to include. The system can accept nearly all types of files, including word documents, PDFs, and image files.
6. Select "Add" to save the new map change request point.

SCM Plans Available QC Workflow

This review process will help the team track what resources still need to be reviewed to locate plans that may be missing. These checks should be completed by NEORSD staff since most of the file locations are on the Network drive.



The QC point will stay red if all the statuses are set to "Not Reviewed" or "Not Found". In addition to this, the point will also still be red if the Reference Polygon status is the only one set to "Found".

The QC point will be yellow if every status prior to the Community status has been set to "Not Found" and the Community Status has been set to either "Need to Request" or "Requested".

The QC will be green if any one of the statuses for NEORSD Credits, CCDPW 2018, SWCD, or Community has been set to "Found".

General Status Information

- **Not Reviewed -** This is the default status before any source has been reviewed.

Only have one field as "Need to Request" at one time.

When to mark as *"Need to Request"*

Details and plans have not been found in any other source we can check.

When to mark as *"Requested"*

We have sent a request to a community and are waiting for a response.

When to mark as *"Not Found"*

This option should be chosen when the community does not have additional information.

When to mark as *"Found"*

Mark as "Found" when you receive information you use for the inventory area or corroborates details from other sources for the SCM at any point.

Review Dates

Review dates should be filled out when the status is anything other than "Not Reviewed". As the default entry, it should not have any date that it was reviewed on.

Tips

- Some sites have changed names over time. Checking the local ref poly layer can help you figure out names for the area. Additionally, checking Google Maps or Google Earth is helpful when trying to figure out places and names.
- Google Maps and Google Earth are generally helpful when you want to get a closer look at the SCM.
- Use "as-built" plans

Community Review

After all the other sources for plans have been reviewed and not found, the community should be contacted directly.

SCM Types, Definitions, and Examples

Not all SCM designs are the same so the examples shown may only show a specific vendors product.

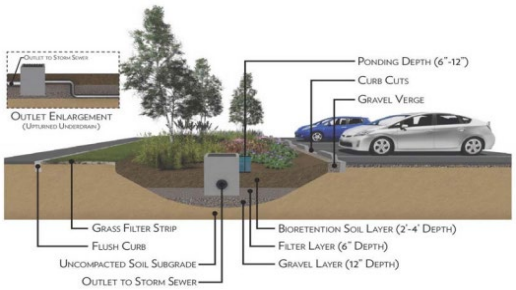
- Bioretention Area
- Dry Pond or Dry Extended Detention Basin
- Wet Pond or Wet Extended Detention Basin
- Infiltration SCMs

- Rain Barrels & Cisterns
- Underground Detention
- Outlet Structures
- Oil-Water Separator
- Non-Structural SCMs: Riparian & Wetland Setbacks and Conservation Areas

Bioretention Cell

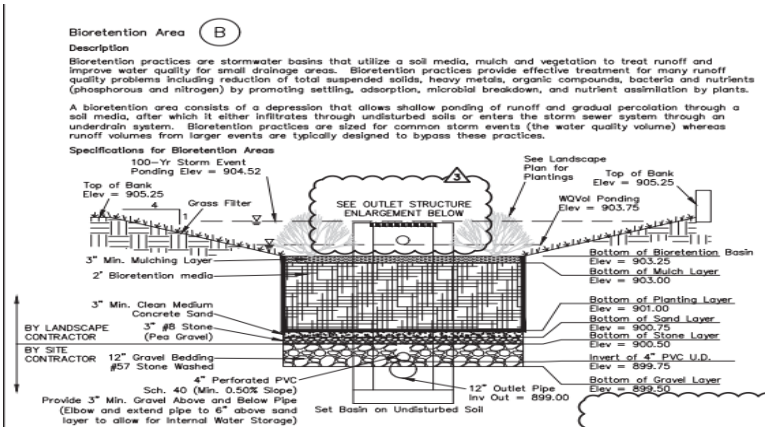
Other names: bioswale[1]*, bioinfiltration basin

Bioswale can also refer to a vegetated infiltration swale. The difference lies in the design.



Typical bioretention area cross-section view. *Credit: Chagrin River Watershed Partners, Inc. in "Maintaining Stormwater Control Measures", p. 7*

Landscaped depressions designed to treat localized stormwater runoff. The stormwater ponds and filters through vegetation and a mixture of soil, sand, and/or gravel. The water quality of the stormwater improves as the pollutants are filtered out. The water then soaks into the ground, providing water to vegetation and potentially recharging the local water table. Underdrains may be installed to drain the bioretention area to local sewers or an appropriate outlet.



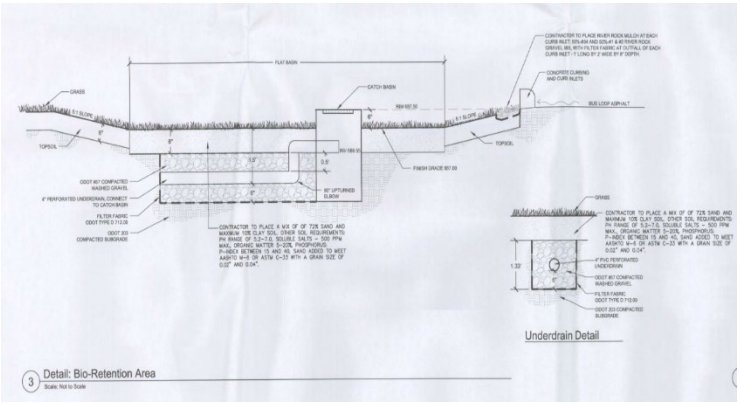
Bioretention cross-section with description of SCM. *From PA0026 – Parma Dairy Queen, Ph. 2: ParmaDairyQueen2FinalPlans.pdf*

Dry Detention

Other names: detention ponds, extended detention ponds

General Definition

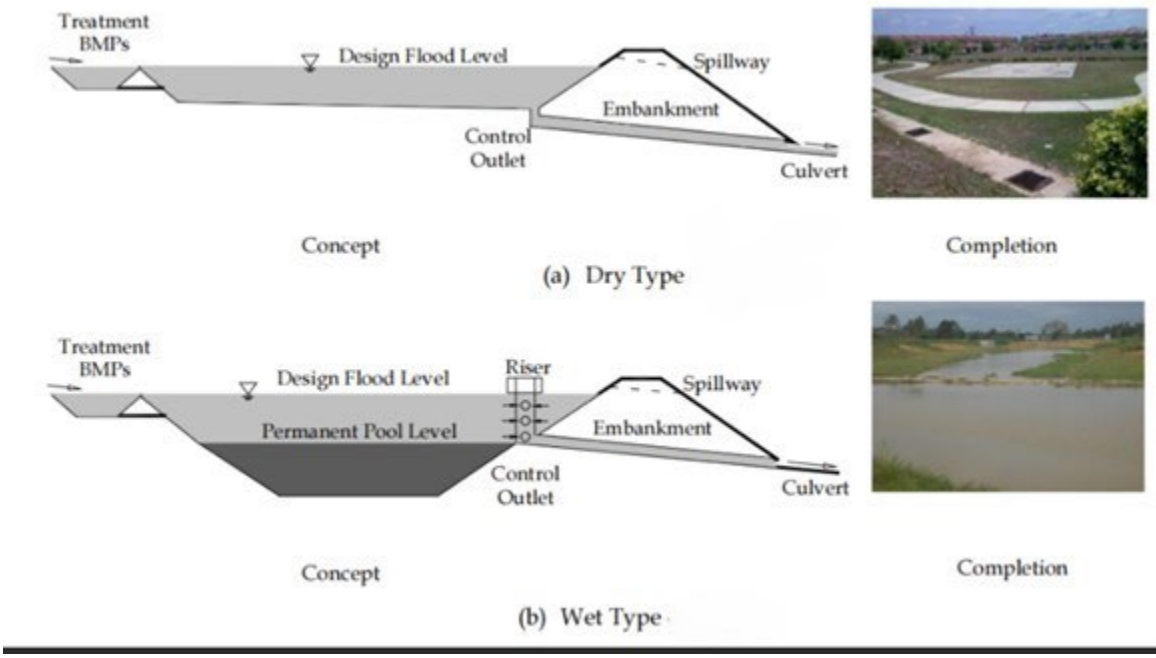
Detention basins are designed to slowly release water downstream after a storm event has occurred. Water infiltration through the bottom of the basin does occur (if there is not a barrier in place), but it happens at a much slower rate than stormwater discharging through pipes, spillways, and other structures. The purpose is to temporarily detain stormwater runoff, thereby reducing the peak rate of runoff to a stream or storm sewer and preventing localized flooding. They are typically dry between storm events, but they can have small permanent forebays and micropools. The outlet structures usually have openings closer to the bottom of the basin so that any water levels remain lower than a typical retention/wet basin.



Side cross-section of bioretention cell with perforated underdrain. *From CL0036 – RTA – University-Cedar Station: RTAUniversityCedarStation.pdf*

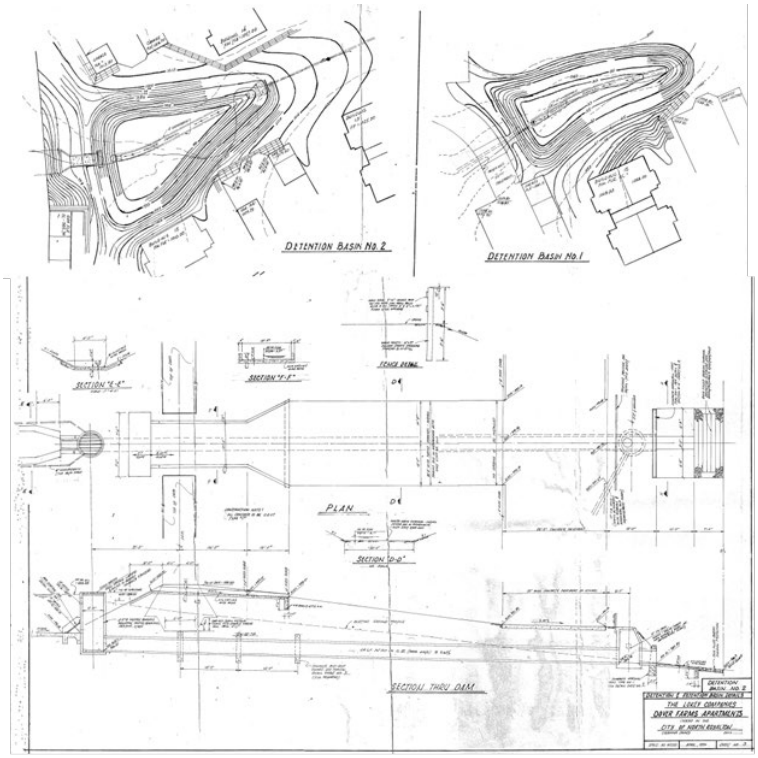
Dry Ponds	Similar	Dry Extended Detention Basin
○ Don't have references to WQ volumes or elevation ○ Outlet structures (if they aren't just a pipe and headwall or a weir) don't have water quality orifices	○ Might have a visible channel during dry weather ○ Might have forebays and micropools	○ Plans will often refer to WQ elevation or volume ○ Outlet structures should have a water quality orifice or references to treatment of water

○ Typically built 2003 or before		○ Deeper forebays and micropools ○ Typically built after 2003



Dry Ponds (typically pre-2003)

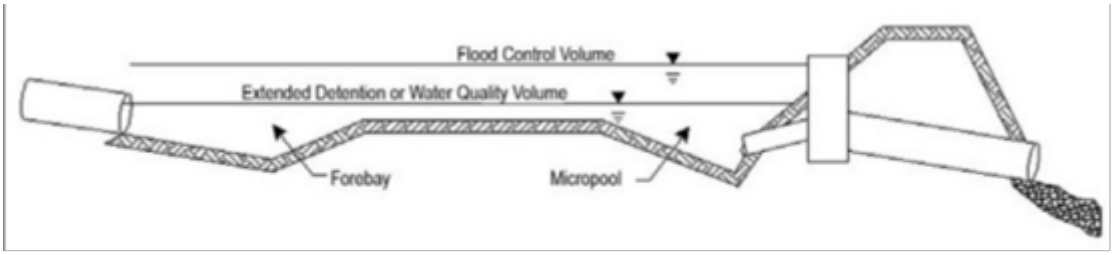
Older dry ponds (i.e., detention basins) usually drain completely between storm events and their sole purpose is to detain flows from large storm events. Beyond some sediment settlement, dry ponds are not designed to treat stormwater runoff.



