

SWPPP Design Guidance

Case Study B for a Recreational Park in CSS Area

NYC DEP BEPA PERM

Part I: August 2025

Part II: September 2025

Objective

To provide an overview of design methodology that can be used on projects that require a Stormwater Construction Permit and stormwater management practices (SMPs).

- Using a case study for reference, this presentation is intended to communicate the appropriate design methodology for establishing and complying with stormwater management permit requirements.
- The presentation will also refer to supporting documentation and calculations that are key to the design process.
- This presentation was given in two parts, as listed below:
 - SWPPP Design Workshop Part I took place on August 26, 2025.
 - SWPPP Design Workshop Part I took place on September 30, 2025.Published slides have been compiled into a single deck for clarity.

Overview

1. Introduction & Case Study Overview

2. SWPPP Design Process (Part I)

- Permit Applicability
- Criteria Applicability
- Geotechnical Planning
- SMP Siting

3. SWPPP Design Process (Part II)

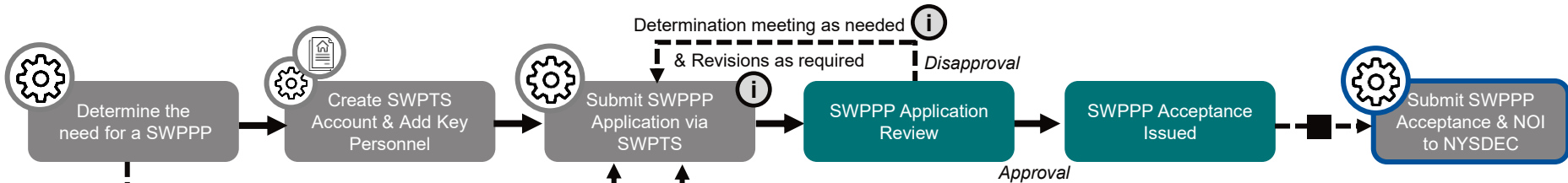
- Required Site-Wide Criteria
- Tier 1 & 2 SMP Design
- Tier 3 SMP Design (*CSS Only*)
- Confirming all Requirement are Met

4. Questions

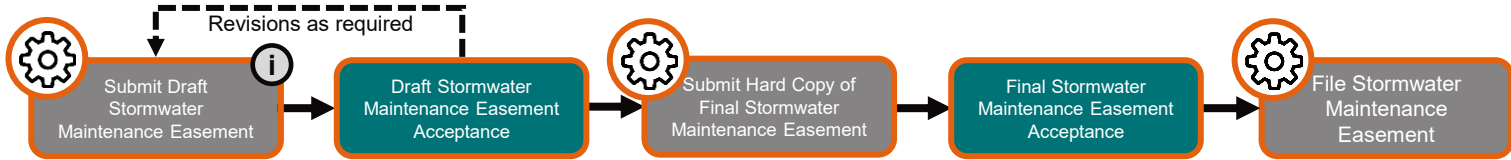
Introduction & Case Study Overview

NYC DEP STORMWATER PERMITTING PROCESS SUMMARY DIAGRAM

Phase I:
SWPPP
Application



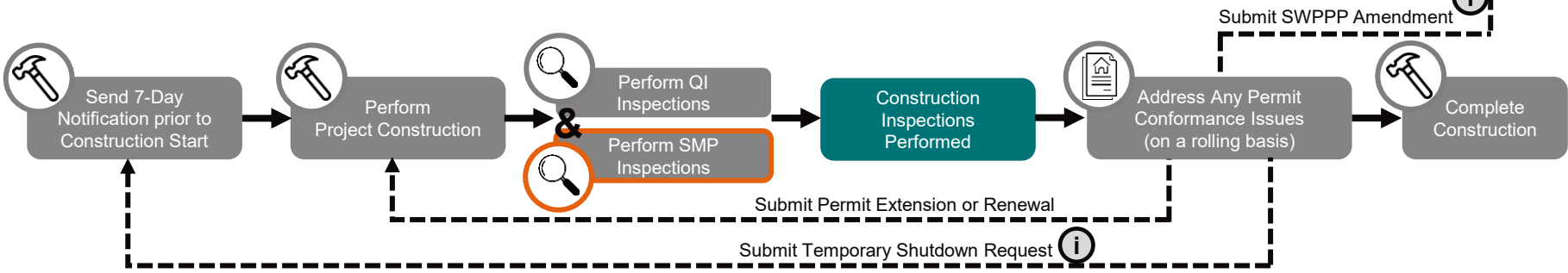
Phase II:
Stormwater
Maintenance
Easement



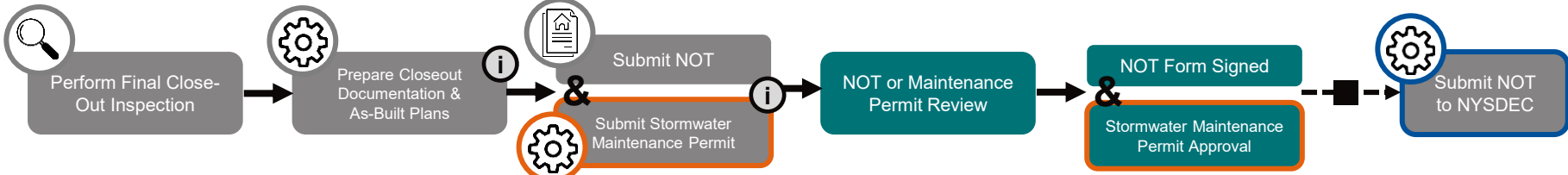
Phase III:
Pre-Construction



Phase IV:
Active
Construction



Phase V:
Construction
Close-Out



Phase VI:
Post-Construction



Legend

Project Team
Action Item

DEP Action Item

Step Applicable
for SMP Projects

Step Applicable
for MS4 Projects

- Indicates Required Step
- Indicates Supplemental Step (as required)
- Guidance Material Available
- Download Approved Documentation

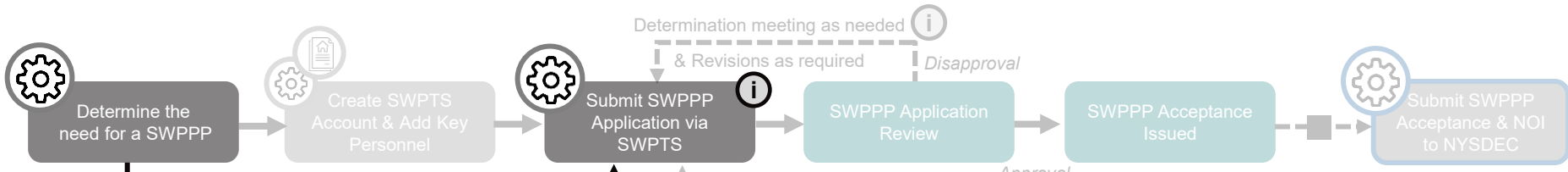
Primary Entity

- Owner/Developer
- Owner
- Qualified Professional
- Contractor
- Qualified Inspector

Note: This summary diagram is not intended to show all potential sub-steps. While the primary entity typically leads a particular step, other entities may also be involved in that step.

NYC DEP STORMWATER PERMITTING PROCESS SUMMARY DIAGRAM

Phase I:
SWPPP
Application



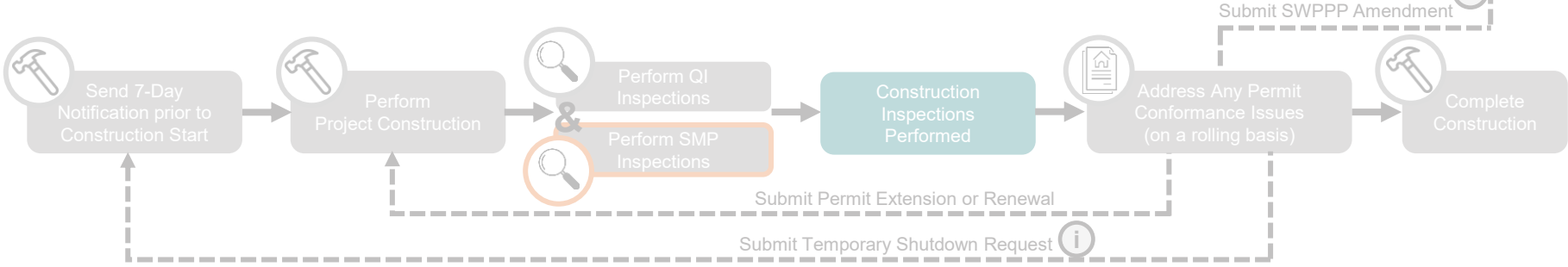
Phase II:
Stormwater
Maintenance
Easement



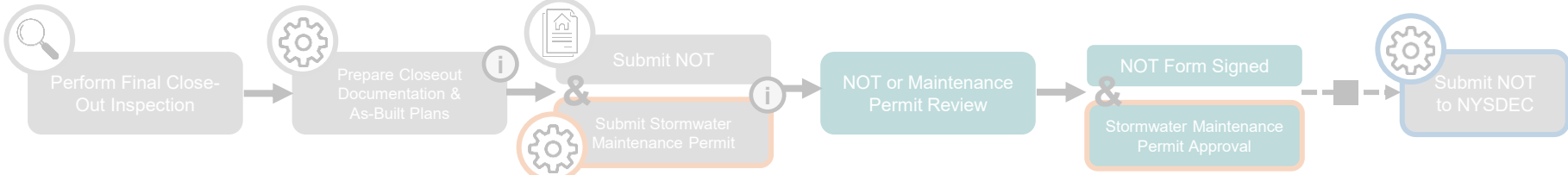
Phase III:
Pre-Construction



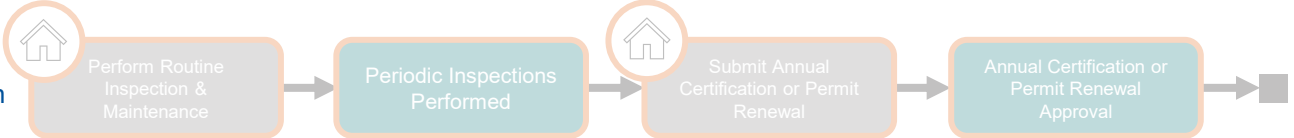
Phase IV:
Active
Construction



Phase V:
Construction
Close-Out



Phase VI:
Post-Construction



Legend

Project Team Action Item

DEP Action Item

Step Applicable for SMP Projects

Step Applicable for MS4 Projects

Indicates Required Step

Indicates Supplemental Step (as required)

i Guidance Material Available

Download Approved Documentation

Primary Entity

Owner/Developer

Owner

Qualified Professional

Contractor

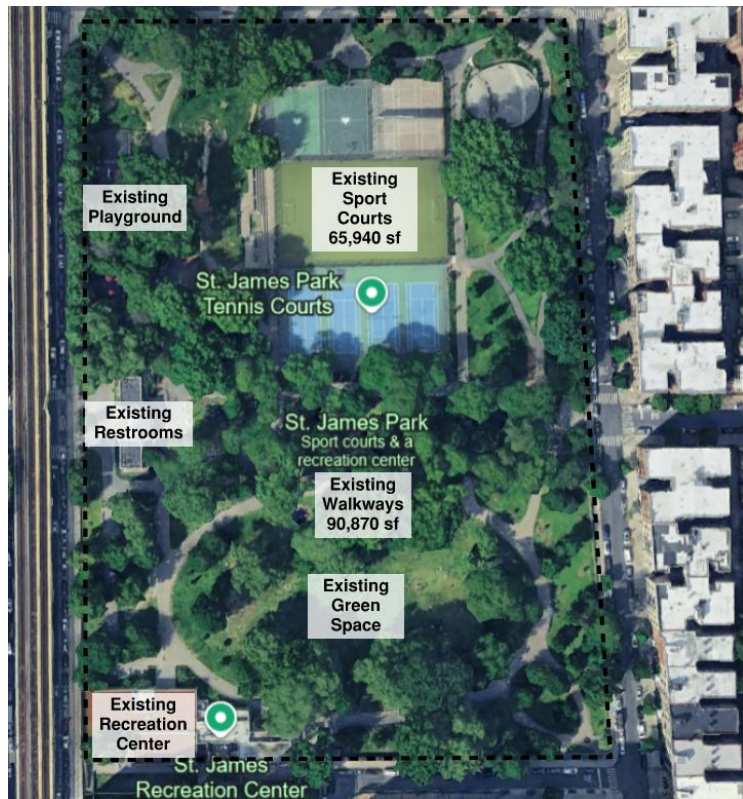
Qualified Inspector

Note: This summary diagram is not intended to show all potential sub-steps. While the primary entity typically leads a particular step, other entities may also be involved in that step.

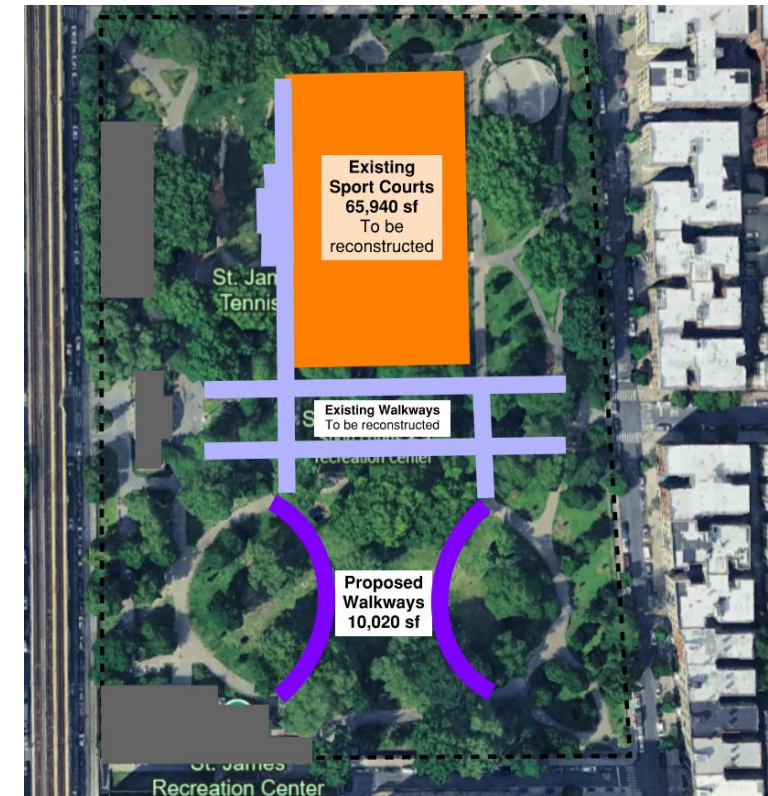
Introduction

Overview of Case Study Scope

Recreational park that drains to Combined Sewer System (CSS) is reconstructing the sport courts (impervious courts and artificial turf) and constructing new walkways



Concept Map: Existing Site



Concept Map: Proposed Development

Introduction

Important Notes

The SWPPP Design process is highly nuanced and project-specific.