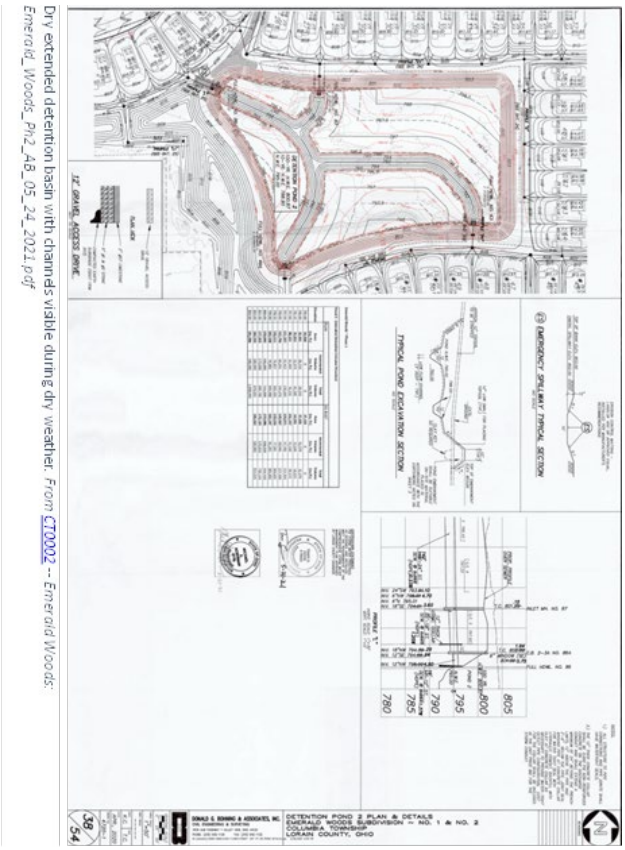
Dry pond example. *From NR0014 – Dover Farms Apartments: DoverFarmsApartmentsFinal.pdf*

Dry Extended Detention Basin (typically post-2003)

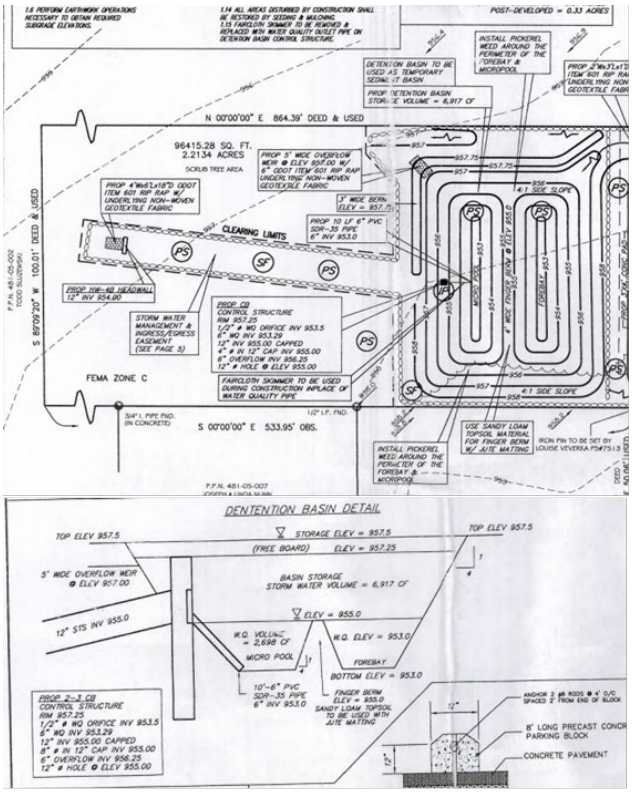
Generally, these perform the same functions as dry ponds. However, extended basins are also purposefully designed to treat the water quality volume (WQv) by allowing excess sediments, trash, and debris to settle before being released downstream or to a local sewer system. Dry extended detention basins might retain some water between storms in forebays (at inlet) and/or micropools (at outlet).



Typical extended dry detention cross-section view showing different levels of ponding control during storm events. *Credit: Ohio Rainwater & Land Development Manual, from "Maintaining Stormwater Control Measures", p. 9.*



Dry extended detention basin with channels visible during dry weather. *From CT0002 – Emerald_Woods_Ph2_AB_05_24_2021.pdf*



Dry extended detention basin with forebay and micropool aerial drawing and cross-section. *From NR0010 – Albion Woods Villas: AlbionWoodsVillas.pdf*

Wet Detention

Other names: Stormwater ponds, wet retention ponds, wet ponds, wet extended detention ponds/basins.

General Definition

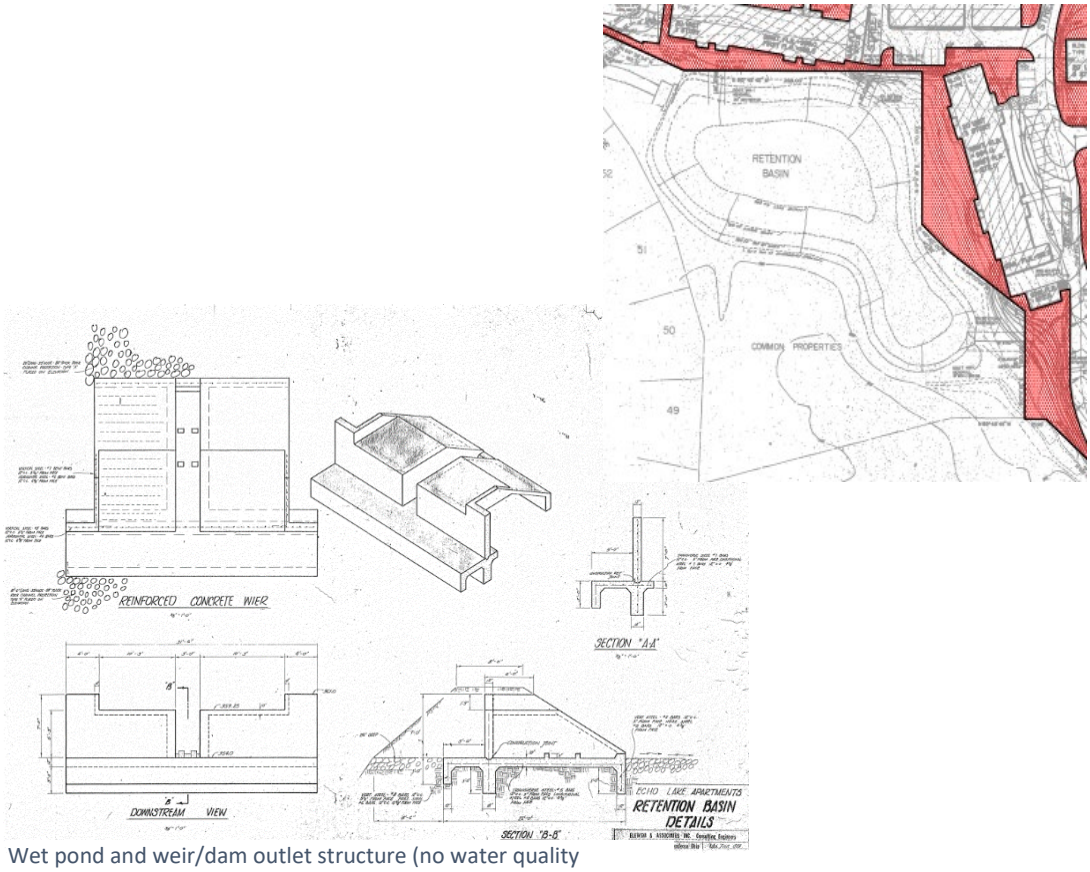
Retention basins are designed to slowly release water downstream after a storm event has occurred, while still retaining a permanent pool. Water infiltration through the bottom of the basin does occur (if there is not a barrier in place), but it happens at a

much slower rate than stormwater discharging through pipes, spillways, and other structures. The purpose is to temporarily detain stormwater runoff in addition to its permanent water level, thereby reducing the peak rate of runoff to a stream or storm sewer and preventing localized flooding. The outlet structures have openings at or above the permanent water level.

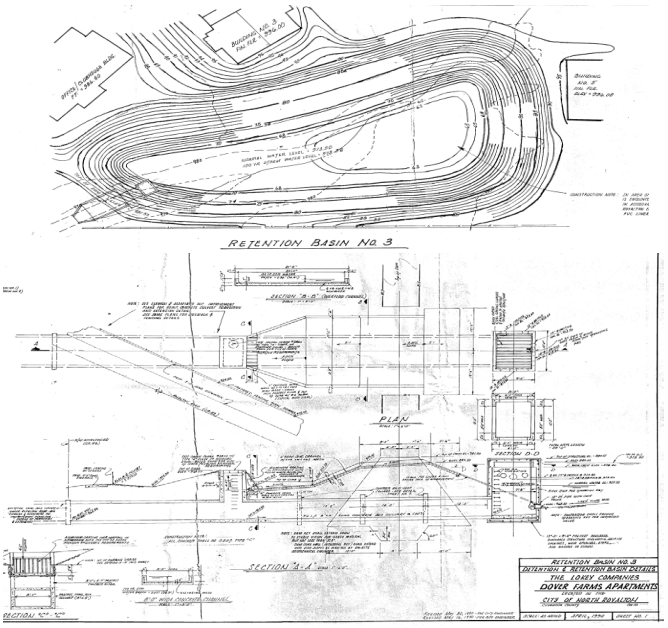
Wet Ponds	Similar	Wet Extended Detention Basin
○ Don't have references to WQ volumes or elevation ○ Outlet structures don't have water quality orifices ○ Typically built 2003 or before	○ Permanent pool	○ Plans will often refer to WQ elevation or volume ○ Outlet structures might have a water quality orifice ○ Deeper forebays and micropools ○ More sediment settlement ○ Typically built after 2003

Wet Ponds (typically pre-2003)

Wet ponds perform the same functions as dry ponds (i.e., reduce the peak rate of runoff to a stream or storm sewer and help to prevent localized flooding), but do not drain completely between storm events, thereby maintaining a permanent pool of water. Although wet ponds do aid in capturing some sediments and contaminants from the stormwater before being released downstream or to a local sewer system, their use is primarily an aesthetic preference over dry ponds. Wet Ponds typically contain a principal outlet structure or pipe and an emergency spillway. They can either be excavated ponds or created by building a small dam/embankment to hold stormwater runoff.



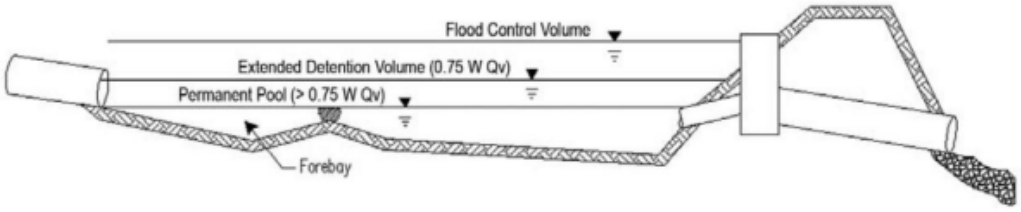
Wet pond and weir/dam outlet structure (no water quality treatment). *From ST0005 – Hunters Hollow: HuntersHollow.pdf*



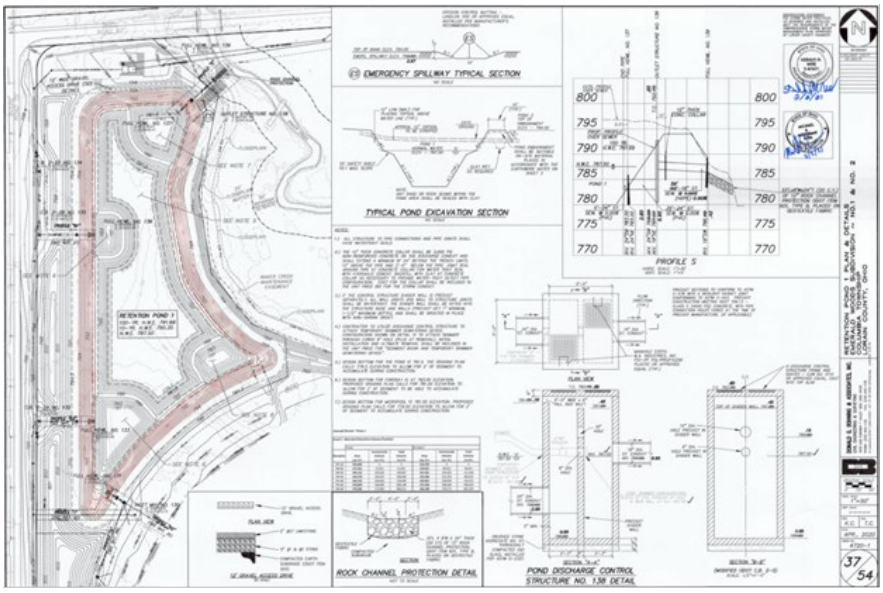
Wet pond and catch basin/pipe outlet structure cross-section. *From*

Wet Extended Detention Basin (typically post-2003)

Generally, these perform the same functions as wet ponds (i.e., reduce the peak rate of runoff to a stream or storm sewer and help to prevent localized flooding). However, wet extended detention basins are also purposefully designed to treat the water quality volume (WQv) through the capture of excess sediments, trash and debris by settling and uptake of pollutants (particualrly nutrients) through biological activity. Extended detention was required starting in 2003.



Typical wet extended detention basin cross-section view showing different levels of ponding control during storm events and permanent pool level. *Credit: Ohio Rainwater & Land Development Manual, from "Maintaining Stormwater Control Measures", p. 11.*



Wet extended detention basin with outlet structure and cross-sections. WQv treatment exists because of the weir and the small orifices on it. *From CT0002 – Emerald Woods: Emerald_Woods_Ph2_AB_05_24_2021.pdf*

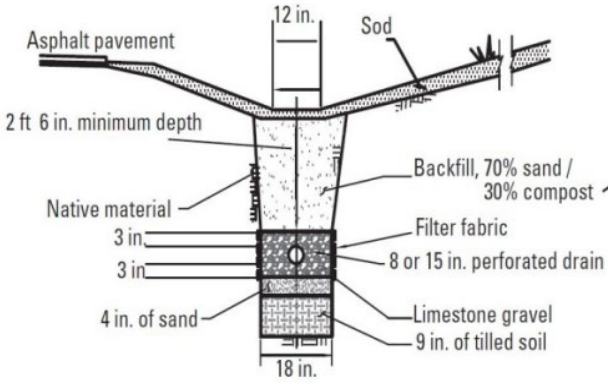
Infiltration SCMs

Infiltration stormwater control measures are designed to collect stormwater runoff. The runoff either then soaks through an underlying medium and/or is transferred via pipe or other structure to another nearby SCM, storm sewer, or natural waterway (depending on incoming, or lack thereof, stormwater runoff flow). This is the basis for all infiltration SCMs, but some have additions and variations in their designs.

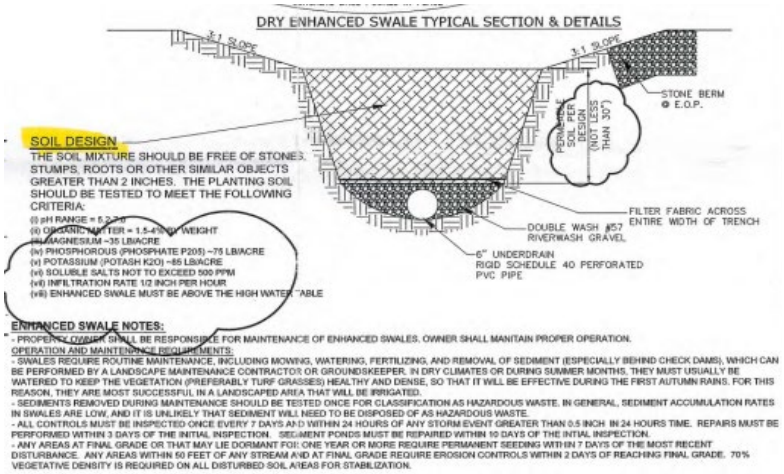
Vegetated Infiltration Swale

Other names: Grassed swale, vegetated filter strip, bioswale[1*], vegetated biofilter

Designed to slow, collect, channel, and transfer runoff in a non-erosive manner from hard surfaces. They are vegetated with turf grass and/or perennial plants that trap sediment and filter pollutants from runoff as it flows through the swale. They are constructed with a mixture of sand and compost and allow runoff to soak into the swale during low-flow runoff conditions.



Typical vegetated infiltration swale cross-section view showing how stormwater runoff drains through swale system. *Credit: Chagrin River Watershed Partners, Inc. from "Maintaining Stormwater Controls Measures", p. 13.*



Vegetated infiltration swale cross-section with underdrain and soil information. *From PA0040 – St. Charles Borromeo: StCharlesBorromeo.pdf*

Infiltration Basin and Trench

An ***infiltration basin*** looks like a dry pond/detention basin. They are dry during dry weather conditions and might have similar vegetation to a typical dry pond/detention basin. However, the infiltration basin is designed to detain water and allow it to soak through the ground rather than detaining water to later discharge to a storm sewer or stream. Some water might discharge via an outlet structure or a spillway, but infiltration is still the primary means of discharging stormwater. Infiltration basins require specific types of soil (i.e. sandy or another relatively porous medium) to be effectively implemented.

Infiltration basin in an urban area. The basin has two gravel areas for infiltration. The remainder of the basin bottom and its slopes are planted with sod. *Credit: Massachusetts Department of Transportation, taken from EPA, "NPDES: Stormwater BMP Infiltration Basin".*

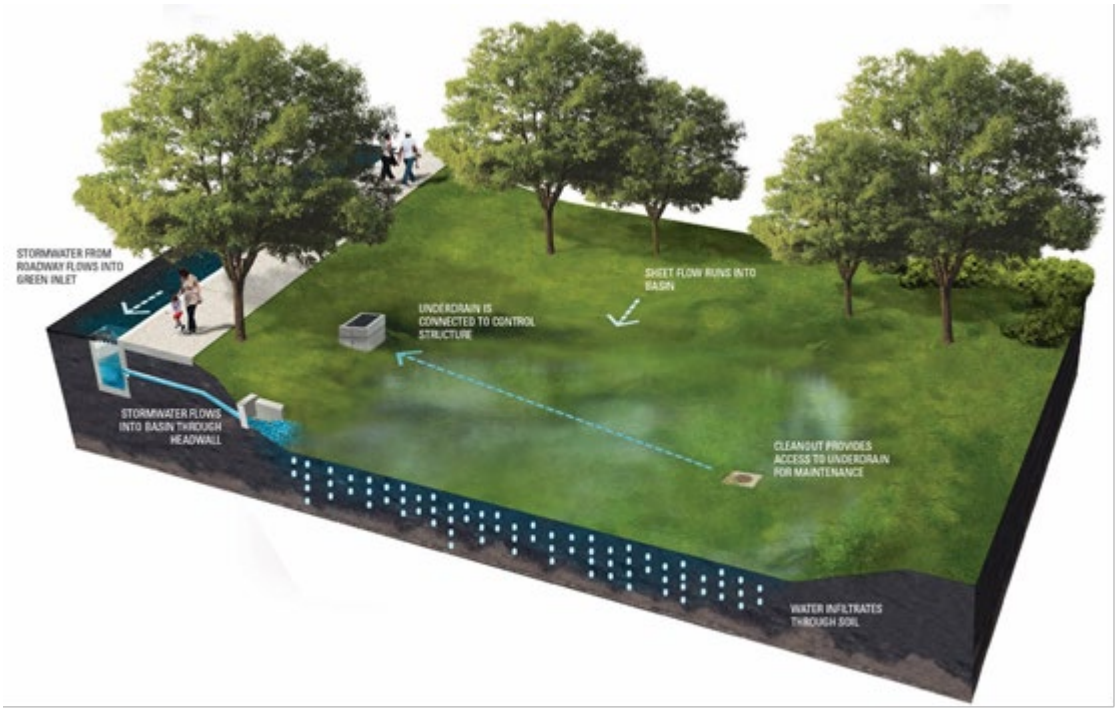
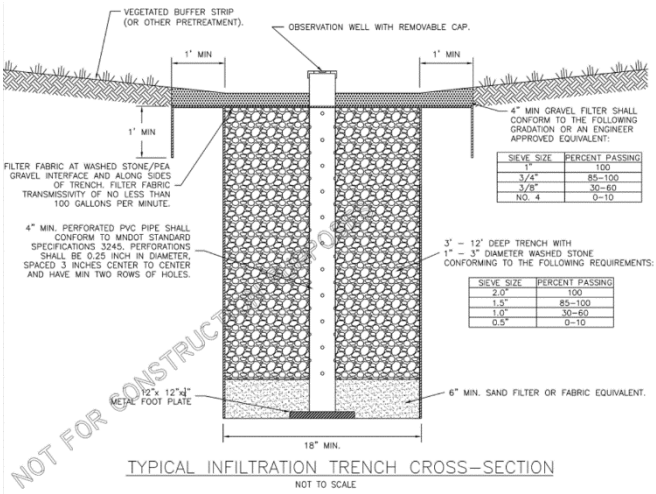


Diagram of a "stormwater basin" – there is an underdrain and outlet structure, but the primary discharge method for runoff is infiltration. *Credit: Philadelphia Water Department*

An ***infiltration trench*** is a gravel-filled trench that allows stormwater to soak through and into the ground. Designs may include vegetation, an underdrain, and/or an overflow. Sometimes water can infiltrate into an underground storage structure from the trench and further soak into the underlying soil from there. To reduce clogging and increase overall effectiveness, infiltration trenches are often used in tandem with infiltration basins. They can act as an inlet structure to the basin or run along the base.

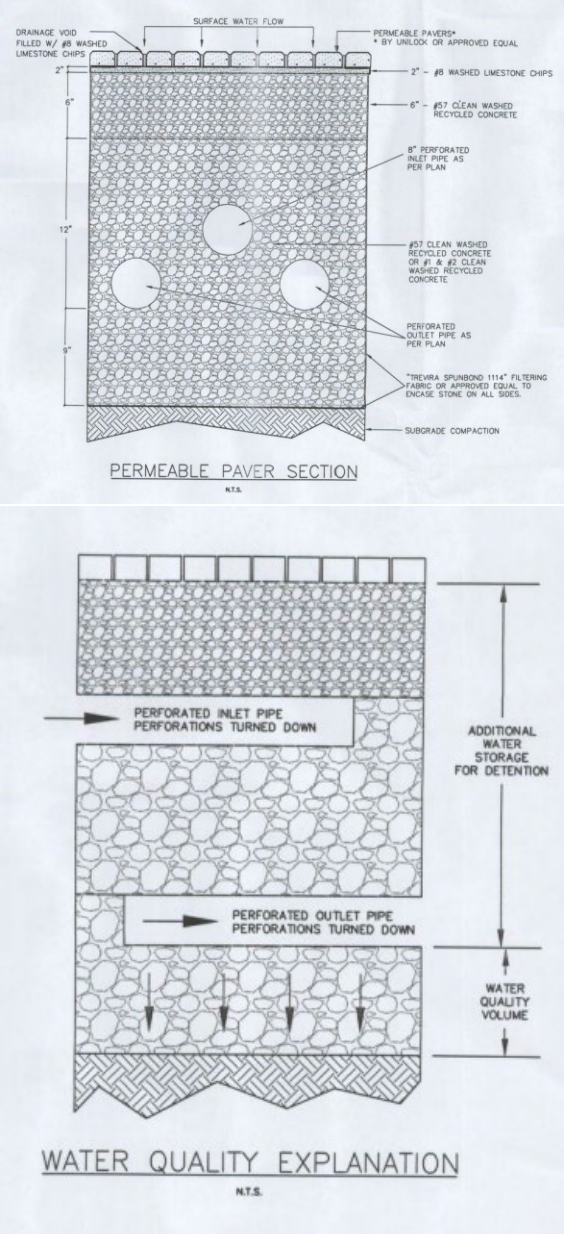


Typical infiltration trench cross-section with an observation well (vertical perforated pipe). *Credit: Minnesota Stormwater Manual, "Design Criteria for Infiltration"*

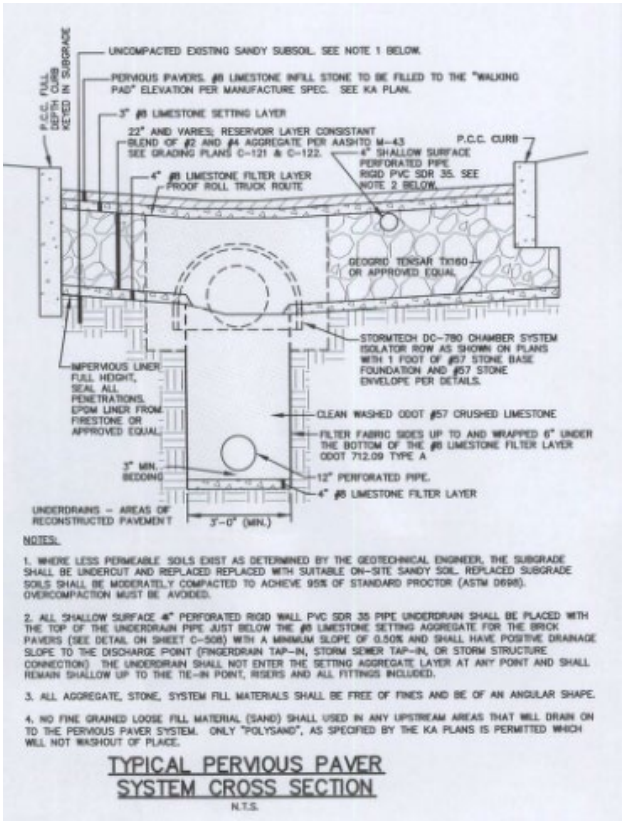
An infiltration trench in the city of Lino Lakes, MN. This design took aesthetics and environmental factors (i.e. plants for pollinators) into consideration. *Credit: Minnesota Stormwater Manual, "Design Criteria for Infiltration"*

Permeable Pavement

Consists of permeable material that provides structure and stability but allows water to pass through the pavement and infiltrate into underlying gravel and soil layers. All permeable pavements allow infiltration of runoff, but the individual designs determine how much storage is provided for stormwater runoff.