This workshop discusses applicability triggered by the following case study parameters:

- ✓ Disturbance occurs only within a recreational site
- ✓ Sport courts are being reconstructed
- ✓ Walkways (re)constructed in a recreational site
- ✓ Project discharges to a combined sewer system

This workshop is not intended to:

- ✗ Represent all possible design scenarios
- ✗ Cover all regulated elements of the NYC DEP Stormwater Permitting Program
- ✗ List all required supporting documentation

Introduction

Important Notes

The SWPPP Design process is highly nuanced and project-specific.

“Considerations” slides were added for various topics throughout the presentation to:

- Help communicate nuances in the design process
- Provide general guidance on elements that may be outside the scope of the case study



Topic

Considerations:

- Consideration 1
- Consideration 2

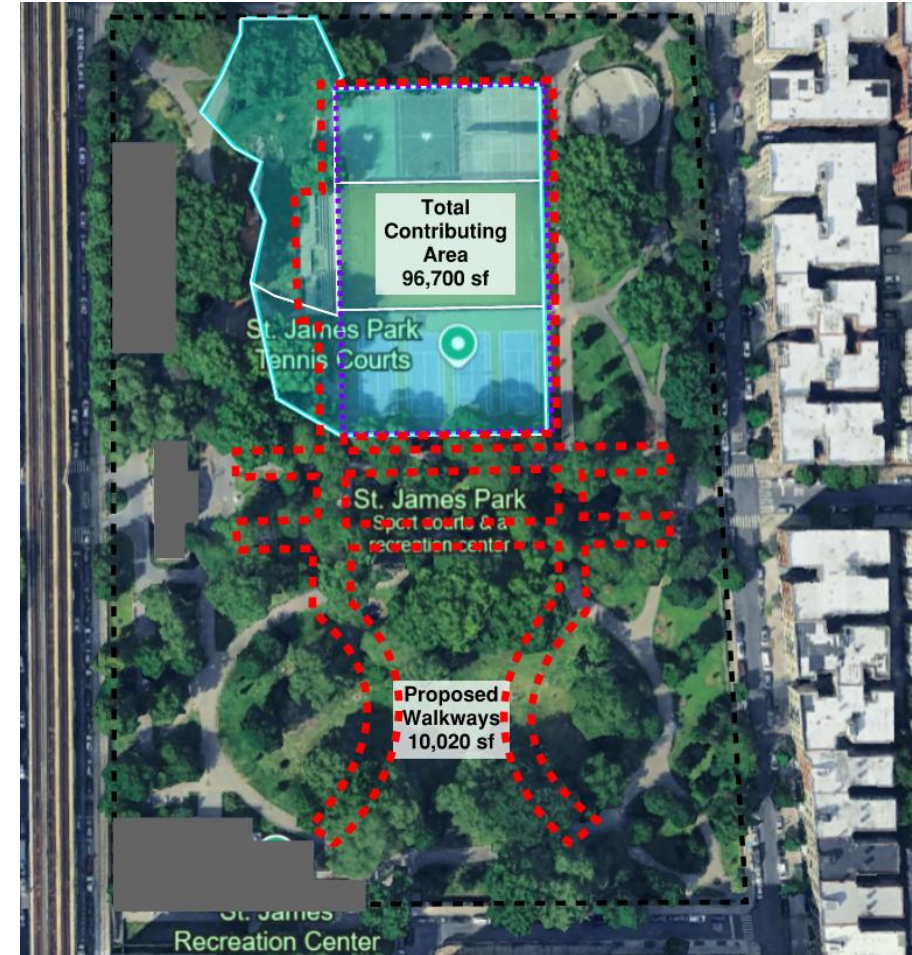
A light blue callout box with a lightbulb icon and a title 'Topic'. It contains a section 'Considerations:' with two bullet points: 'Consideration 1' and 'Consideration 2'.

Introduction

Visual Examples

Throughout this workshop, example **Concept Maps** will be used to communicate a design concept visually.

- Contents inform SWPPP design components, including drawings, calculations, and construction processes
- Representations of design elements are schematic
- Maps are tagged with the term “Preliminary” when the plan will change throughout the design process



Concept Map: Site Contributing Area
(Preliminary)

Introduction

Visual Examples

The **Concept Maps** shown throughout this presentation do not include the level of detail required in SWPPP submissions.

SWPPP submissions must include:

- All documents listed in Appendix A of the SWPPP template, in the form of engineering drawings that include all contents listed in bullets under each plan.
- If a plan was not included, a justification that states the reason it is not necessary

Appendix A: Drawings

Instructions:

- Check the box for each document included in this appendix. Note that several drawings may be submitted for each checklist item to provide all the necessary detail. Leave the check box.
- Drawing scale shall be indicated.
- A clear, detailed legend shall be provided.
- All drawings shall be prepared by a professional, licensed engineer or architect.
- If a document was not included, a justification shall be provided in the textbox below.
- Please do not include the inclusion of any other documents.

Documents included:

☐ Historical Impervious Area Plan

match current surveyed conditions

- Delineation of impervious areas removed from a project
- Area of impervious areas

☐ Existing Site Plan, showing:

- A minimum of 50' beyond project boundaries
- Total project site area
- Indicate area disturbed by project
- Existing site surface features
- Existing surface footprints of all structures
- On-site and adjacent features
- Callouts for key site features

☐ Existing Drainage Utility Plan

- Existing site surface features
- Existing surface footprints of all structures
- Existing drainage structures
- Existing drainage pipe locations
- Subsurface drainage features different from the surface
- Existing on-site sewage treatment
- Existing topographic contours

- Callouts for each design point, including the IDs of all individual drainage areas that contribute to the design point, the total contributing area to the design point, and the total area of each surface type within the total contributing area
- Delineation of the limits of disturbance

☐ Proposed Grading Plan, showing proposed topographic contours, or spot elevations if the site is relatively flat

☐ Final Landscaping and Stabilization Plan

- Can include landscaping plan and materials plan/roof plan.
- Delineation of all vegetated areas noting practices to achieve final stabilization
- Delineation of type of soil disturbance across the entire site, as categorized in NYS DEC Stormwater Design Manual Table 5.3
- Callouts for each runoff reduction practice that requires Soil Restoration measures to be applied over and adjacent to the practice.
- Callouts for each type of soil disturbance and soil restoration activity (see NYS DEC Stormwater Design Manual Table 5.3)

☐ SMP Section/Detail Plans, showing:

- Elevations for bottom of practice, interface of each media layer, top of ponding, and top of practice
- Elevations for inverts in, inverts out, and/or overflows
- Elevations of any groundwater table or bedrock
- Elevations for the top and bottom of active storage zones
- Ponding depths
- Media slope, depths, and specifications
- Any observation wells and their materials specifications
- Any pre-treatment devices and proprietary SMPs

☐ Drainage Section/Detail Plans, for any manholes, inlets, outlet-control structures, or other drainage structures.

For projects that will disturb more than 5 acres at any one time,

☐ Cut and Fill Plan

☐ Phasing Plan defining maximum disturbed Area per phase

☐ Master Phasing Plan (Include when project is part of a Larger Common Plan), showing a delineation of separate projects under the Larger Common Plan, their projected start/end dates, and their application IDs.

If any of the above documents are not included, explain why below:

Click or tap here to enter text.

Design Process

Permit Applicability

Permit Applicability

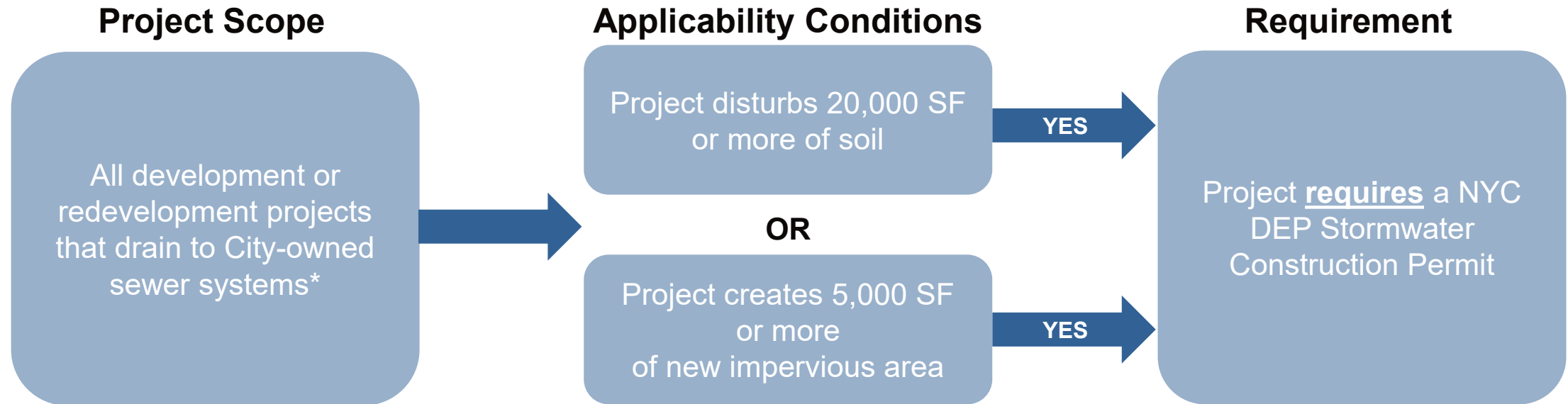
Goal: Determine whether a project needs a Stormwater Construction Permit

Key Questions

- Can the development project drain to an NYC-owned sewer system?
- How much soil is disturbed?
- How much new impervious cover is created?

Permit Applicability

Stormwater Construction Permit Applicability Flow Chart

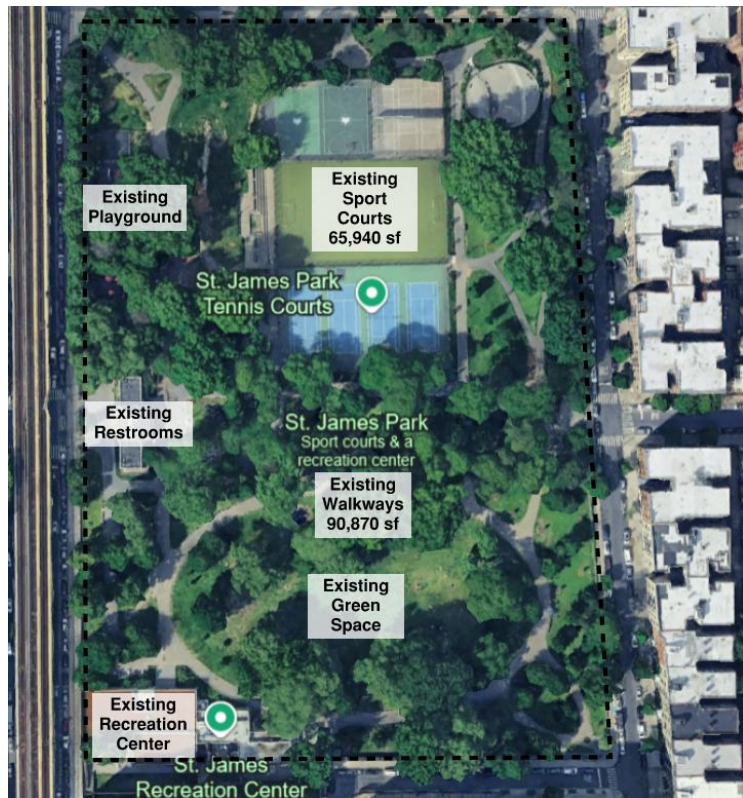


**Direct discharges to Waters of the State of New York from or through NYC-Owned properties may also be considered covered development projects that require a Stormwater Construction Permit.*

Permit Applicability

Can the development project drain to an NYC-owned sewer system?

Recreational park that drains to Combined Sewer System (CSS) ✓
is reconstructing the sport courts (impervious courts and artificial turf) and constructing new walkways



Concept Map: Existing Site



**Concept Map: Proposed Development
& Existing Sewer Connection**

Permit Applicability

Can the development project drain to an NYC-owned sewer system?



Confirming Sewershed Type & Connectivity

Considerations:

- If the proposed project is re-using an existing sewer connection, confirmation must be completed to verify where the existing site discharge point connects to the NYC sewer system.
- Confirmation of connectivity and discharge point to the NYC sewer system is especially important if there are both combined sewer and municipal separate storm sewer systems adjacent to the site.
- A dye test shall be performed to confirm the existing discharge point to the NYC sewer system.
- If a sewer card exists verifying the existing sewer connection and it is clear from record drawings and field observation that the existing drainage system flows in one direction to the NYC sewer system, then a dye test can be avoided.

Permit Applicability

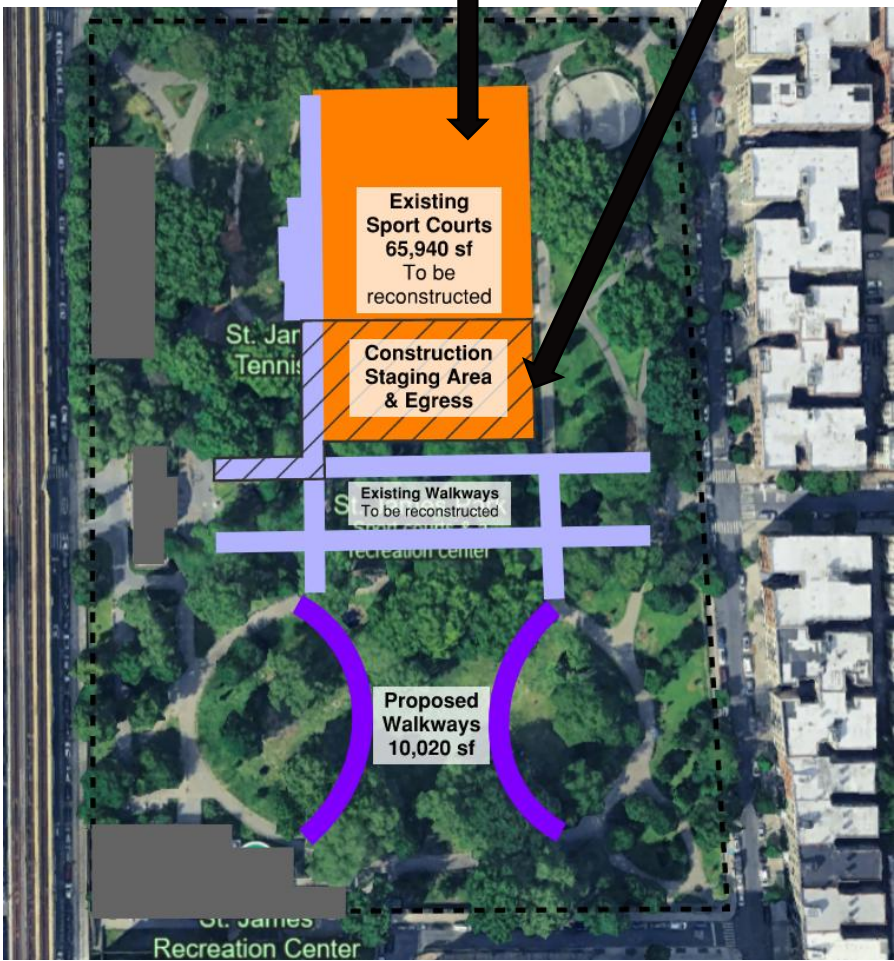
How much soil is disturbed?

LEGEND

-  Property Limits: 496,270 sf
-  Existing Structures
-  Existing Sport Courts - To be reconstructed
-  Existing Walkways - To be reconstructed
-  Proposed Walkways
-  Construction Staging & Egress Areas

Disturbed areas are characterized as soil disturbed by development activities such as clearing, grading, excavation, demolition & construction

Disturbed areas include construction support activities, such as construction staging areas, stockpiling, egress, etc.



Concept Map: Proposed Development & Construction Activities

Permit Applicability

How much soil is disturbed?

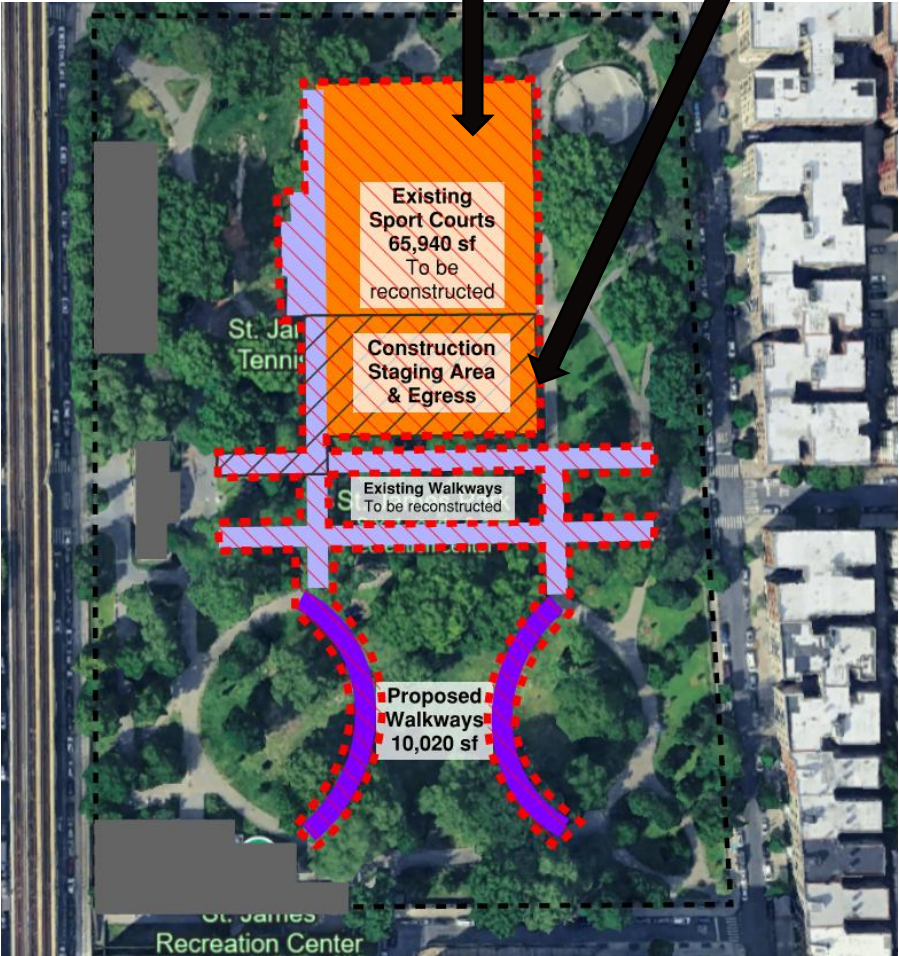
Note: Disturbance extending outside of the property boundary (within an easement or the right-of-way) must be accounted for in overall disturbance value.

LEGEND

- Property Limits: 496,270 sf
- Existing Structures
- Existing Sport Courts - To be reconstructed
- Existing Walkways - To be reconstructed
- Proposed Walkways
- Construction Staging & Egress Areas
- Limit of Disturbance: 137,170 sf

Disturbed areas are characterized as soil disturbed by development activities such as clearing, grading, excavation, demolition & construction

Disturbed areas include construction support activities, such as construction staging areas, stockpiling, egress, etc.



Concept Map: Soil Disturbance

Permit Applicability

How much soil is disturbed?



Estimating Soil Disturbance

Considerations:

- To avoid delays and costs associated with SWPPP amendments, estimate soil disturbance conservatively
- Planned limits of work itself, as well as construction support activities.
- In some cases, all areas within the contract limit lines should be included if the contractor is likely to disturb as part of construction support.
- Projects that are close to the 20,000-sf threshold should consider submitting a SWPPP to avoid significant delays if the contractor disturbs more than anticipated.
- Disturbance extending outside of the property boundary (within an easement or the right-of-way) must be accounted for in overall disturbance value. If there are both on-site and ROW disturbance, they must be identified separately in the SWPPP and plans.

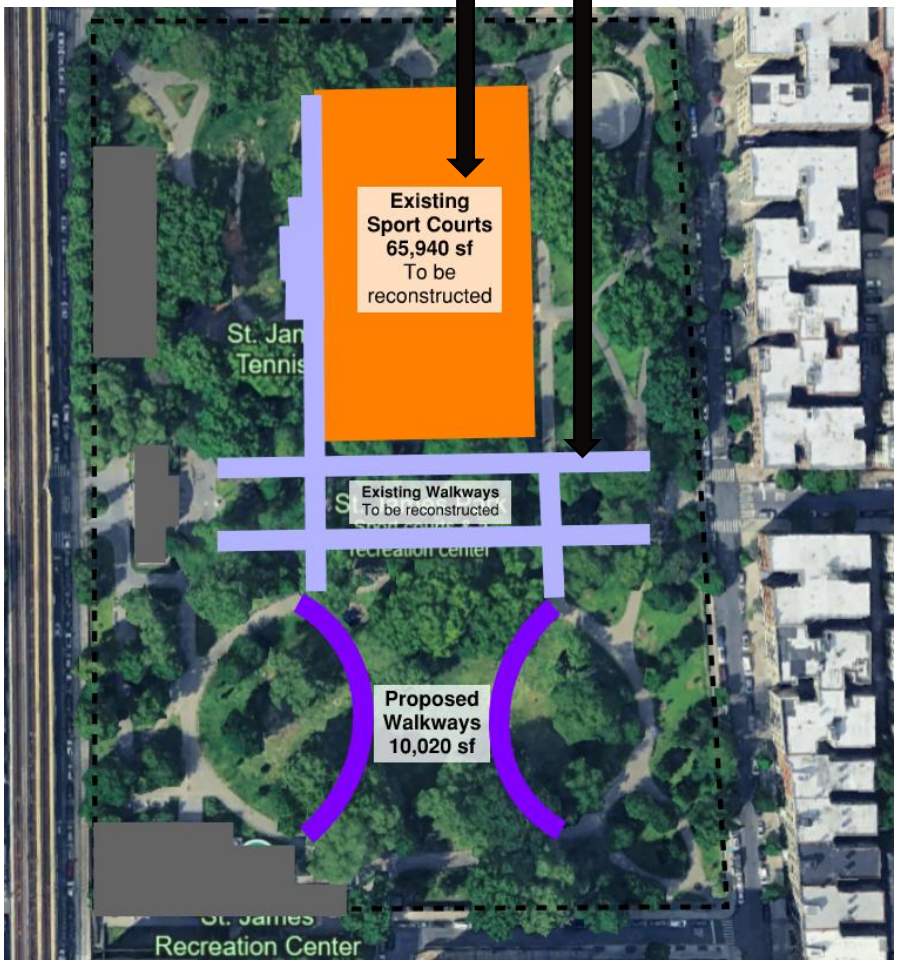
Permit Applicability

How much new impervious cover is created?

LEGEND

-  Property Limits: 496,270 sf
-  Existing Structures
-  Existing Sport Courts - To be reconstructed
-  Existing Walkways - To be reconstructed
-  Proposed Walkways

Impervious area are hard surfaces that cannot effectively infiltrate rainfall, such as rooftops, pavements, sidewalks, and driveways.

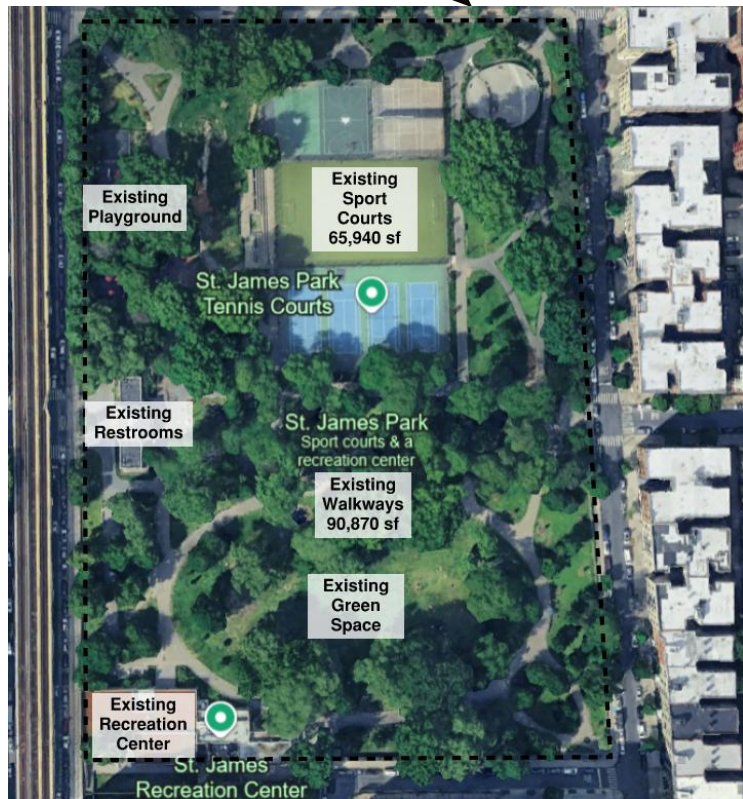


Concept Map: Proposed Development Activities

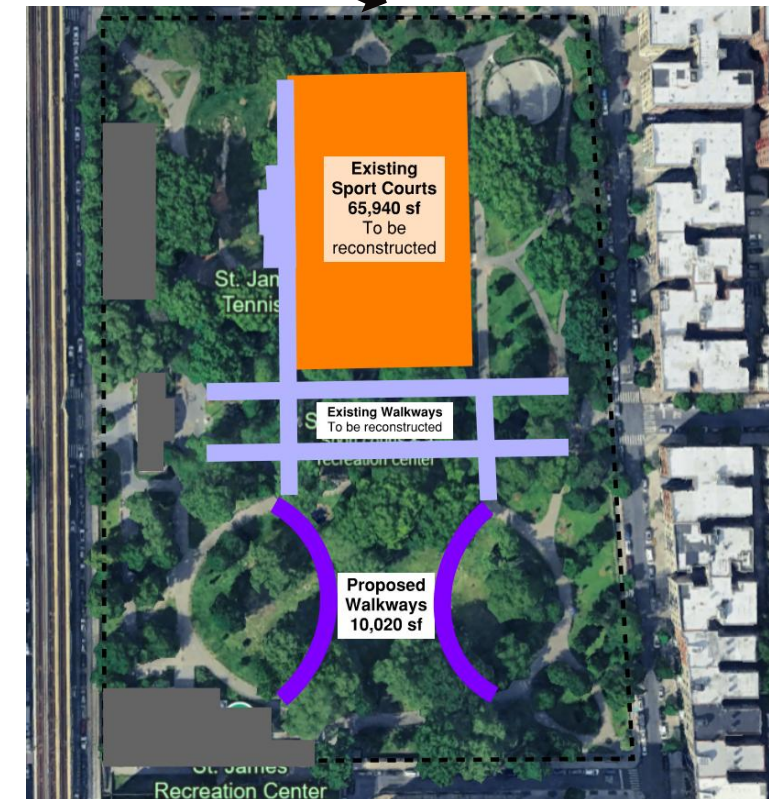
Permit Applicability

How much new impervious cover is created?

Change in impervious cover is calculated from pre- to post- development conditions for the disturbed area.