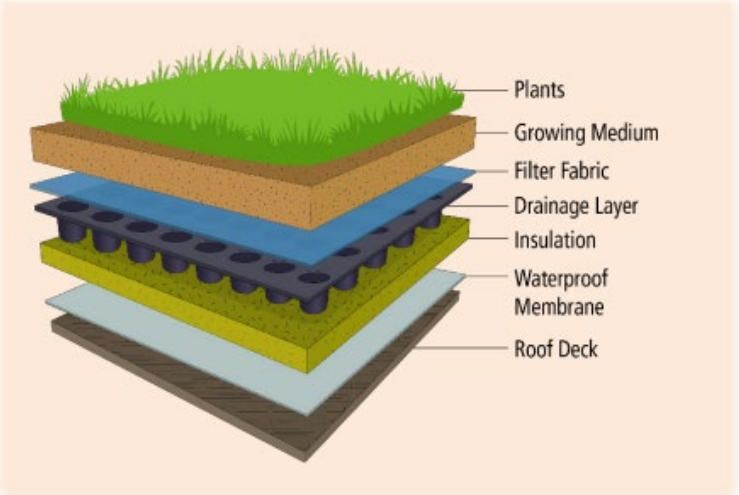
Permeable pavers with additional storage cross-section. *From CL0072 – Uptown Cleveland: Uptown.pdf*



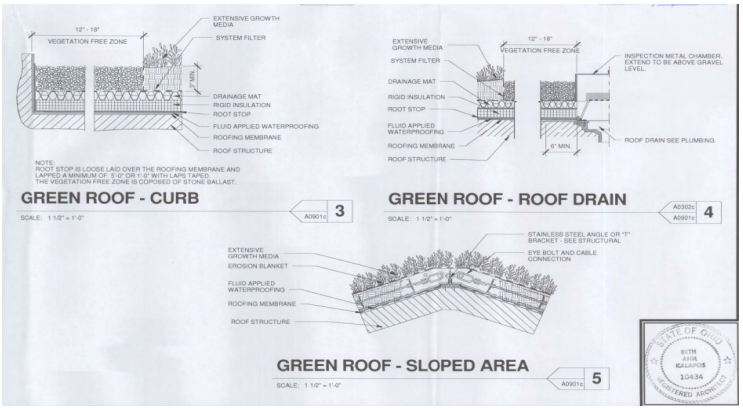
Permeable pavement with sandy subsoil and StormTech underground detention system. *From CL0064 – University Circle Courtyard by Marriott: UniversityCircleCourtyard.pdf*

Green Roof

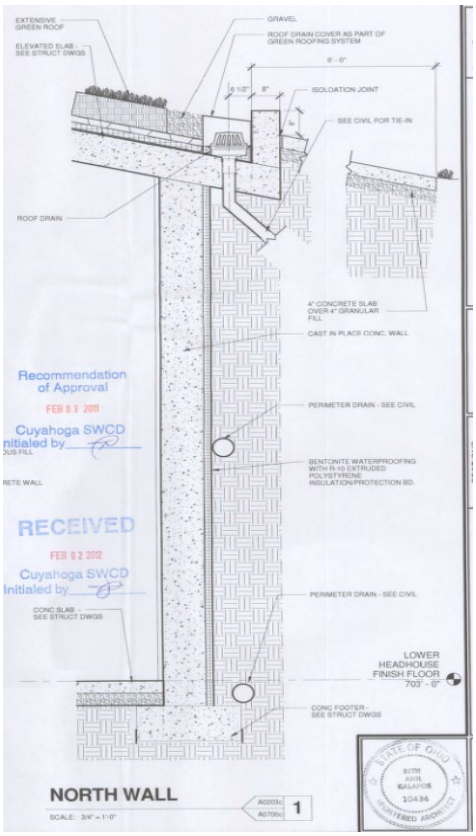
Intercepts precipitation and slows/reduces runoff from rooftops through storage and evapotranspiration by vegetation. Some green roofs drain into a cistern or another SCM that later treats and discharges the water into a storm sewer or the environment



Green roof cross-section showing typical material layers. Credit: EPA, "NPDES: Stormwater BMP Green Roofs".

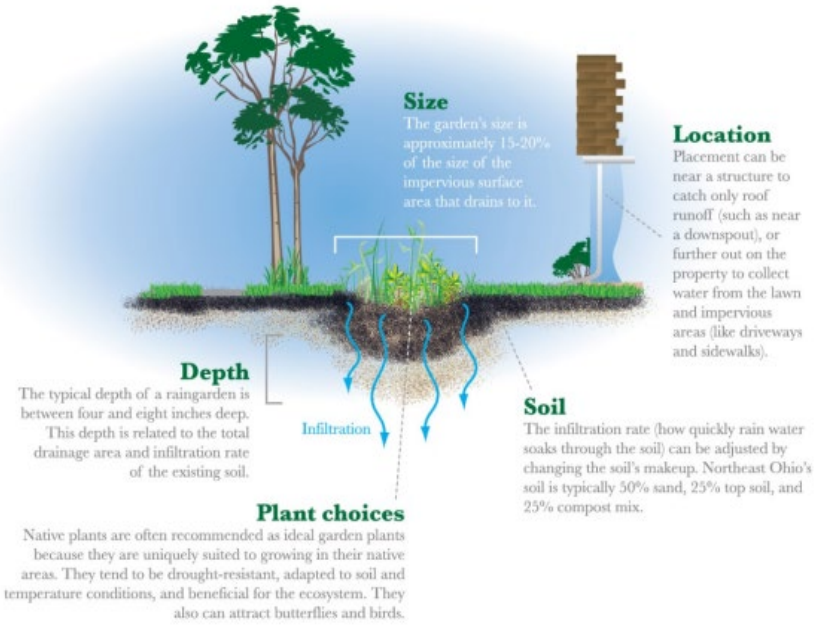


From CL0036 – RTA – University-Cedar Station:
RTAUniversityCedarStation.pdf



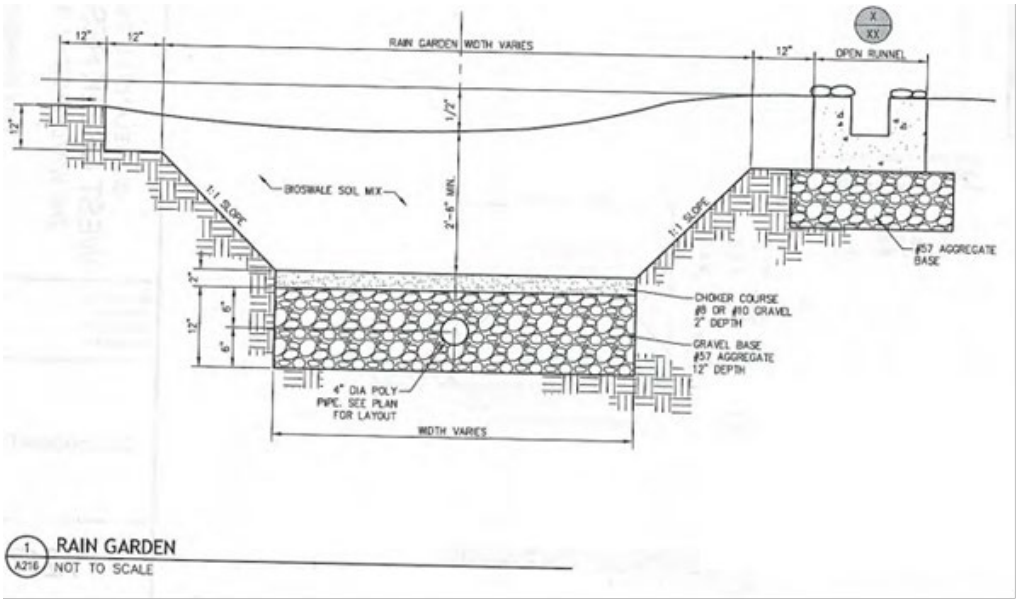
Rain Garden

A shallow, landscaped depression that preferably contains native plants that can tolerate both wet and dry conditions. It captures stormwater runoff from smaller rooftops and driveways and allows it to soak into the ground before it reaches the environment or sewer systems. Rain gardens typically rely on amended soils to allow stormwater runoff to soak into the ground. Evapotranspiration by plants also aids in the reduction of stormwater runoff.

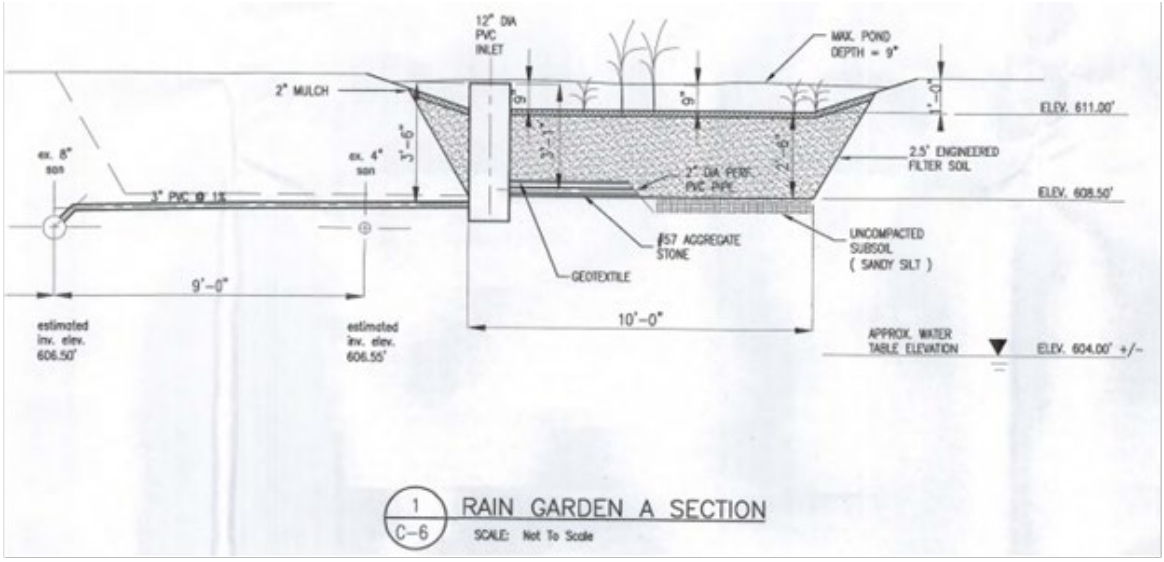


Rain garden receiving water from a downspout and other residential impervious surfaces. *Credit: Northeast Ohio Regional Sewer District, from "Maintaining Stormwater Control Measures", p. 24.*

Diagram of a rain garden that includes a storm sewer outlet. *Credit: Philadelphia Water Department.*



Rain garden cross-section with underdrain. *From PA0018 – West Creek Reservation: CMPWestCreekPreserve.pdf (A216 or p. 147)*



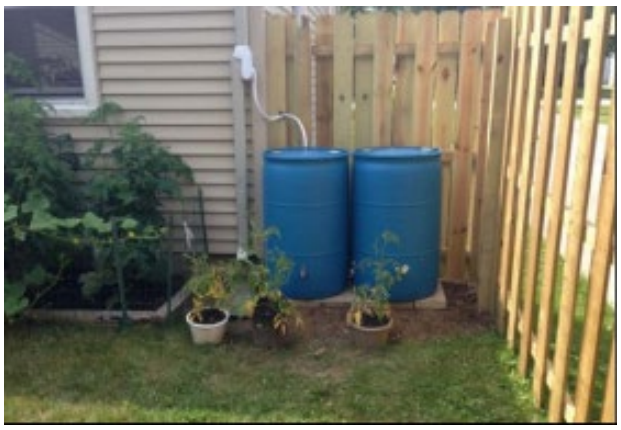
Rain garden cross-section with outlet structure and water table elevation. *From CL0013 – Cleveland Water Pollution Control: DPWWaterPollutionControlBuilding.pdf*

Rainwater Harvesting

The process of collecting rooftop rainwater that would otherwise drain into natural waters or sewer systems. The stored water is then utilized for other uses (e.g., irrigation, rinsing of vehicles, etc.), and the structures used to store water are called rain barrels and cisterns.