Concept Map: Existing Site



Concept Map: Proposed Development

Permit Applicability

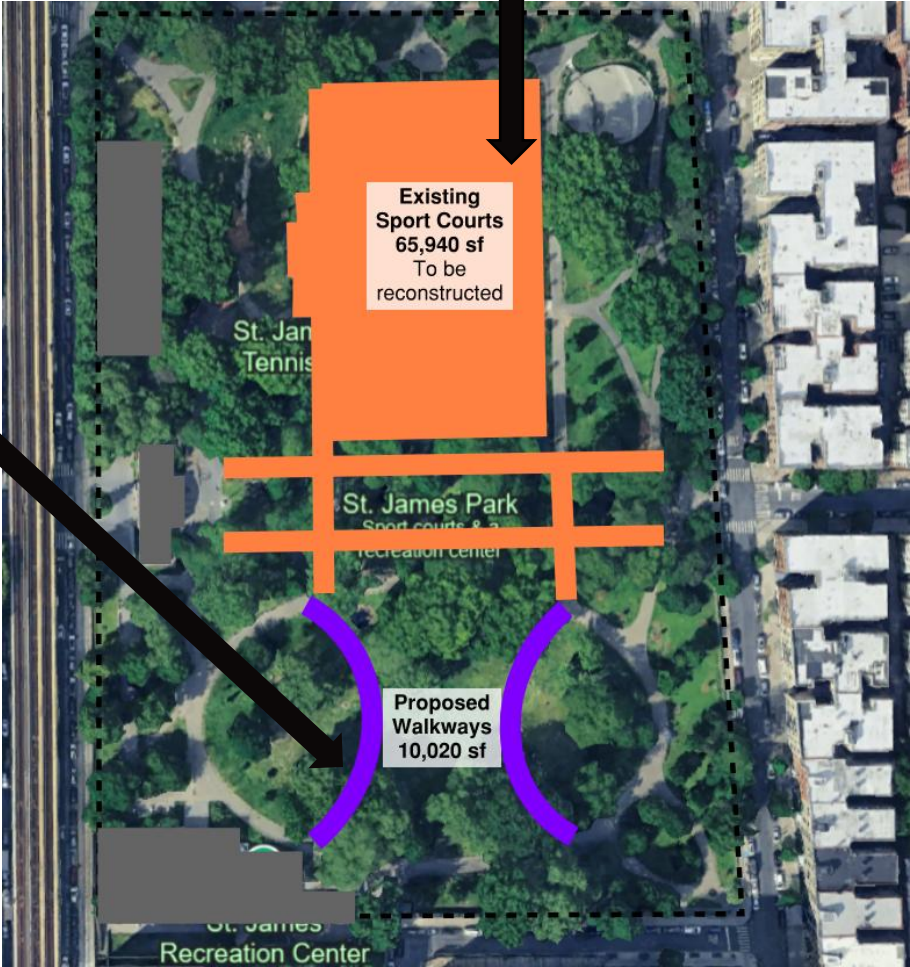
How much new impervious cover is created?

Impervious area are hard surfaces that cannot effectively infiltrate rainfall, such as rooftops, pavements, sidewalks, and driveways.

Change in impervious cover is calculated from pre- to post- development conditions for the disturbed area.

LEGEND

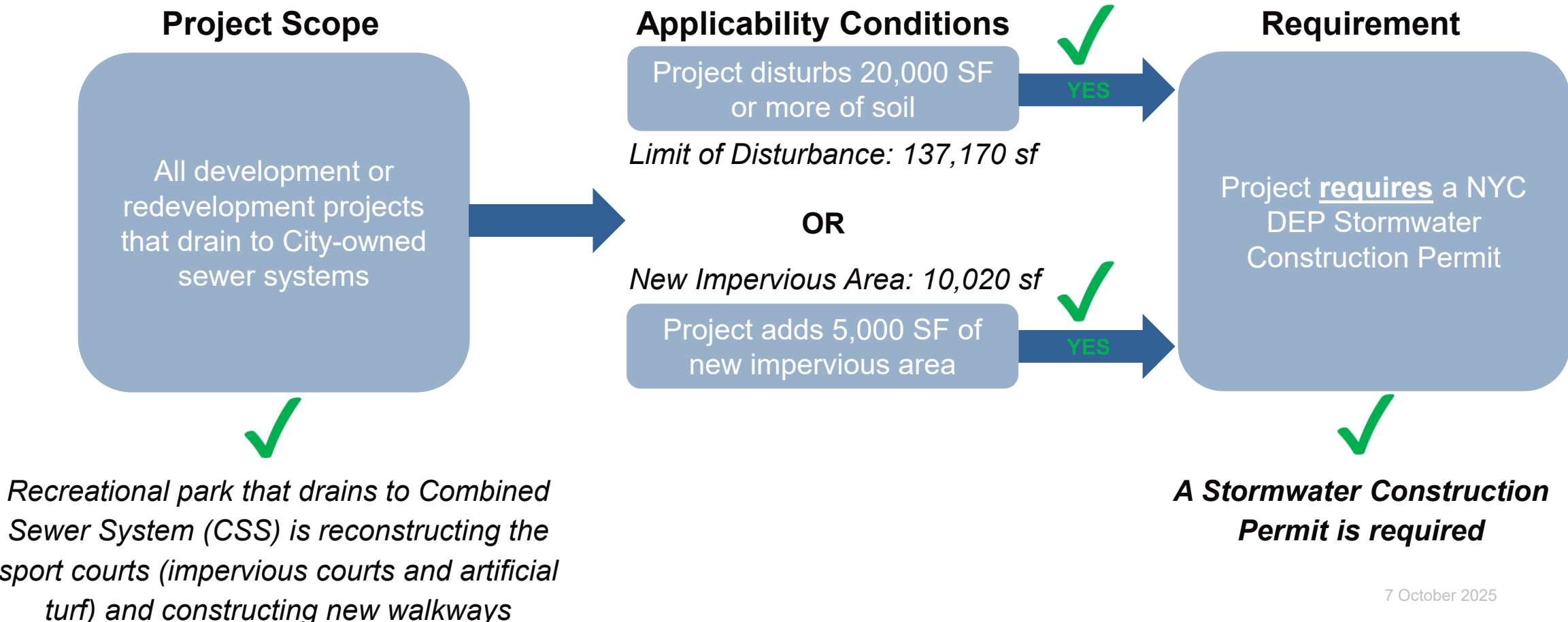
-  Property Limits: 496,270 sf
-  Existing Structures (Undisturbed)
-  Existing Impervious in Disturbed Area: 89,700 sf
-  New Impervious in Disturbed Area: 10,020 sf



Concept Map: Change in Impervious Area

Permit Applicability

Stormwater Construction Permit Applicability Flow Chart



Permit Applicability

Goal: Determine whether a project needs a Stormwater Construction Permit

Key Questions

- Can the development project drain to an NYC-owned sewer system?
- How much soil is disturbed?
- How much new impervious cover is created?

A Stormwater Construction Permit is required for this project.

Criteria Applicability

Criteria Applicability

Goal: Establish which stormwater management criteria apply to my project

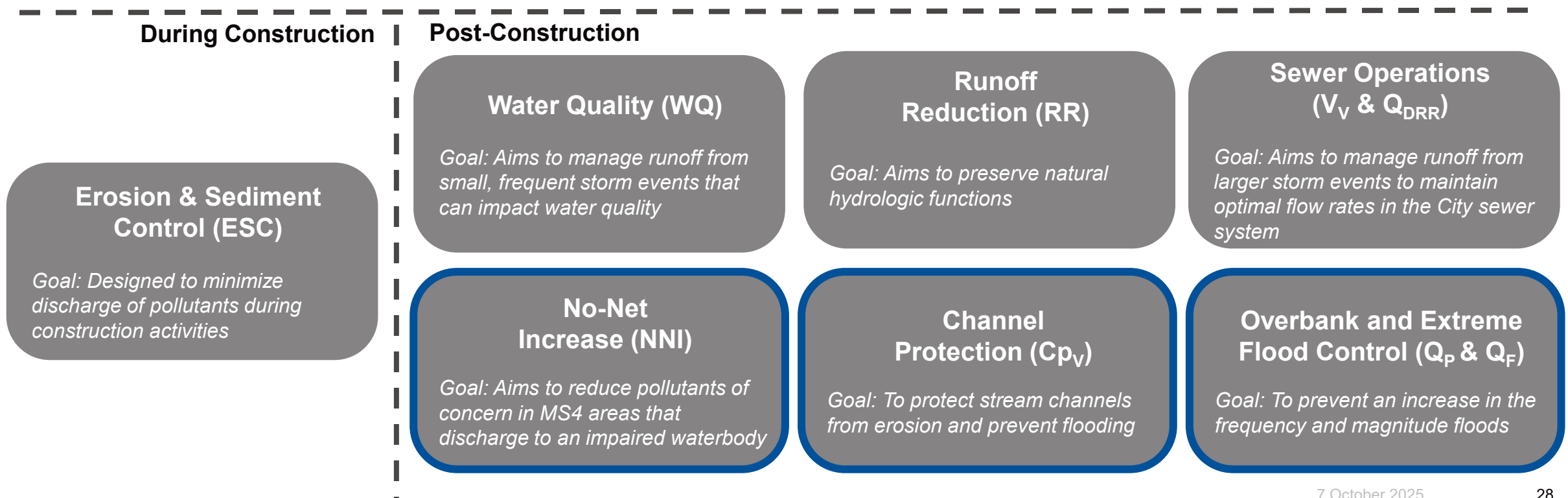
Key Questions

- Are Erosion & Sediment Controls required?
- Are long-term stormwater management practices (SMPs) required?
- Do any MS4-Only criteria apply?

Criteria Applicability

Criteria Regulated under Stormwater Construction Permits

When a Stormwater Construction Permit is applicable, a Stormwater Pollution Prevention Plan (SWPPP) **must** be prepared. The contents of the SWPPP will depend on which of the following criteria apply:



ESC

WQ_v

RR_v

V_v
Q_{DRR}

NNI

Cp_v

Q_P
Q_F



Criteria Applicability

Are Erosion & Sediment Controls required?

Erosion and Sediment Control criteria are **always** required.

Criteria Applicability

Are long-term SMPs required?

NYC SWM Table 2.2 lists covered development projects that only require the implementation of ESC during construction, and therefore “ESC-Only” SWPPP.

If any proposed activities on a project are not listed within this table, long-term stormwater management is required as well as ESC. In this case, an “ESC&SMP” SWPPP must be prepared.

Notes:

Projects should cross reference this table with the 2025 New York State Construction General Permit (CGP) Appendix B Table 1.



Table 2.2. Covered development projects that require the preparation of a SWPPP that includes only erosion and sediment control (ESC) requirements.

Covered Development Activity
Installation of underground, linear utilities such as gas lines, fiber-optic cable, cable TV electric, telephone, sewer mains, and water mains
Environmental enhancement projects, such as wetland mitigation projects, stormwater retrofits and stream restoration projects
Pond construction
Linear bike paths running through areas with vegetative cover, including bike paths surfaced with an impervious cover
Cross-country ski trails and walking/hiking trails
Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are not part of residential, commercial or institutional development
Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that include incidental shoulder or curb work along an existing highway to support construction of the sidewalk, bike path or walking path
Slope stabilization projects
Slope flattening that changes the grade of the site, but does not significantly change the runoff characteristics
Spoil areas that will be covered with vegetation
Vegetated open space projects (i.e. recreational parks, lawns, meadows, fields, downhill ski trails) excluding projects that alter hydrology from pre- to post-development conditions
Athletic fields (natural grass) that do not include the construction or reconstruction of impervious area and do not alter hydrology from pre to post development conditions
Demolition project where vegetation will be established, and no redevelopment is planned
Overhead electric transmission line project that does not include the construction of permanent access roads or parking areas surfaced with impervious cover
Temporary access roads, median crossovers, detour roads, lanes, or other temporary impervious areas that will be restored to pre construction conditions once the construction activity is complete
Road reconstruction projects where the total soil disturbance from all activities is less than 1-acre

Criteria Applicability

Are long-term SMPs required?

NYC SWM Table 2.3 is a non-exhaustive list of covered development projects that require long-term stormwater management, as well as ESC.

These projects require an “ESC&SMP” SWPPP.

Notes:

Projects should cross reference this table with the 2025 CGP Appendix B Table 2.



Table 2.3. Covered development projects that require the preparation of a SWPPP that includes ESC requirements, as well as WQ and RR requirements.

Covered Development Activity

Single family home directly discharging to one of the impaired segments listed in Appendix 2 of the MS4 Permit

Single family home that disturbs five (5) or more acres of land



Playgrounds that include the construction or reconstruction of impervious area

Sports complexes

Racetracks; includes racetracks with earthen (dirt) surface

Road construction, including roads constructed as part of the covered development projects listed in Table 2.2

Road reconstruction, except as indicated in Table 2.2 when the total soil disturbance from all activities is less than 1-acre

Parking lot construction or reconstruction, including parking lots constructed as part of the covered development projects listed in Table 2.2

Athletic fields (natural grass) that include the construction or reconstruction of impervious area (>5% of disturbed area) or alter the hydrology from pre to post development conditions

Athletic fields with artificial turf

Permanent access roads, parking areas, substations, compressor stations and well drilling pads, surface with impervious cover, and constructed as part of an over-head electric transmission line project, wind-power project, cell tower project, oil or gas well drilling project, sewer or water main project or other linear utility project

Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are part of a residential, commercial, or institutional development

Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are part of a highway construction or reconstruction project

All other covered development projects that include the construction or reconstruction of impervious area or alter the hydrology from pre and post development conditions, and are not listed in Table 2.2

Criteria Applicability

Are long-term SMPs required?

Case Study Scope: Recreational park is reconstructing sport courts and constructing new walking paths

✓ Proposed walking path in a recreational park is listed in NYC SWM Table 2.2

HOWEVER,

✗ Reconstructing sport courts (impervious courts and artificial turf) are not listed in NYC SWM Table 2.2



Table 2.2. Covered development projects that require the preparation of a SWPPP that includes only erosion and sediment control (ESC) requirements.

Covered Development Activity

Installation of underground, linear utilities such as gas lines, fiber-optic cable, cable TV electric, telephone, sewer mains, and water mains

Environmental enhancement projects, such as wetland mitigation projects, stormwater retrofits and stream restoration projects

Pond construction

Linear bike paths running through areas with vegetative cover, including bike paths surfaced with an impervious cover

Cross-country ski trails and walking/hiking trails

Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are not park or residential, commercial or institutional development

Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that include incidental shoulder or curb work along an existing highway to support construction of the sidewalk, bike path or walking path

Slope stabilization projects

Slope flattening that changes the grade of the site, but does not significantly change the runoff characteristics

Spoil areas that will be covered with vegetation

Vegetated open space projects (i.e. recreational parks, lawns, meadows, fields, downhill ski trails) excluding projects that alter hydrology from pre- to post-development conditions

Athletic fields (natural grass) that do not include the construction or reconstruction of impervious area and do not alter hydrology from pre to post development conditions

Demolition project where vegetation will be established, and no redevelopment is planned

Overhead electric transmission line project that does not include the construction of permanent access roads or parking areas surfaced with impervious cover

Temporary access roads, median crossovers, detour roads, lanes, or other temporary impervious areas that will be restored to pre construction conditions once the construction activity is complete

Road reconstruction projects where the total soil disturbance from all activities is less than 1-acre

Criteria Applicability

Are long-term SMPs required?

Case Study Scope: Recreational park is reconstructing sport courts and constructing new walking paths

- ✓ Reconstruction of sport courts is listed in NYC SWM Table 2.3



Table 2.3. Covered development projects that require the preparation of a SWPPP that includes ESC requirements, as well as WQ and RR requirements.

Covered Development Activity
Single family home directly discharging to one of the impaired segments listed in Appendix 2 of the MS4 Permit
Single family home that disturbs five (5) or more acres of land
Playgrounds that include the construction or reconstruction of impervious area
Sports complexes
Racetracks; includes racetracks with earthen (dirt) surface
Road construction, including roads constructed as part of the covered development projects listed in Table 2.2
Road reconstruction, except as indicated in Table 2.2 when the total soil disturbance from all activities is less than 1-acre
Parking lot construction or reconstruction, including parking lots constructed as part of the covered development projects listed in Table 2.2
Athletic fields (natural grass) that include the construction or reconstruction of impervious area (>5% of disturbed area) or alter the hydrology from pre to post development conditions
Athletic fields with artificial turf
Permanent access roads, parking areas, substations, compressor stations and well drilling pads, surface with impervious cover, and constructed as part of an over-head electric transmission line project, wind-power project, cell tower project, oil or gas well drilling project, sewer or water main project or other linear utility project
Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are part of a residential, commercial, or institutional development
Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are part of a highway construction or reconstruction project
All other covered development projects that include the construction or reconstruction of impervious area or alter the hydrology from pre and post development conditions, and are not listed in Table 2.2

Criteria Applicability

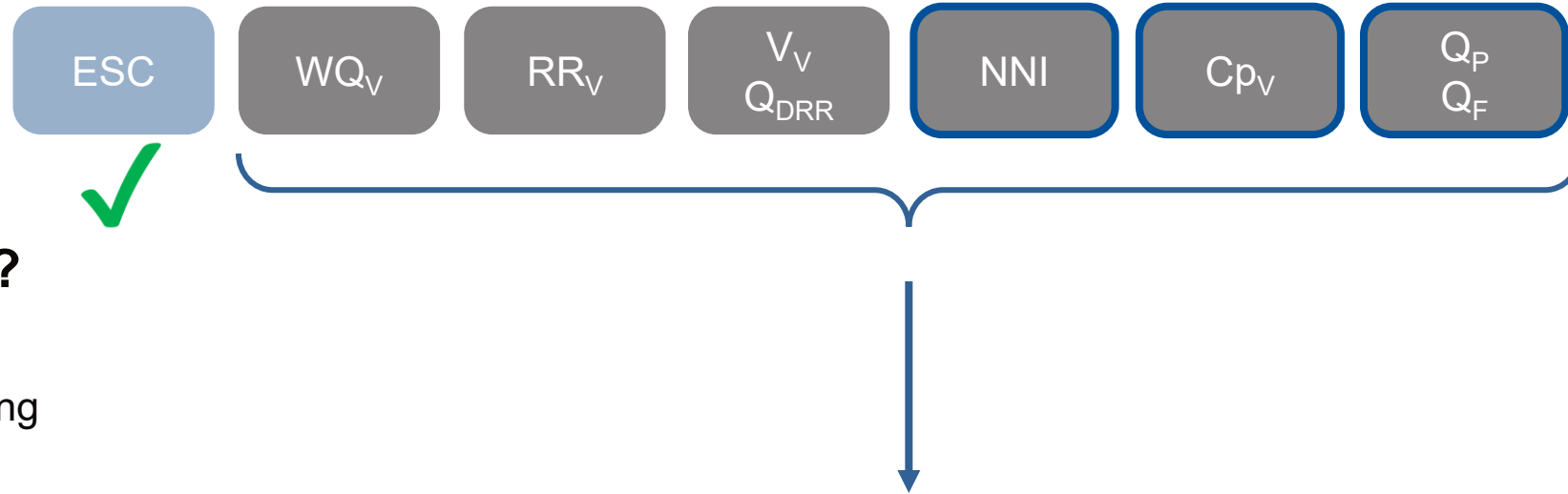
Are long-term SMPs required?

Case Study Scope: Recreational park is reconstructing sport courts and constructing new walking paths

X Since a portion of the project (reconstruction of sport courts) is not listed in NYC SWM Table 2.2

&

✓ A portion of the project (reconstruction of sport courts) is listed in NYC SWM Table 2.3

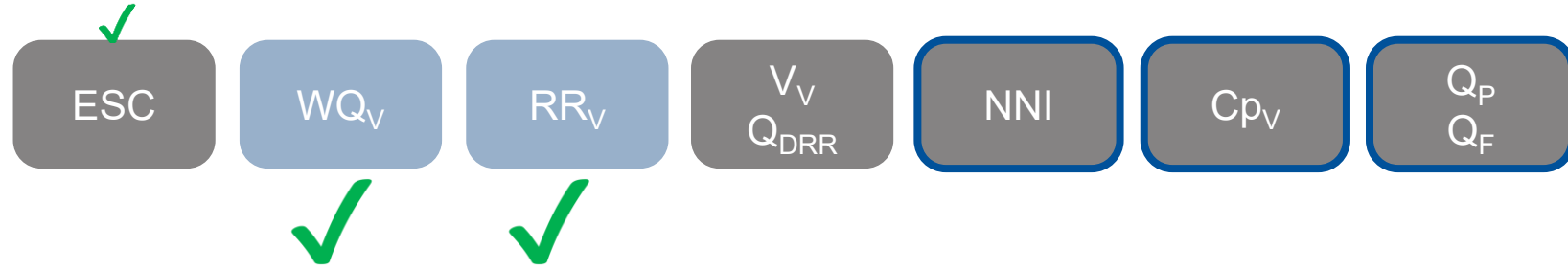


Project requires an “ESC&SMP” SWPPP*.

Once this is established, projects must check for the applicability of each of the long-term stormwater management criteria.

Criteria Applicability

Are long-term SMPs required?



WQ_v and RR_v apply to **all** projects that require long-term stormwater management.



Criteria Applicability

Are long-term SMPs required?

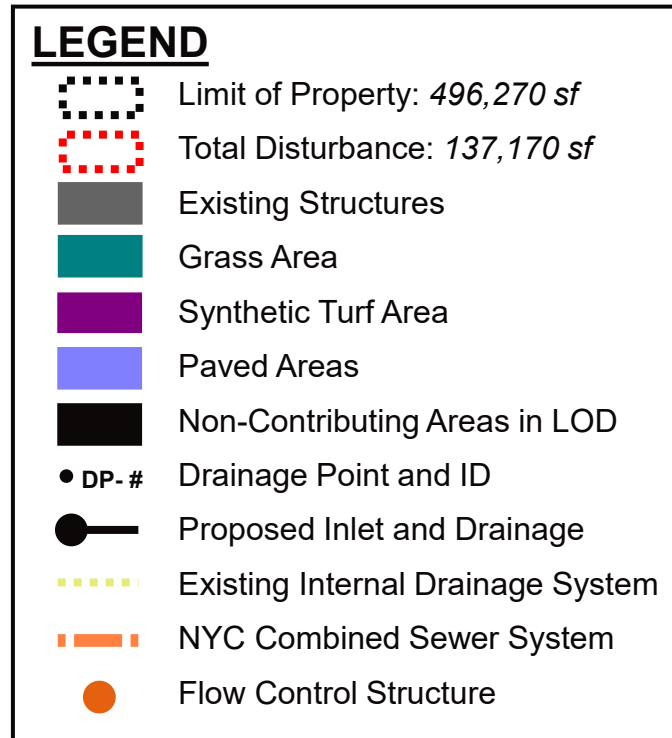
Sewer Operations criteria apply when a site discharges to City sewers.



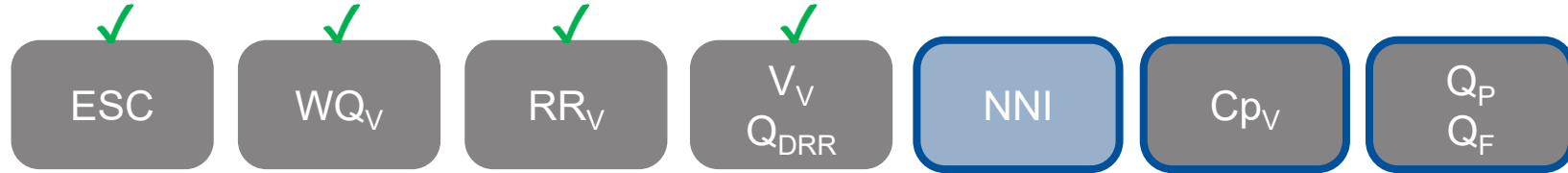
Criteria Applicability

Are long-term SMPs required?

Apply when project discharges
to a City-owned sewer



Concept Map: Proposed Cover and Contributing Area Drainage (Preliminary)

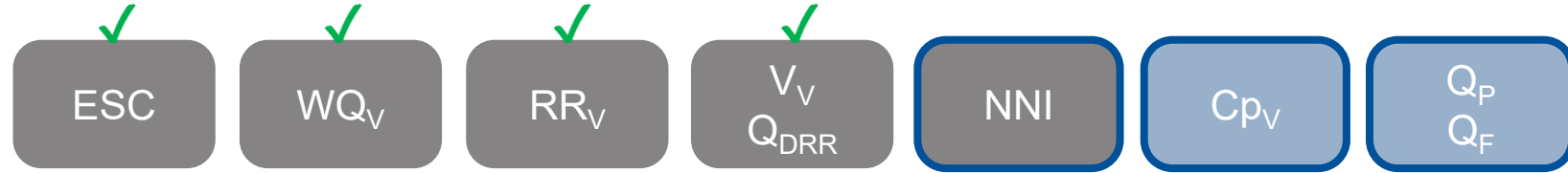


Criteria Requirements

Do any MS4-Only criteria apply?

No-Net-Increase criteria apply when a project meets **all** of the following conditions:

1. Project disturbs 20,000 SF or more of soil, or creates 5,000 sf or more of new impervious area ✓
2. Project increases site imperviousness ✓
3. Project discharges to MS4 system → Must be confirmed.
4. Project discharges to an impaired waterbody



Criteria Requirements

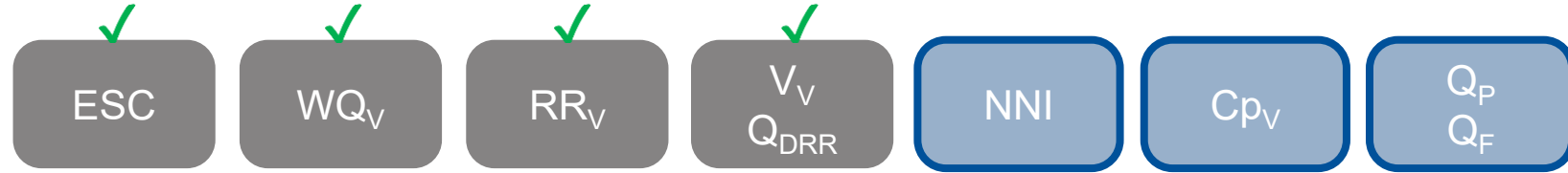
Do any MS4-Only criteria apply?

Channel Protection, Overbank Flood Control, and Extreme Flood Control criteria apply when a project meets **all** of the following conditions:

1. Project disturbs 20,000 sf or more of soil, or creates 5,000 sf or more of new impervious area ✓
2. Project discharges to MS4 system → Must be confirmed.
3. Site discharges to non-tidal waters. ✗

Notes:

Channel protection, overbank flood control, and extreme flood control requirements are not common in NYC projects. However, Designers must review the applicability criteria in the New York State Construction General Permit (2025 CGP Part II.C.2.a.iii) to confirm applicability.



Criteria Requirements

Do any MS4-Only criteria apply?

The following steps may be used to determine the sewershed type:

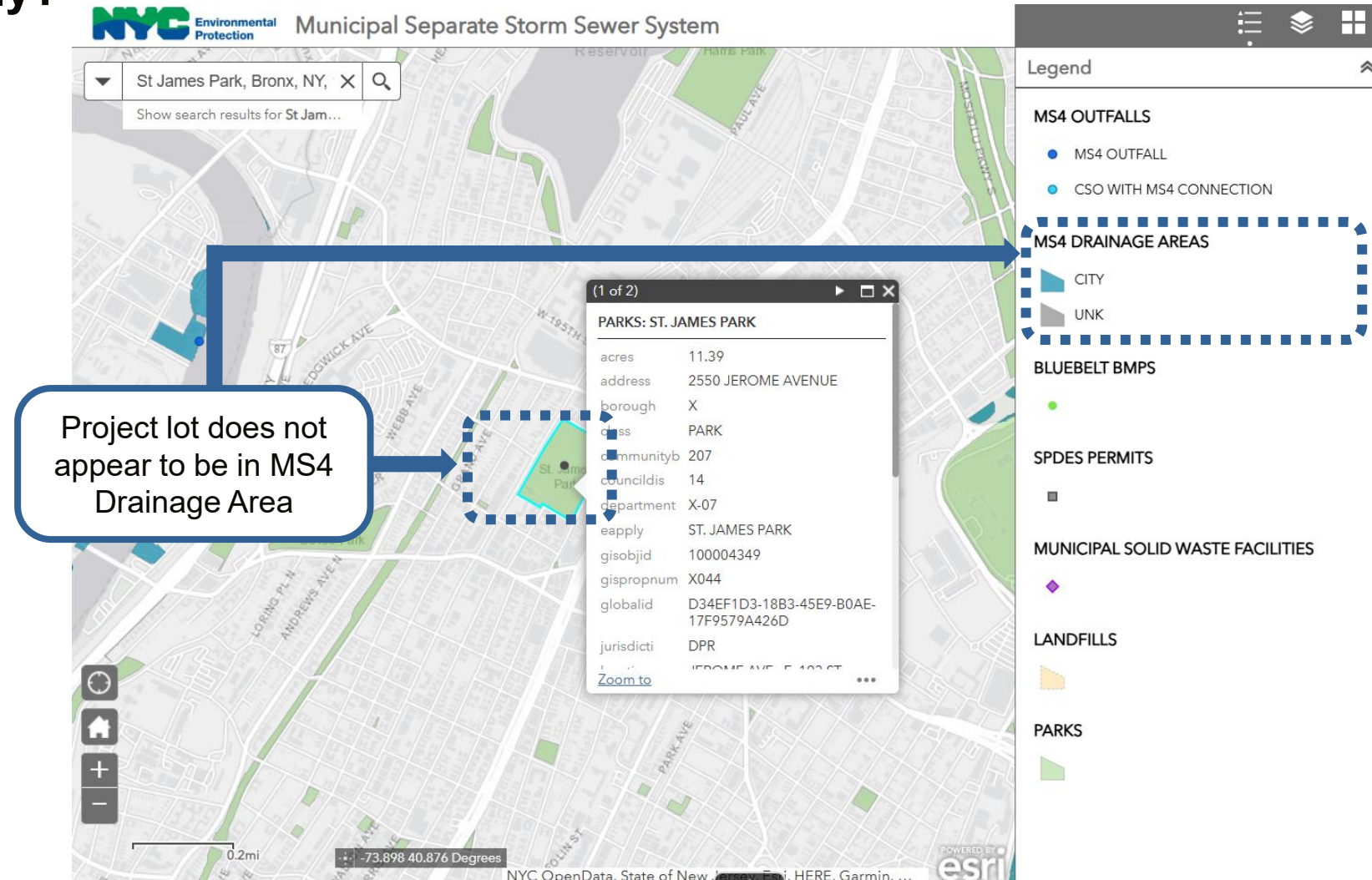
1. Locate project on [NYC DEP MS4 Interactive Map](#)
2. Confirm findings by requesting official record via [NYC DEP PARIS](#)
3. Resolve any inconsistencies by requesting a [Pre-Application Meeting](#) with DEP (as needed)