Rain Barrel

A 40-55 gallon barrel or drum with connection from the downspout, a hose, or spigot to drain the barrel and some type of overflow mechanism. There may be small openings to the air that are screened to keep debris and pests out.

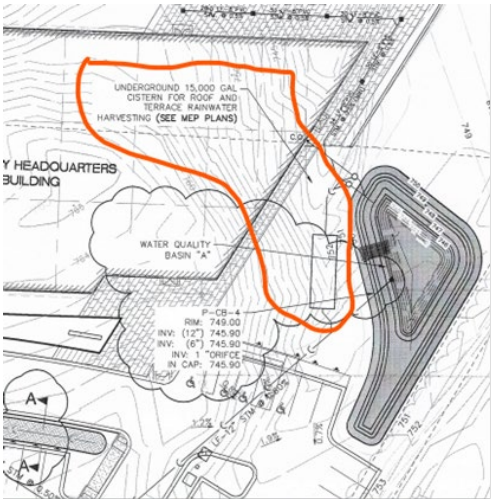


Example of residential rain barrels.

Cistern

Like rain barrels, but they typically hold a larger quantity of water. They may be installed underground, at ground level, or elevated, depending on the site.

Cistern (along with a green roof and other SCMs) at PA0018 – West Creek Reserve.



Roof and terrace drain to an underground cistern. *From CL0147 – Oatey Corporate Headquarters: OateyCorporateHeadquartersAdditionalPlans.pdf*

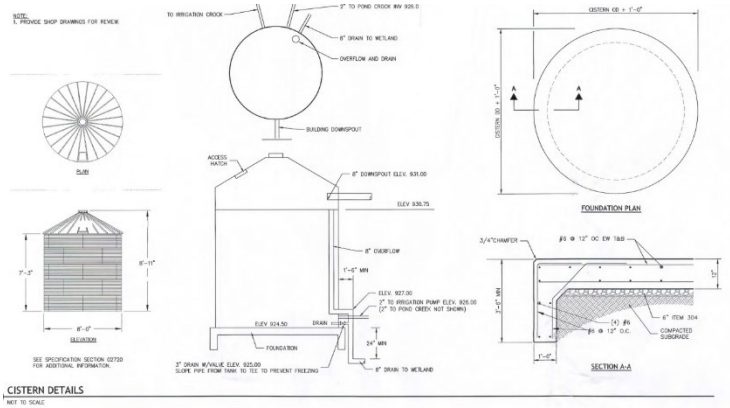
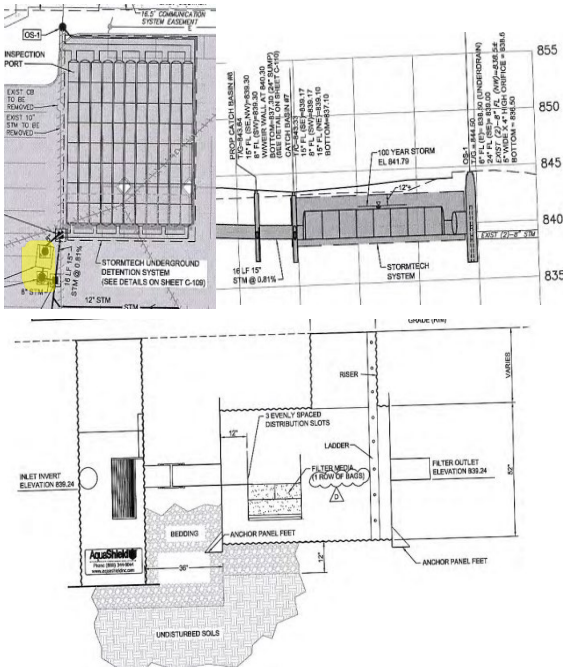


Diagram of an above-ground cistern. *From PA0018 – West Creek Reservation: CMPWestCreekReservation.pdf*

Underground Detention Systems

General Definition

Consists of large underground pipes or chambers that capture and store stormwater runoff before slowly releasing it into a stormwater system. Some underground detention systems might allow stormwater to infiltrate into the ground through the base of the SCM. Like dry ponds, these SCMs drain completely between storm events and their sole purpose is to detain flows from large storm events. Underground detention systems temporarily store stormwater runoff, thereby reducing the peak rate of runoff to a stream or storm sewer. They help to prevent localized flooding. Underground detention is often used in space-limited areas, such as parking lots and paved areas where there is not enough land for a surface SCM. Pre- or post-treatment structures may be integrated into or near the underground detention system. If WQv is treated by the underground detention system through an outlet/control structure or another method (not a pre-/post-treatment system that is a separate structure), see the **underground extended detention** subsection below.



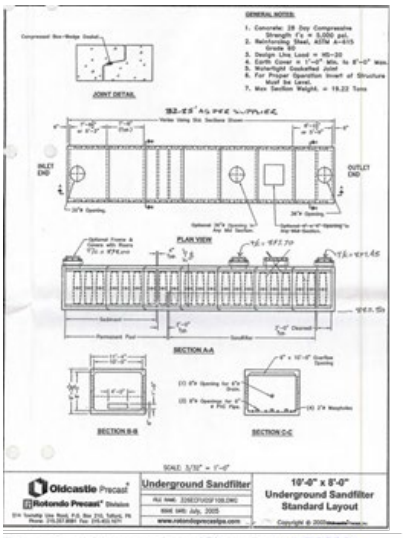
Underground detention system with a separate pre-treatment (Aqua-Filter Filtration System Model AF-2.1 – highlighted in yellow). *From MI0025 – Sunnyside Audi:*

Underground Extended Detention (typically post-2003)

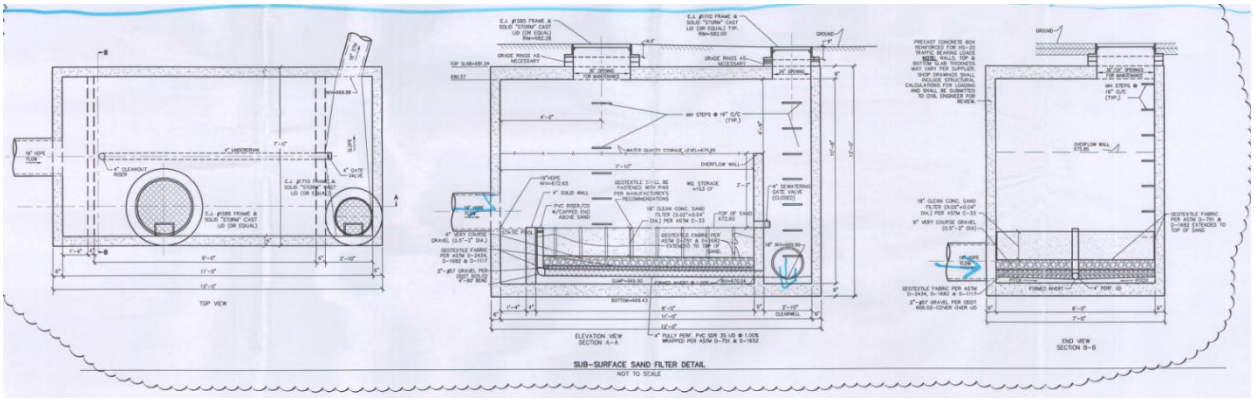
Generally, these perform the same functions as underground detention SCMs. However, underground extended detention systems are also purposefully designed to treat water and store the water quality volume (WQv). Underground extended detention systems are designed to capture excess sediments, trash, and debris and can also remove contaminants from stormwater before being released downstream or to a local sewer system. Extended detention was required starting in 2003.

Sand Filter System

These are used to treat runoff from highly impervious settings, such as commercial/office complexes and high-density residential areas. The structure consists of a series of chambers that removes sediment, debris, and oil before slowly filtering stormwater through layers of sand, where additional pollutants are removed as they become trapped between sand and other filter media. These systems are usually located in an underground concrete shell.



Pre-cast underground sandfilter. *From NR0028 – Platinum Park Plaza: PlatinumPlaza.pdf*



Underground sandfilter system within a concrete chamber. *From CL0024 – Case Western Reserve University: TinkhamVealeUniversityCenter.pdf*

Proprietary System

A manufactured device that treats stormwater before discharge to another BMP or to a body of water. This is a broad category of SCMs with a variety of pollutant removal mechanisms and varying pollutant removal efficiencies. Proprietary systems can be classified into two major groups: **separation devices** and **filtration devices**.

Non-Structural SCMs: Impervious Reduction, Riparian & Wetland Setbacks and Conservation Areas

Riparian and wetland setbacks require the protection of vegetation, soils, and drainage patterns in these naturally sensitive areas to protect water quality and wildlife habitat. Local government ordinances specify terms of protection and use within areas, and signage is usually present.

Conservation areas are often protected through a conservation easement that dictates terms of use and maintenance of a specific area, often with the intent to maintain existing natural conditions for water quality and habitat protection

SCM Outlet Structure Examples

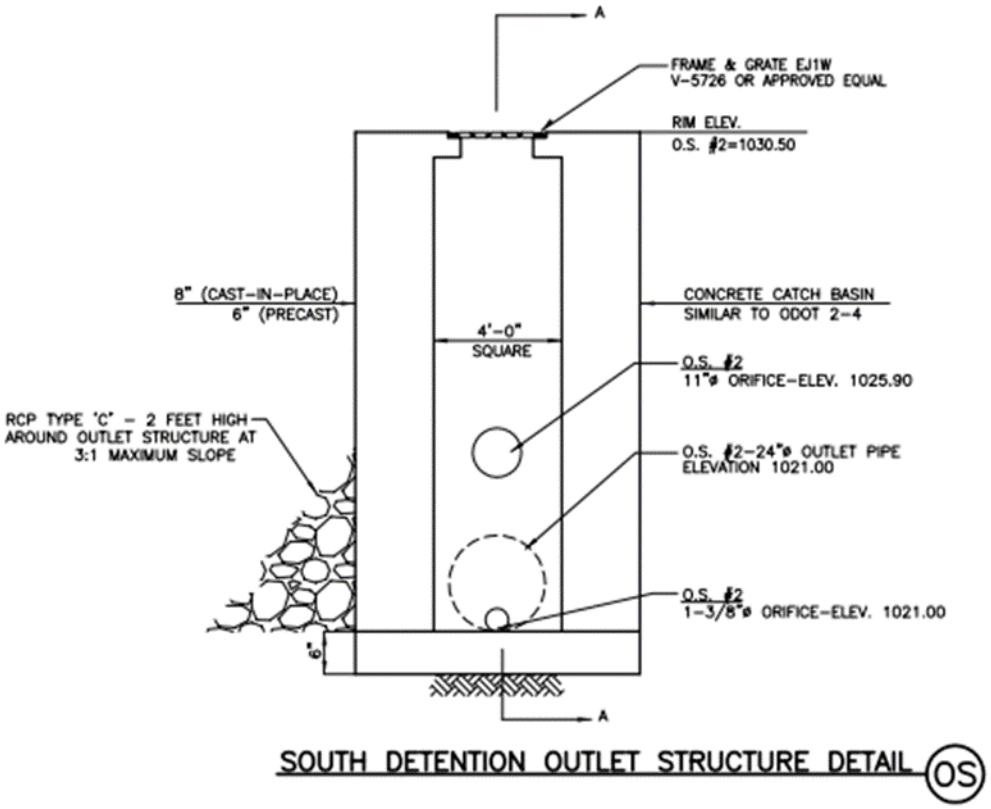
This is a non-exhaustive list of examples. Representative examples are shown, but that does not account for all variation and types.