Criteria Requirements

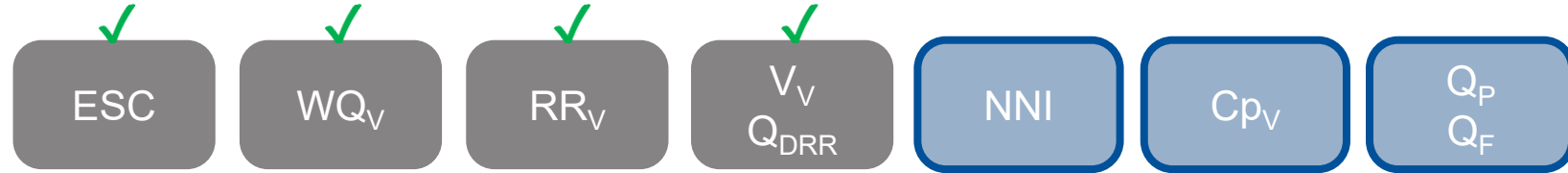
Do any MS4-Only criteria apply?

1. Locate project on [NYC DEP MS4 Interactive Map](#)



Notes:

- MS4 Interactive Map provides approximate boundaries for areas discharging to MS4 system and impaired waterbodies.
- It is helpful in determining an MS4 area's receiving waterbody and impairment.
- In some cases, the ownership and discharge area is inaccurate or unknown and must be verified separately.



Criteria Requirements

Do any MS4-Only criteria apply?

2. Confirm findings by requesting official record via [NYC DEP PARIS](#)



Login

Permit and Review Information System (PARIS)

Welcome to the New York City Department of Environmental Protection (DEP)

Permit and Review Information System (PARIS)

The Permit and Review Information System (PARIS) is an online platform for Professional Engineers, Registered Architects, and Licensed Master Plumbers to apply for water and sewer permits. This system will replace the Water & Sewer Permitting System (WSPS), in phases, over the next few years.

First Time Users:

To register, click "Login". After you are redirected to the login page, click "Sign up now". After registering, login to access Permit and Review Information System (PARIS).

Returning Users:

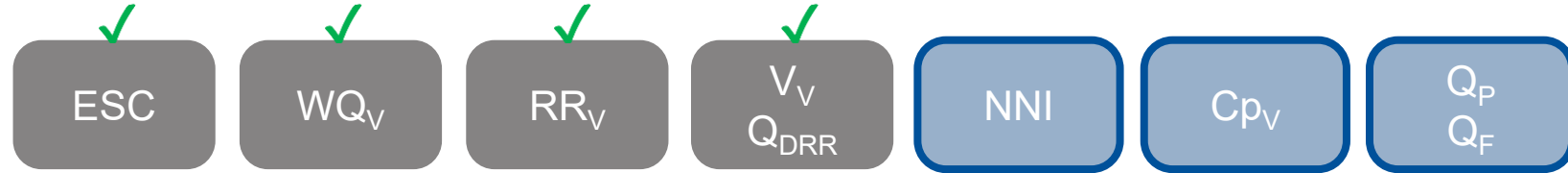
Click "Login". After you are redirected to the login page, enter your email and password to access Permit and Review Information System (PARIS).

Log in to DEP's Permit and Review Information System (PARIS) to:

- Submit and Pay for Hydrant Flow Tests and Access Hydrant Flow Test Results
- Submit for Sewer Repair, Sewer Relay, Water Repair, Water Relay, New Sewer Connection, Sewer Plug, Tap Permit, Wet Connection Permit, Tap & Plug Permits and Wet Connection & Plug Permits
- Submit a Tap Card Form (Self-Certification) to close out online permits
- Submit a Standalone Tap Card Form to close out paper permits

Note:

Detailed PARIS steps are not shown on this slide, but verification was completed for the case study.



Criteria Requirements

Do any MS4-Only criteria apply?

3. Resolve any inconsistencies by requesting a Pre-Application Meeting with DEP via the [Stormwater Permit Inquiry Form](#) (as needed)



Stormwater Permits Inquiry

You can reach out to the Stormwater Permits Team by submitting your contact information and inquiry below. Be sure to have look at the [Stormwater Permit FAQs](#) before submitting your inquiry.

Name *

First Last

Email *

Phone Number

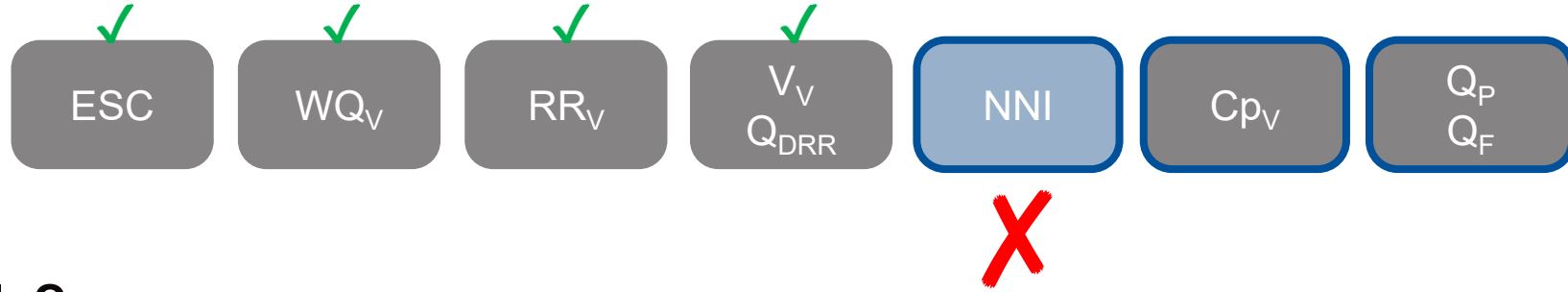
- -

####

Subject *

If you have questions related to multiple subjects, please submit a separate form for each subject.

This site is protected by reCAPTCHA Enterprise and the Google [Privacy Policy](#) and [Terms of Service](#) apply.

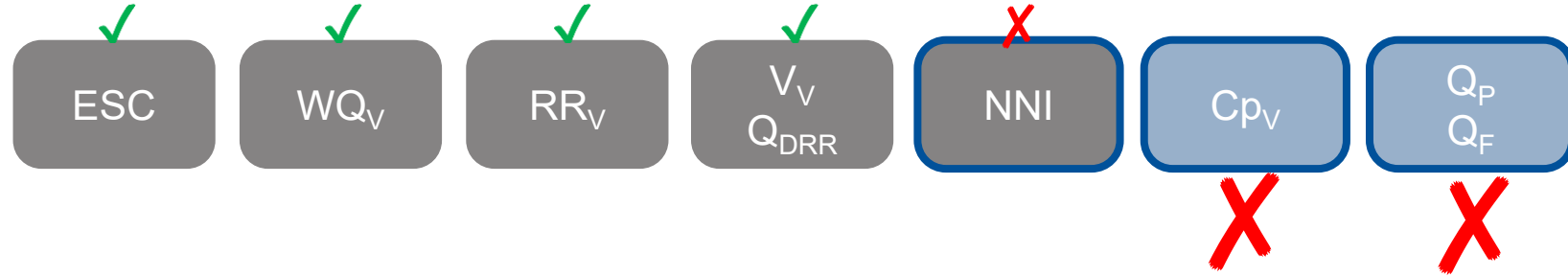


Criteria Requirements

Do any MS4-Only criteria apply?

No-Net-Increase criteria apply when a project meets **all** of the following conditions:

1. Project disturbs 20,000 SF or more of soil, or creates 5,000 sf or more of new impervious area ✓
2. Project increases site imperviousness ✓
3. Project discharges to MS4 system ✗
4. Project discharges to an impaired waterbody ✗



Criteria Requirements

Do any MS4-Only criteria apply?

Channel Protection, Overbank Flood Control, and Extreme Flood Control criteria apply when a project meets **all** of the following conditions:

1. Project disturbs 20,000 sf or more of soil, or creates 5,000 sf or more of new impervious area ✓
2. Project discharges to MS4 system ✗
3. Site discharges to non-tidal waters. ✗

Notes:

Channel protection, overbank flood control, and extreme flood control requirements are not common in NYC projects. However, Designers must review the applicability criteria in the New York State Construction General Permit (2025 CGP Part II.C.2.a.iii) to confirm applicability.

Criteria Applicability

Goal: Establish which stormwater management criteria apply to my project

Key Questions

- Are Erosion & Sediment Controls required?
- Are long-term SMPs required?
- Do any MS4-Only criteria apply?

The following criteria apply:

- ✓ Erosion and Sediment Control (ESC)
- ✓ Water Quality Volume (WQ_V)
- ✓ Runoff Reduction Volume (RR_V)
- ✓ Sewer Operations Volume (V_V) & Maximum Release Rate (Q_{DRR})

Geotechnical Planning

Geotechnical Planning

Goal: Develop and Implement a Geotechnical Investigation Plan

Key Questions

- What site constraints limit the geotechnical testing area?
- Where should boring and permeability tests be conducted?
- What are the infiltration rates on site?
- Was groundwater or bedrock discovered?

Geotechnical Planning

Applicability

On-site geotechnical investigations are **required*** when stormwater management practices (SMPs) are proposed to comply with the NYC DEP Stormwater Construction Permit.

Note:

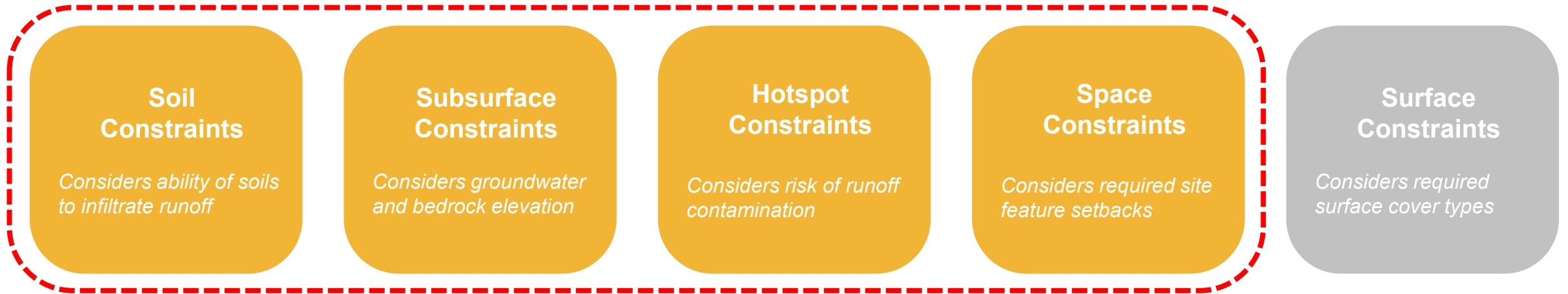
* Geotechnical investigations are not required when a lot line building is proposed that does not increase impervious surface.

Geotechnical Planning

Purpose

The type of proposed SMP should be determined based on a constraints analysis.

The SWPPP **must** document constraints analyzed that impact SMP selection.



A geotechnical investigation will inform on these constraints, which must be reported in the SWPPP.

Geotechnical Planning

What site constraints limit the geotechnical testing area?

Space Constraints:

- ✓ 10 ft Setback from Building Foundations
- ✓ 5 ft Setback from Property Line

Subsurface Constraints:

- ✓ Areas of historical bedrock
- ✓ Areas of historical high groundwater

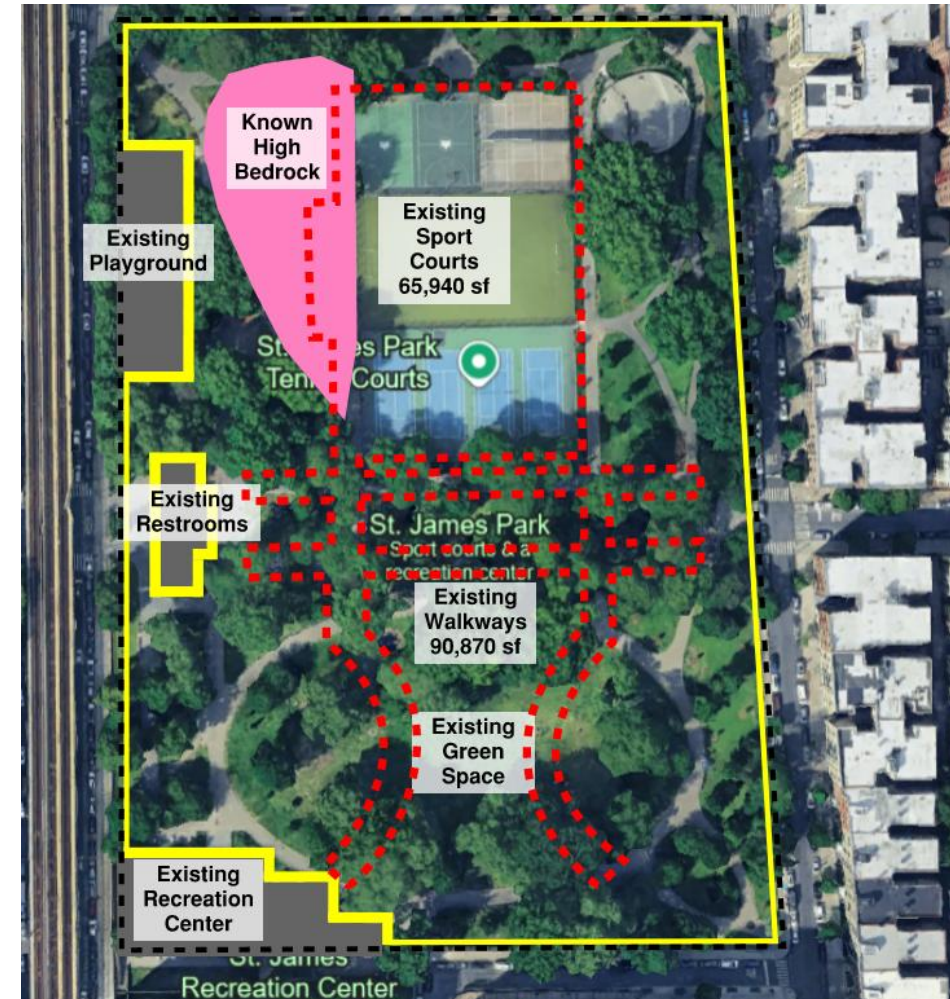
Other Potential Constraints:

- ✓ Areas of contamination
- ✓ Essential paved building access pathways

References:

1. [NYC Stormwater Manual Appendix C](#)

Concept Map: Geotechnical Testing Constraints



LEGEND

- Property Limit
- Limit of Disturbance
- Space Constraints
- Subsurface Constraints

Geotechnical Planning

Where should boring and permeability tests be conducted?

Select testing locations based on:

- ✓ **Desktop analysis**
of existing site conditions
- ✓ **Review regulatory guidance**
that may impact SMP location & design
- ✓ **Create a preliminary constraints map**
to determine where SMPs cannot be located
- ✓ **Create a preliminary boring plan**
to ensure the minimum number of tests will be performed at all feasible SMP locations
- ✓ **Review results as they are performed**
to confirm current investigation is consistent with historic borings

References:

1. [NYS DEC Stormwater Management Design Manual – Appendix D](#)
2. [BEPA PERM Geotech Investigation Workshop](#)

Concept Map: Boring Plan



LEGEND

- | | | | |
|--|------------------------|--|-----------------------|
| | Property Limit | | B-# Boring Log |
| | Limit of Disturbance | | P-# Permeability Test |
| | Space Constraints | | |
| | Subsurface Constraints | | |

Geotechnical Planning

How many boring and permeability tests should be conducted?



Geotechnical Investigation Planning

Considerations:

- Project may choose to conduct geotechnical testing in two rounds—first to confirm hydrologic soil groups and constraints across the site, then to confirm suitable soil conditions for each proposed infiltration practice.
- Alternatively, projects could choose to conduct one round of more comprehensive testing to avoid a second geotechnical mobilization. This more comprehensive testing may also help eliminate additional geotechnical work if practices are found to be infeasible during construction.
- In all cases, DEP recommends having the geotechnical professional communicate closely with the design professional during geotechnical investigation testing in order to effectively alter the testing plan based on site conditions and design requirements.

Geotechnical Planning

Results Analysis

Refer to the [Geotechnical Investigation Workshop](#) for additional guidance on reviewing and interpreting results from a geotechnical investigation.

Workshop Highlights:

- Refer to NYS SWMDM Appendix D for the geotechnical testing procedures
- Permeability tests must be conducted at a depth 2-ft below the proposed bottom of SMP
- Permeability tests can be conducted at multiple depths if the proposed bottom of SMP is not known
- Testing shall be repeated, with a minimum of 4 runs, until a stabilized rate is achieved (when 2 successive tests are approximately equal)
- The lowest stabilized rate of the permeability tests shall be used for practice feasibility
- Refer to NYC SWM Section 2.4 for minimum number of soil boring and permeability tests

Geotechnical Planning

What are the infiltration rates on site?

All permeability tests found infiltration rates below 0.5 in/hr.

References:

1. [NYS DEC Stormwater Management Design Manual – Appendix D](#)
2. [BEPA PERM Geotech Investigation Workshop](#)

Concept Map: Boring Plan



LEGEND

	Property Limit		B-# Boring Log
	Limit of Disturbance		P-# Permeability Test
	Space Constraints		
	Subsurface Constraints		

Geotechnical Planning

Was groundwater or bedrock discovered?

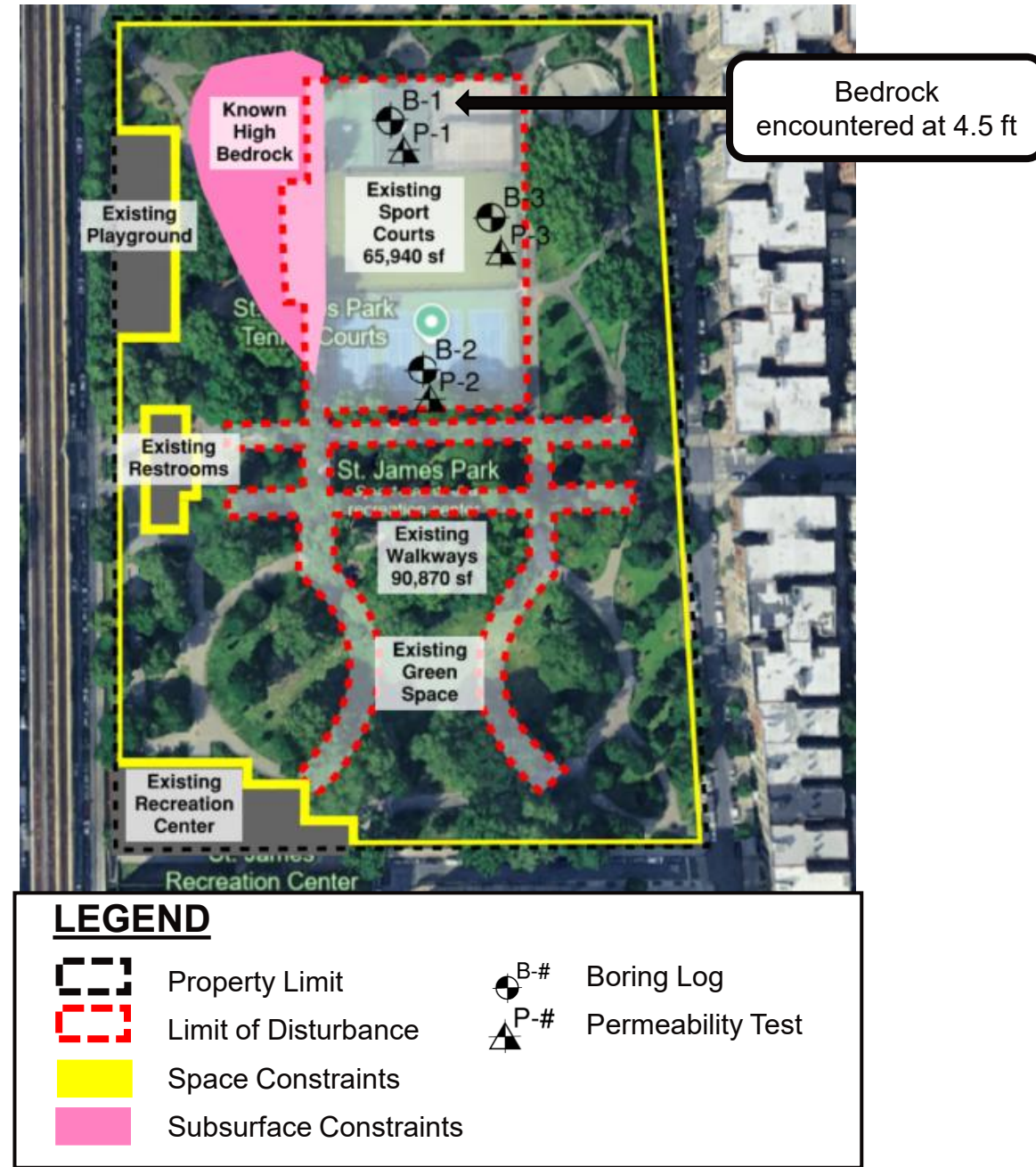
Boring test B-1 encountered bedrock at 4.5 ft but did not encounter groundwater.

Boring tests B-2 and B-3 did not discover groundwater or bedrock.

References:

1. [NYS DEC Stormwater Management Design Manual – Appendix D](#)
2. [BEPA PERM Geotech Investigation Workshop](#)

Concept Map: Boring Plan



Geotechnical Planning

Goal: Develop and Implement a Geotechnical Investigation Plan

Key Questions

- What site constraints limit the geotechnical testing area?
- Where should boring and permeability tests be conducted?
- What are the infiltration rates on site?
- Was groundwater or bedrock discovered?

Geotechnical Investigation results:

- ✓ Infiltration rate < 0.5 in/hr across site (soil constraint)
- ✓ No shallow groundwater
- ✓ Shallow bedrock in northern part of sport courts (subsurface constraint)

SMP Siting

SMP Siting

Goal: Establish Potential SMP Types & Locations

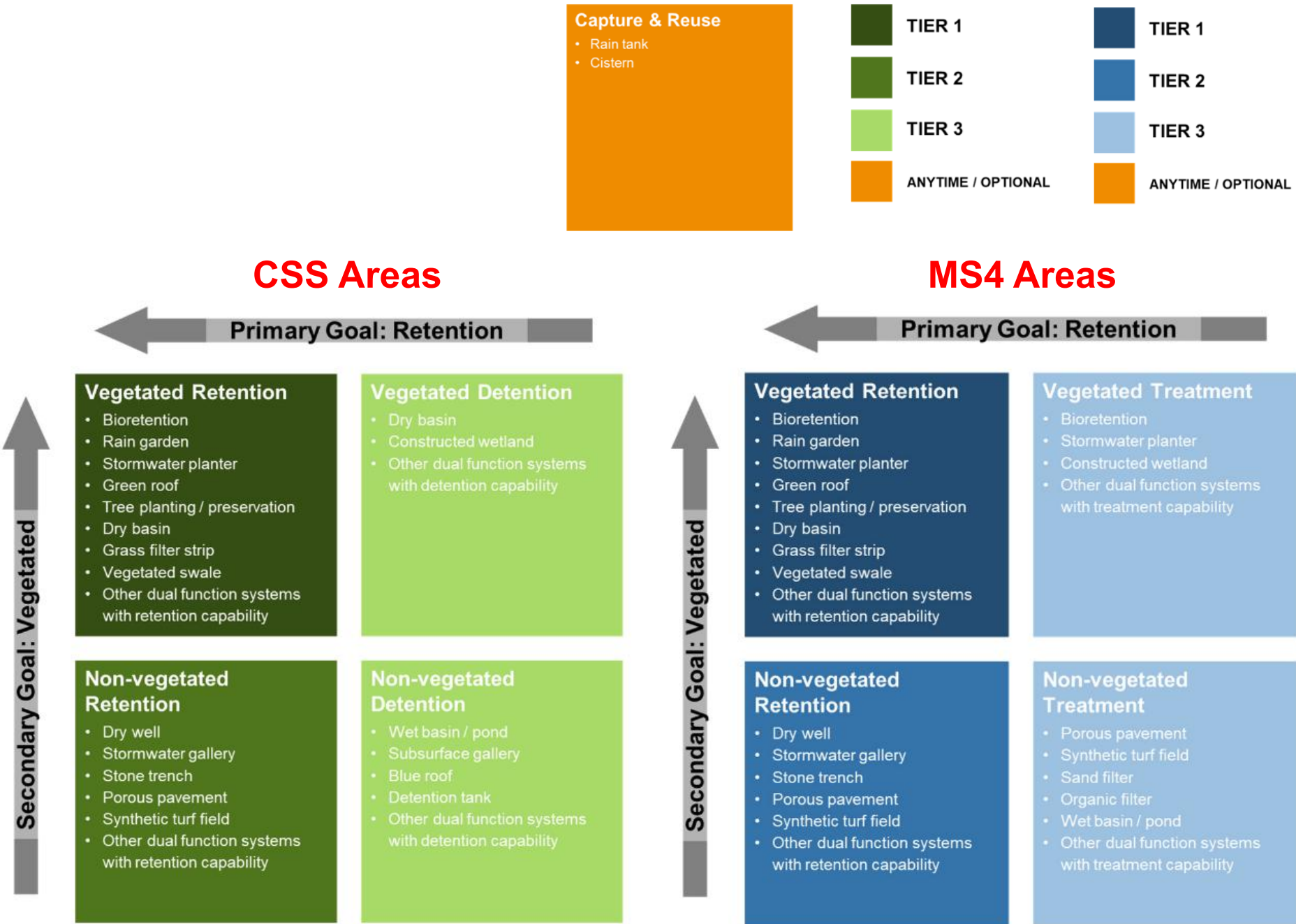
Key Questions

- What soil, subsurface, and hotspot constraints are present?
- What space and subsurface constraints are present?
- Which Tier 1 SMPs are feasible?
- Where can I site Tier 1 SMPs?
- Which Tier 2 SMPs are feasible?
- Where can I site Tier 2 SMPs?
- Which Tier 3 SMPs are feasible?
- Where can I site Tier 3 SMPs?

SMP Siting

SMP Hierarchy

- The SMP hierarchy creates clear and consistent approach for the selection of SMPs.
- Designers must assess and implement SMPs in higher tiers to the maximum extent practicable before moving to lower tier systems.
- Tiers for SMPs are intended to guide designs towards SMPs most effective at meeting NYC goals.