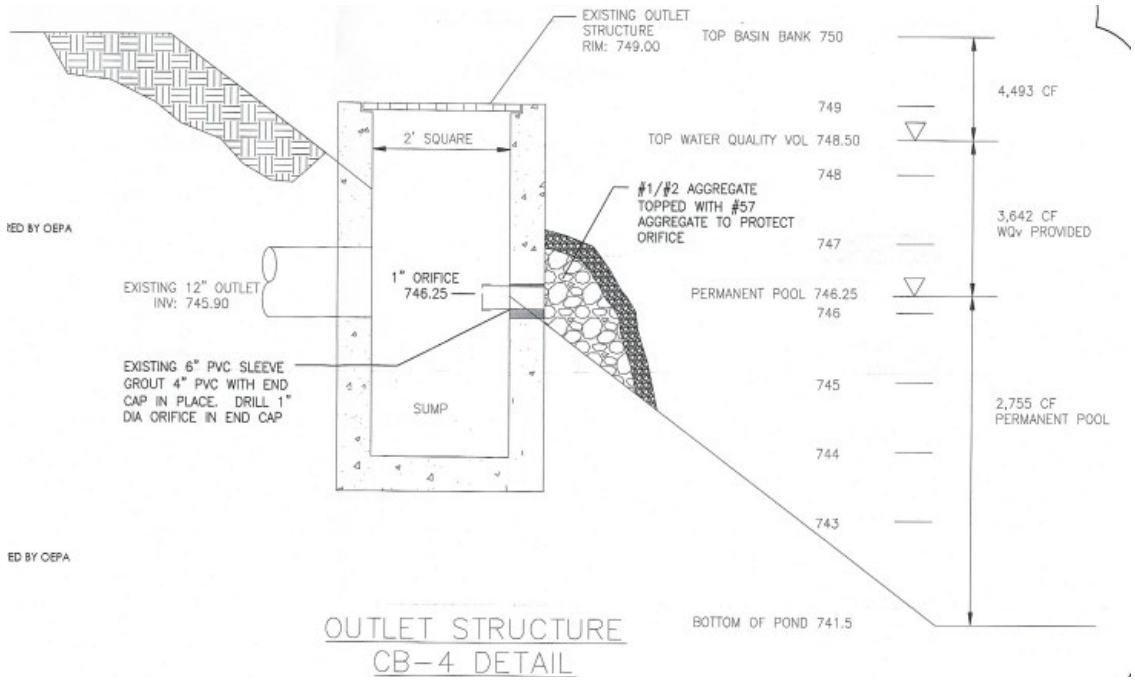
Catch Basins

Catch basins are designed to collect and hold stormwater/water. The amount held depends on the specific design and intention of the catch basin. Sometimes plans for an SCM state the outlet structure is a storm manhole or simply an “outlet/discharge structure”. These structures often resemble catch basins and we can classify them as “catch basins” for our purposes.

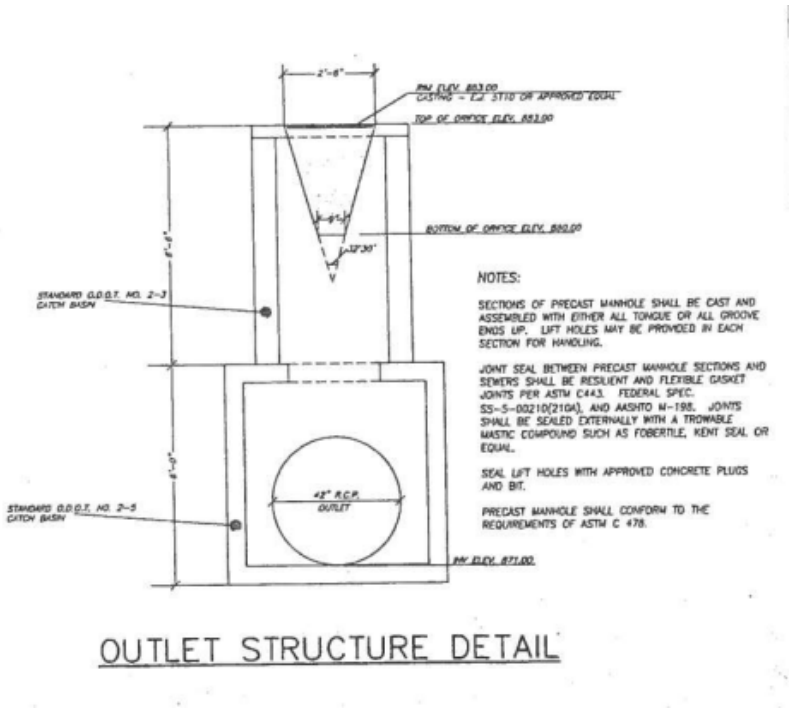
Generic

For NEORSD SCM project purposes, a generic catch basin generally has an inlet and outlet pipe, with no weirs or interior/exterior risers.

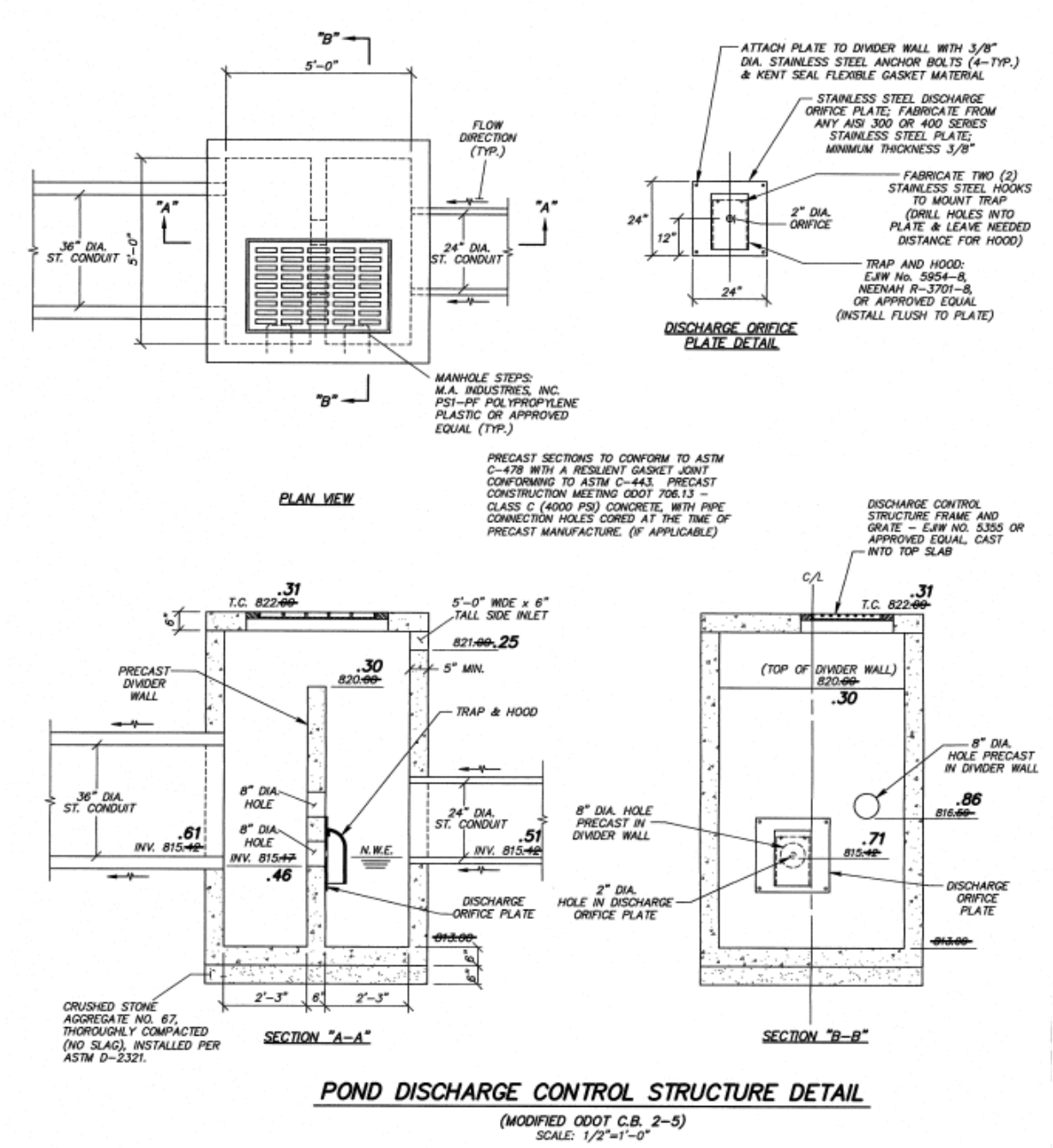




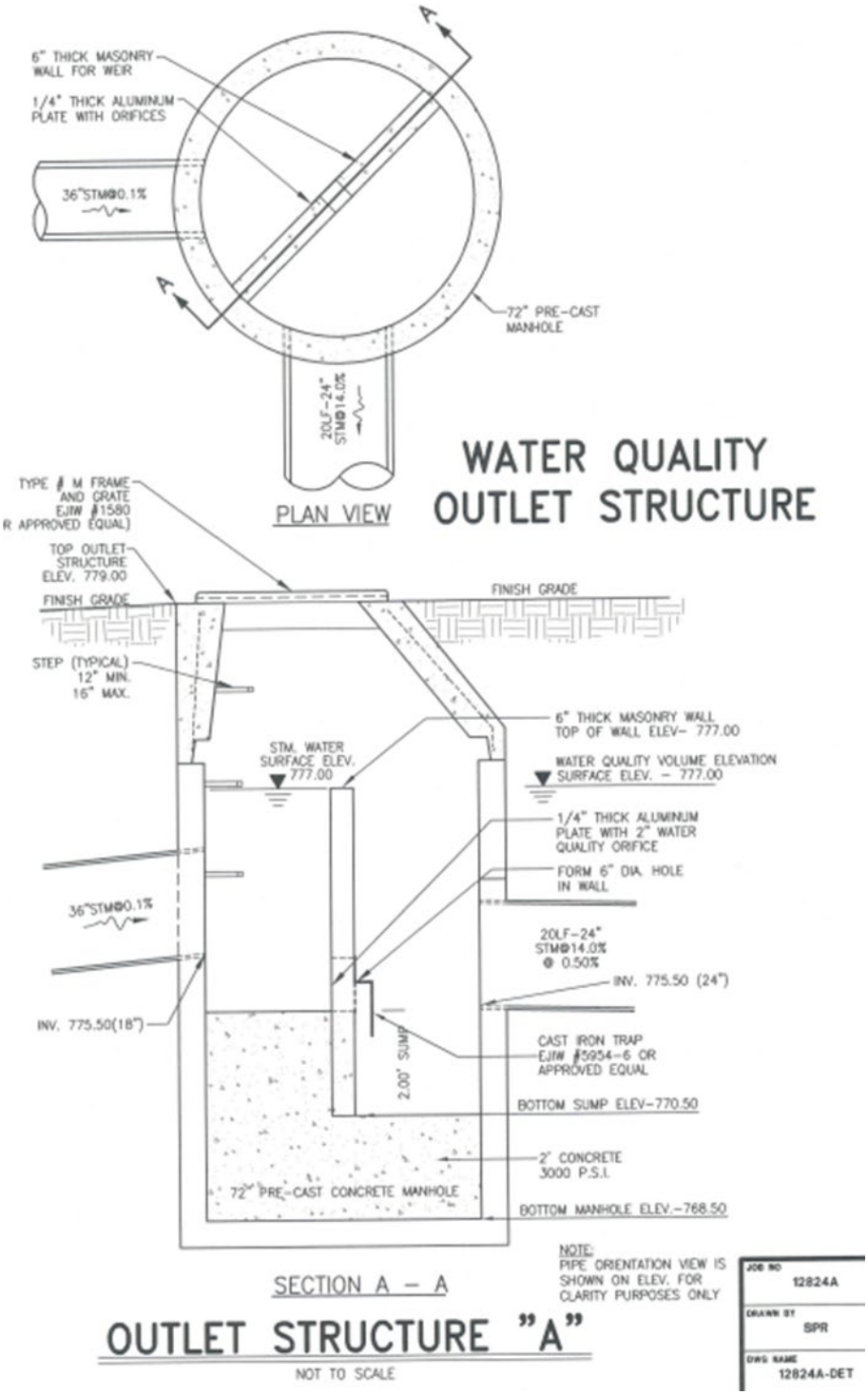
Catch basin outlet structure with water quality orifice (1" diameter) that discharges to a storm sewer pipe. *From CL0147 – Oatey Corporate Headquarters: OateyCorporateHeadquartersAdditonalPlans.pdf*

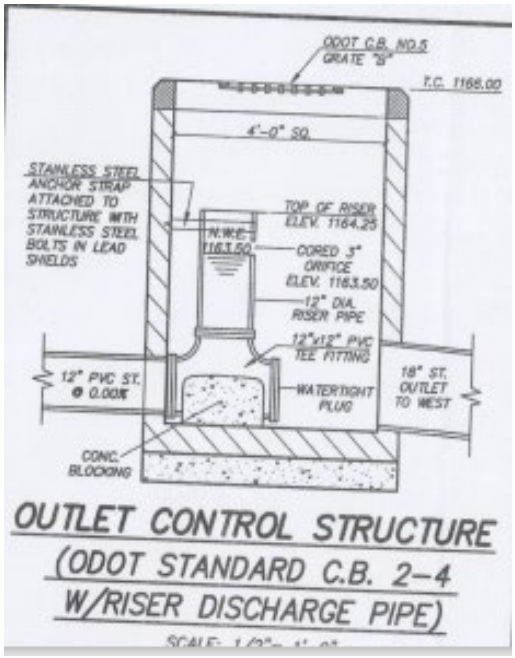


Catch Basin with Weir

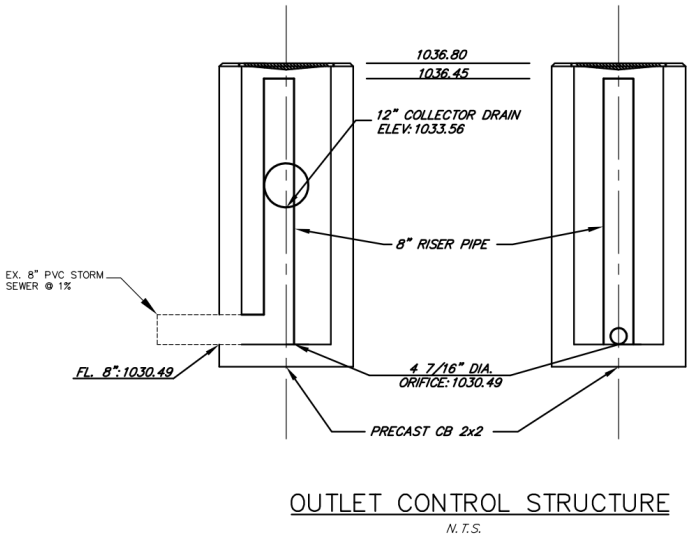


Catch basin with weir and water quality orifice (2" diameter). *From ST0014 - Love Farm: LoveFarmSubd_02162016.pdf*

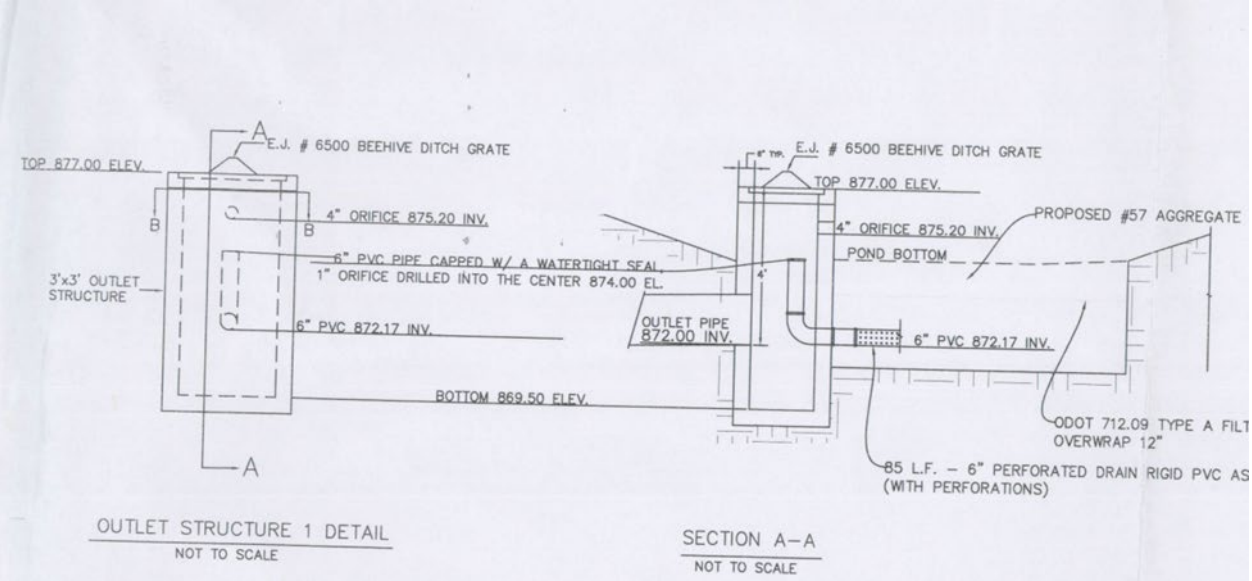

6" THICK MASONRY WALL FOR WEIR
1/4" THICK ALUMINUM PLATE WITH ORIFICES
36"STM@0.1%
72" PRE-CAST MANHOLE
20LF-24" STM@14.0%
PLAN VIEW
WATER QUALITY OUTLET STRUCTURE
TYPE # M FRAME AND GRATE EJIW #1580 R APPROVED EQUAL)
TOP OUTLET STRUCTURE ELEV. 779.00
FINISH GRADE
STEP (TYPICAL) 12" MIN. 16" MAX.
STM. WATER SURFACE ELEV. 777.00
6" THICK MASONRY WALL TOP OF WALL ELEV- 777.00
WATER QUALITY VOLUME ELEVATION SURFACE ELEV. - 777.00
1/4" THICK ALUMINUM PLATE WITH 2" WATER QUALITY ORIFICE
FORM 6" DIA. HOLE IN WALL
20LF-24" STM@14.0% @ 0.50%
INV. 775.50 (24")
INV. 775.50(18")
CAST IRON TRAP EJIW #5954-6 OR APPROVED EQUAL
2.00' SUMP
BOTTOM SUMP ELEV-770.50
2" CONCRETE 3000 P.S.I.
72" PRE-CAST CONCRETE MANHOLE
BOTTOM MANHOLE ELEV.-768.50
NOTE:
PIPE ORIENTATION VIEW IS SHOWN ON ELEV. FOR CLARITY PURPOSES ONLY
SECTION A - A
OUTLET STRUCTURE "A"
NOT TO SCALE
JOB NO 12824A
DRAWN BY SPR
DWG NAME 12824A-DET



Catch basin with interior riser and a water quality orifice (cored 3" orifice). *From BD0021 – Wiltshire Golf*

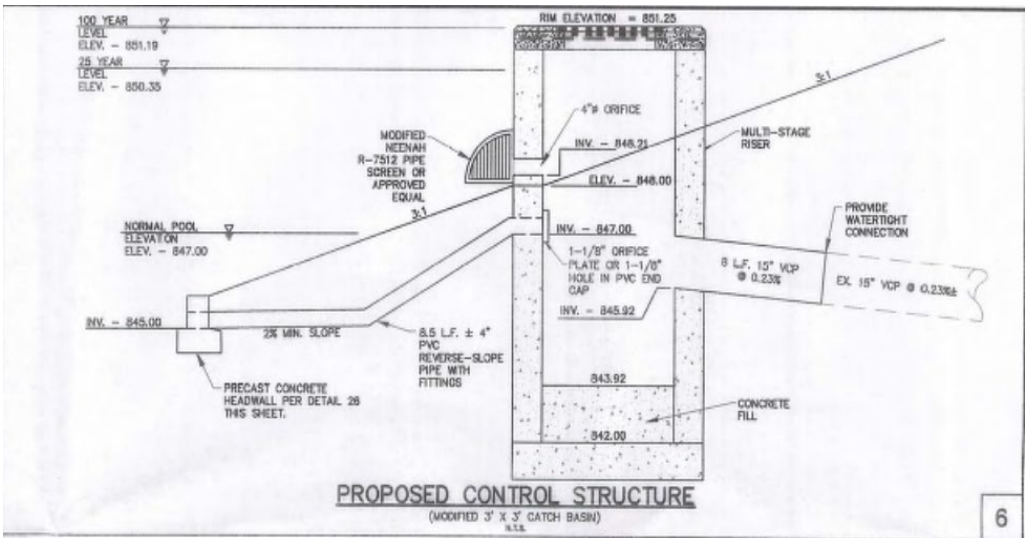


Catch basin with an interior riser and a water quality orifice (4.4375) at the base of the riser. *From SH0003 – Hathaway Brown: HathawayBrownSchoolOMmanual.pdf*

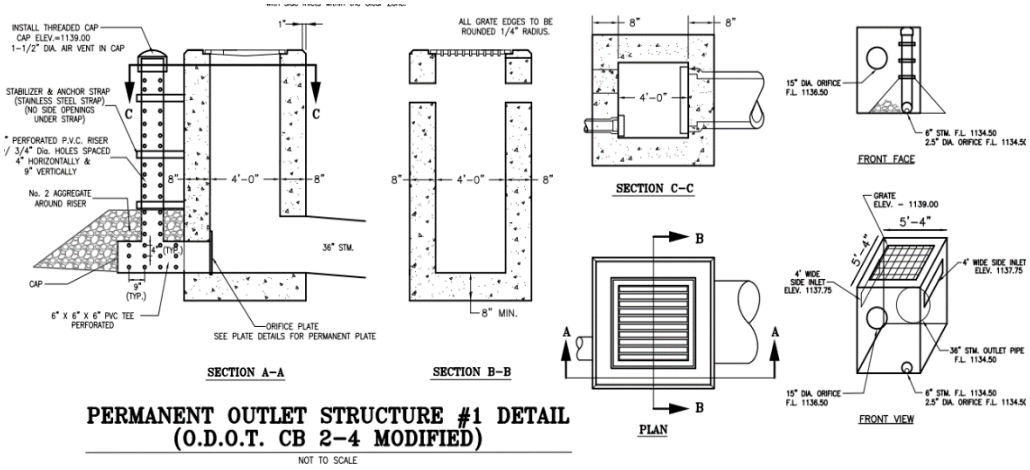


Catch basin with an interior riser and a water quality orifice (1" diameter) drilled into the cap of the riser. *From SV0023 – John Glenn Subdivision: JohnGlennSubdivision.pdf*

Catch Basin with Exterior Riser

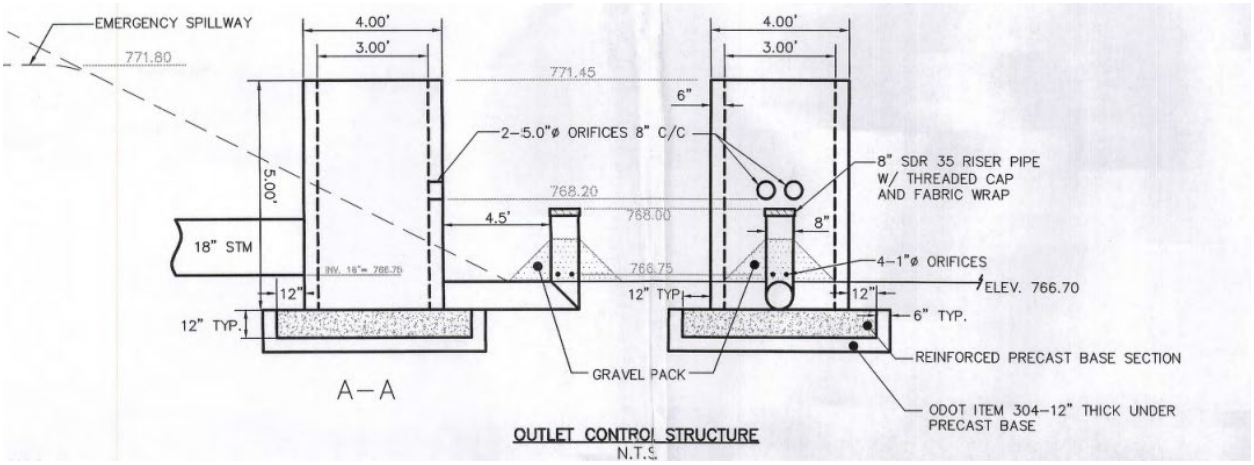


Outlet structure for a dry extended detention basin with an exterior riser. The water quality orifice is located on the orifice plate at the opening of where the riser empties into the catch basin. *From MI0008 – Goodwill / Middleburg*



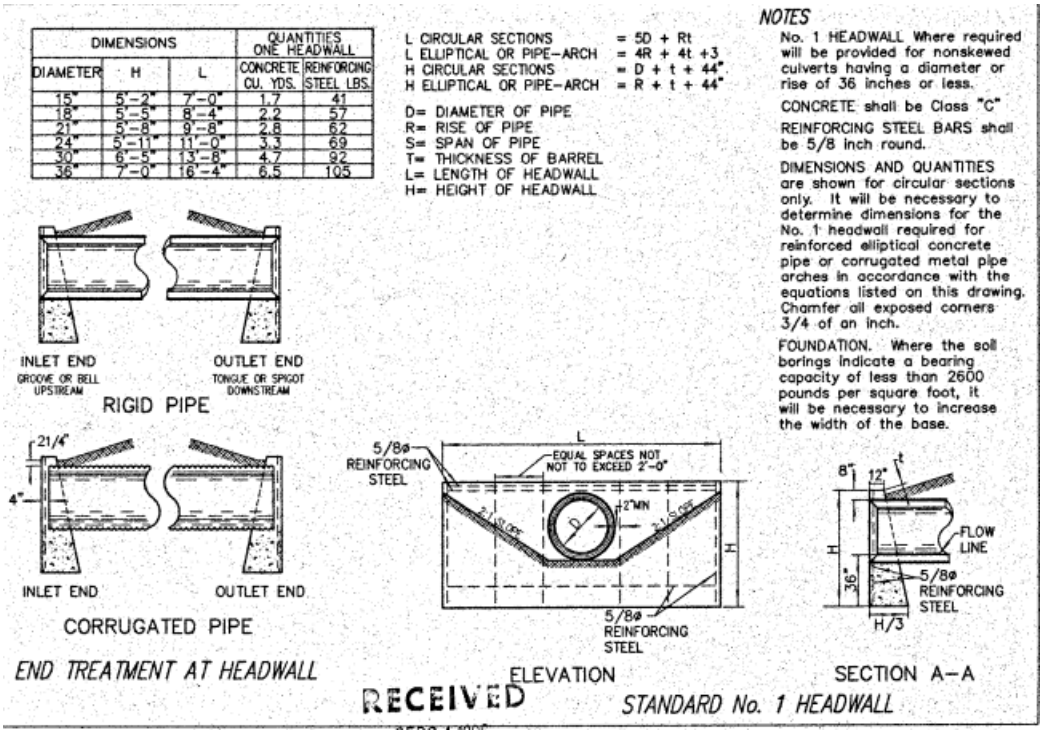
Catch basin for a dry extended detention basin with a perforated exterior riser. The water quality orifice (2.5" diameter) is located on the orifice plate at the base of the riser within the catch basin. *From BD0006 – Rumpke of Northern Ohio – Broadview Heights Truck Stop:*

Headwall and Pipe



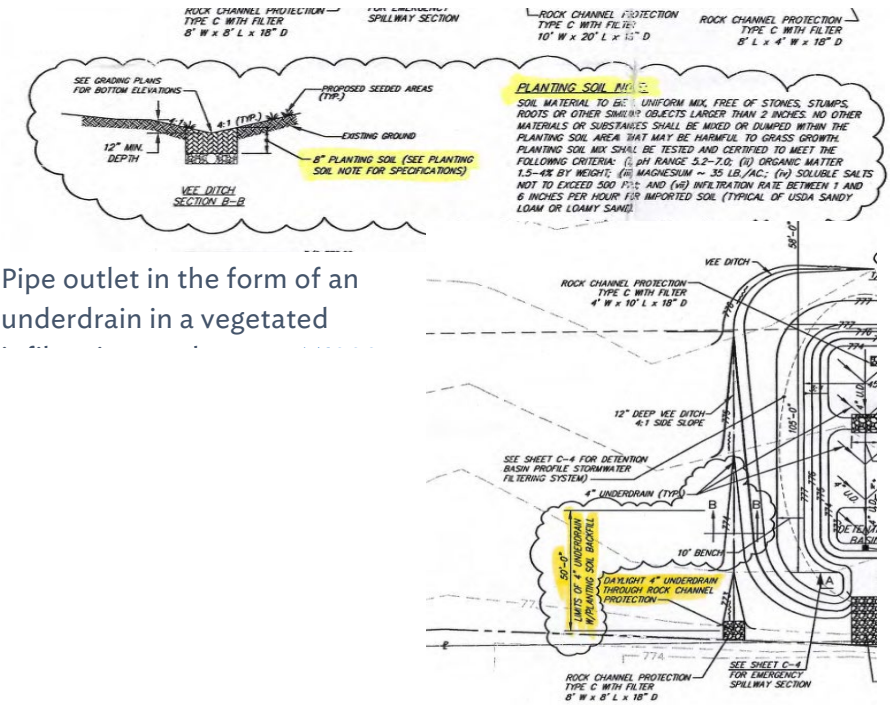
Dry extended detention basin outlet structure with an exterior riser. This riser only has four 1" holes drilled nearer to the base rather than having more perforations. *From MI0013 – Lauth Medical Building: MedicalCampus.pdf*

Headwall

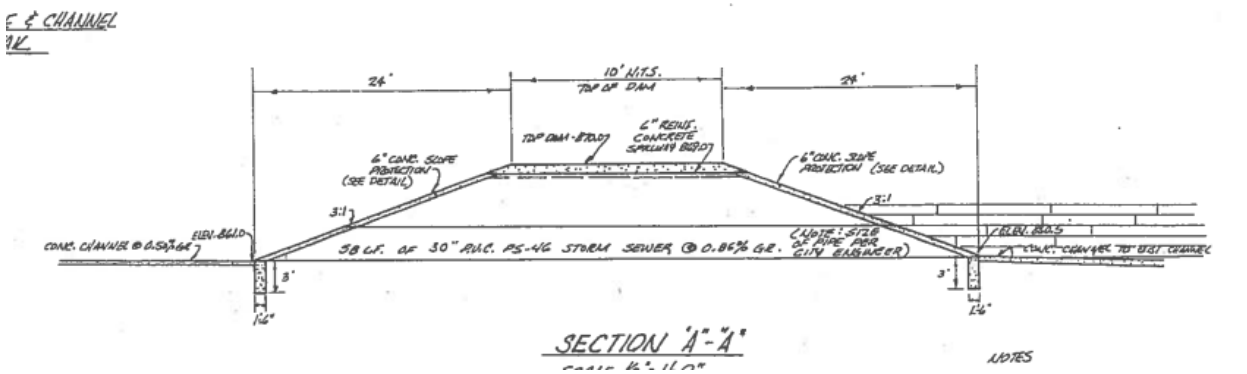


Typical headwall cross-section. The outlet structure for this inventory area is a catch basin, but the headwall was used to connect two ponds together. *From PH0001 – Big Creek Apartments: BigCreekTownhomesPh2.pdf*

Pipe

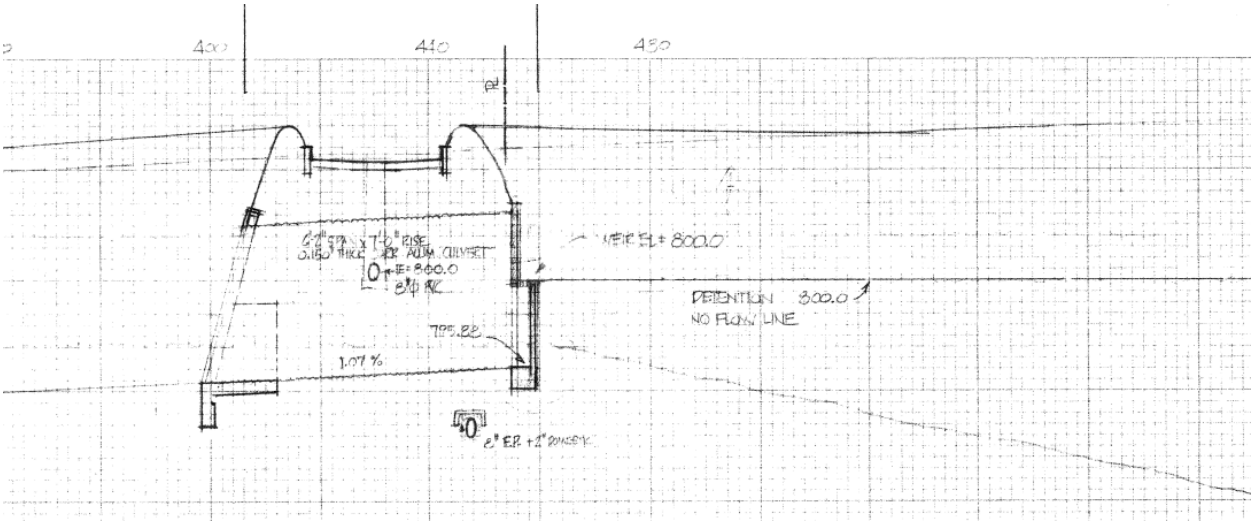


Pipe outlet in the form of an underdrain in a vegetated

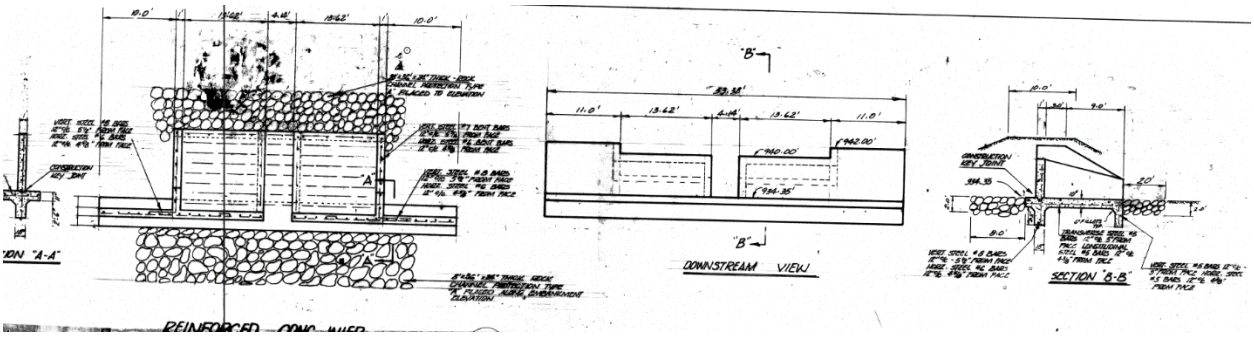


A dam that has a pipe as the primary drainage structure underneath it. *ST0003 – Olympia Subdivision HOA: OlympiaPlans.pdf*

Weir



A detention basin outlet structure in a series of adjacent and connected SCMs. The water spills over the weir into a pipe that discharges to a basin to the east. *From MI0040 – Engle Lake Drive: EngleLakeBusinessCenter1988.pdf*



A weir for a wet pond that discharges to a stream. *From ST0009 – Echo Lake: ECHO_DR.pdf*

Other

Includes no structure (i.e. water infiltrates into the ground), a named proprietary structure that doesn't readily fall into a prior category, complex combination of outlet structure types.

Sources

Guides and Manuals

National Menu of Best Management Practices (BMPs) for Stormwater-Post-Construction | US EPA

maintaining_scm_manual_final.pdf (amherstohio.org)

Design criteria for infiltration - Minnesota Stormwater Manual (state.mn.us)

Green Stormwater Tools – Green Stormwater Infrastructure (phila.gov)

Rainwater and Land Development | Ohio Environmental Protection Agency

CONNECTICUT STORMWATER QUALITY MANUAL (uconn.edu)

https://epa.ohio.gov/divisions-and-offices/surface-water/guides-manuals/rainwater-and-land-development

Ohio Law and Code

https://codes.ohio.gov/ohio-administrative-code/rule-3745-39-01

https://codes.ohio.gov/ohio-administrative-code/rule-901:10-3-11

https://codes.ohio.gov/ohio-administrative-code/rule-1501:9-2-01

https://codes.ohio.gov/ohio-administrative-code/rule-1501:9-12-01