SMP Siting Constraints

Projects **must** document constraints that limit the use of Tier 1 or Tier 2 practices when lower tier practices are used:

Soil Constraints

*Considers ability of soils
to infiltrate runoff*

Subsurface Constraints

*Considers groundwater
and bedrock elevation*

Hotspot Constraints

*Considers risk of runoff
contamination*

Surface Constraints

*Considers required
surface cover types*

Space Constraints

*Considers required site
feature setbacks*

Soil

Subsurface

Hotspot

Surface

Space

Legend: ✓ Constraint evaluated does not limit use of SMP function
✗ Constraint evaluated limits use of SMP function

SMP Siting

What soil, subsurface, and hotspot constraints are present?

- **Soil:** Areas where permeability tests indicate soil infiltration rates <0.5 in/hr
- **Subsurface:** Areas where boring tests indicate that the bottom of the SMP would be <3 ft from groundwater or bedrock, or <4 ft for sole source aquifers.
- **Hotspot:** Areas where land use, soil conditions, or other factors pose risk of contaminating infiltration

Constraint Impact on
SMP Siting*

Tier 1:

- ✓ Vegetated Evapotranspiration SMPs
- ✗ Vegetated Infiltration SMPs

Tier 2:

- ✗ Non-Vegetated Infiltration SMPs

*Guidance is generalized; designer must comply with NYC SWM Section 4.2 when siting practices.

SMP Siting

What soil, subsurface, and hotspot constraints are present?

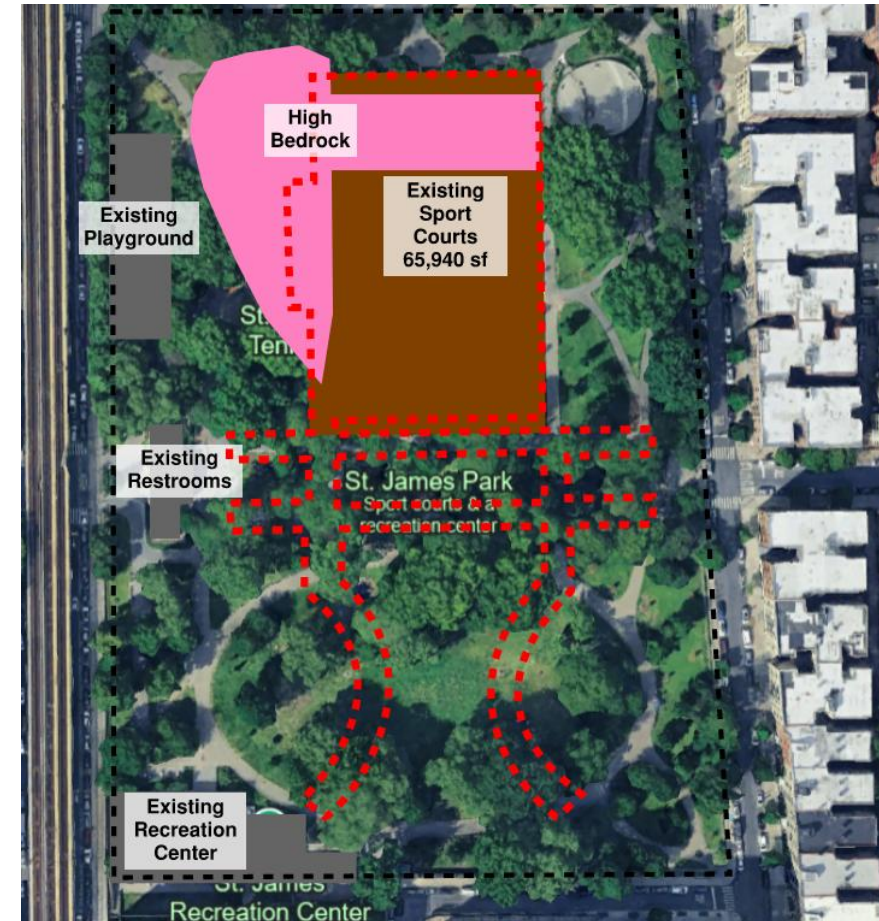
Soil, Subsurface, and Hotspot Constraint Plan

must be included in the SWPPP submission when these constraints impact the use of SMPs.

Notes:

- The constraints plan shown was simplified for clarity.
- SWPPP submissions should include notes with justification of each constraint and references to supporting documentation

Concept Map: Soil, Subsurface and Hotspot Constraints



LEGEND

	Property Line		Soil Constraints
	Limit of Disturbance		Subsurface Constraints
			Hotspot Constraints (N/A)

Soil

Subsurface

Hotspot

Surface

Space

Legend: ✓ Constraint evaluated does not limit use of SMP function
✗ Constraint evaluated limits use of SMP function

SMP Siting

What surface and space constraints are present?

- **Surface:** Areas where regulations require the use of paved surfaces

Constraint Impact on
SMP Siting*

Tier 1:

- ✗ Vegetated Evapotranspiration SMPs
- ✗ Vegetated Infiltration SMPs

Tier 2:

- ✓ Non-Vegetated Infiltration SMPs

*Guidance is generalized; designer must comply with NYC SWM Section 4.2 when siting practices.

Soil

Subsurface

Hotspot

Surface

Space

Legend: ✓ Constraint evaluated does not limit use of SMP function
✗ Constraint evaluated limits use of SMP function

SMP Siting

What surface and space constraints are present?

- **Space:** Areas where regulations require setbacks from structures, utilities, property lines, existing trees, or other site features

Constraint Impact on
SMP Siting*

Tier 1:

- ✓ Vegetated Evapotranspiration SMPs
- ✗ Vegetated Infiltration SMPs

Tier 2:

- ✗ Non-Vegetated Infiltration SMPs

*Guidance is generalized; designer must comply with NYC SWM Section 4.2 when siting practices.

SMP Siting

What surface and space constraints are present?

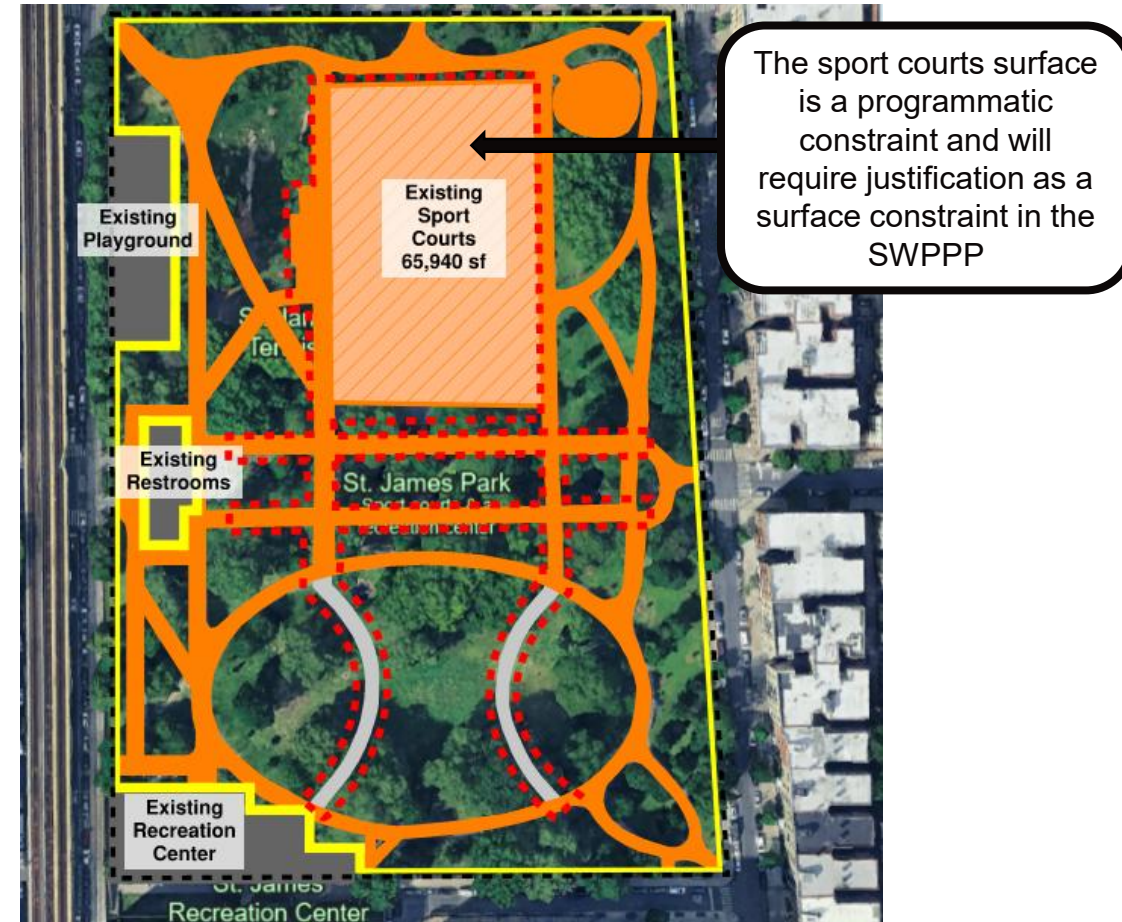
Surface Constraints:

- ✓ Existing sport courts to be reconstructed (programmatic constraint)
- ✓ Existing walkways

Space Constraints (At Grade):

- ✓ 10 ft Setback from Building Foundations
- ✓ 5 ft Setback from Property Line

Concept Map: Surface and Space Constraints Plan



LEGEND



Limit of Property

Limit of Disturbance

Existing Structures

Proposed Improvements



Surface Constraints

Space Constraints

SMP Siting

What surface and space constraints are present?

Surface and Space Constraint Plan must be included in the SWPPP submission when these constraints impact the use of SMPs.

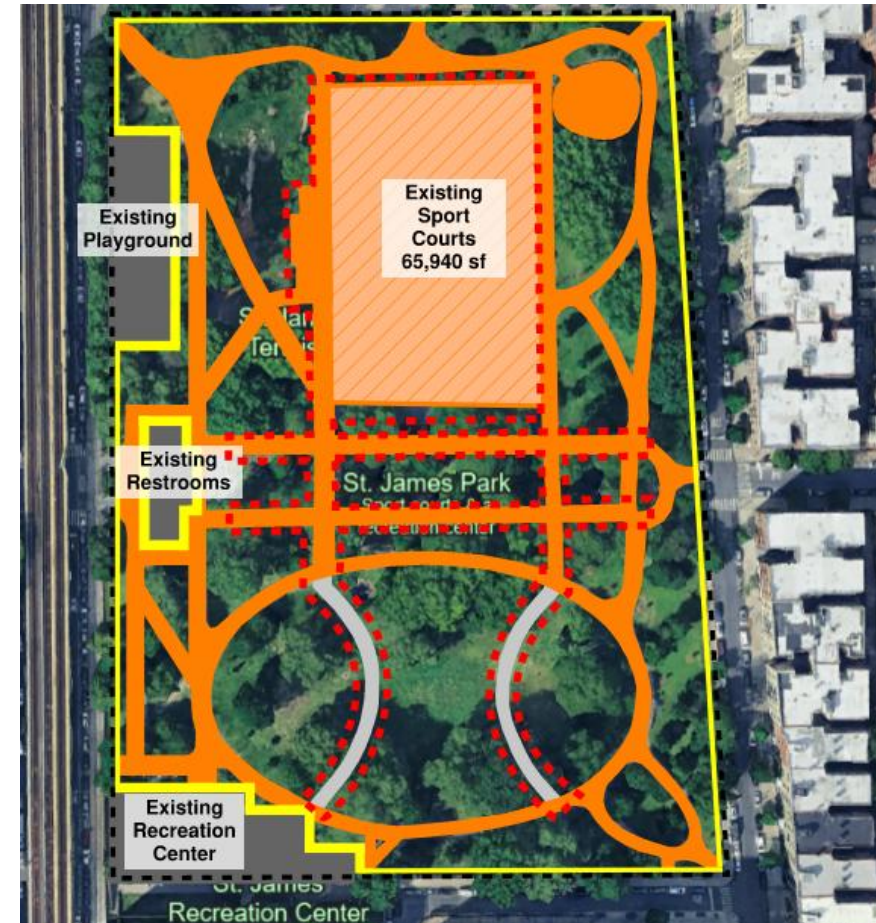
Notes:

- The constraints plan shown was simplified for clarity.
- Constraints plans submitted with the SWPPP may be separated or combined as needed for clarity.
- SWPPP submissions should include notes with justification of each constraint and references to supporting documentation

References:

1. [NYC DEP SWPPP Template – Appendix A](#)

Concept Map: Surface and Space Constraints Plan



LEGEND



Limit of Property

Limit of Disturbance



Existing Structures

Proposed Improvements



Surface Constraints

Space Constraints

SMP Siting

What Tier 1 SMPs are feasible?

This project has surface and soil constraints.

No Tier 1 SMPs are feasible due to **surface** constraints:

- All surfaces will be actively used by the sport courts
- No roofs available in the project area

SMP HIERARCHY CHECKLIST - CSS AREAS

Tier ^c	Function Type ^d	Practice Type ^e	Percent of SMP volume applied ^a			Site constraints that limit SMP feasibility ^b				
			WQv	RRv	Vv	Soil	Subsurface	Hotspot	Surfaces	Space
Tier 1	Infiltration (Vegetated)	Bioretention	100	100	50	×	×	×	×	×
		Rain garden	100	100	50	×	×	×	×	×
		Stormwater planter	100	100	50	×	×	×	×	×
		Tree planting / preservation	SC	SC	0					
		Dry basin	100	100	50	×	×	×	×	×
		Grass filter strip	SC	SC	0	×	×	×	×	×
		Vegetated swale	SC	SC	0	×	×	×	×	×
	Evapotranspiration ^f	Rain garden	100	100	0		×		×	×
		Stormwater planter	100	100	0				×	
		Tree planting / preservation	SC	SC	0					
		Green roof	100	100	0					
Tier 2	Infiltration (Non-vegetated)	Dry well	100	100	50	×	×	×		×
		Stormwater gallery	100	100	50	×	×	×		×
		Stone trench	100	100	50	×	×	×	×	×
		Porous pavement	100	100	50	×	×	×		×
		Synthetic turf field	100	100	50	×	×	×	×	×
Anytime / Optional	Reuse	Rain tank	100	100	SC					
		Cistern	100	100	SC					
Tier 3	Detention ^{g,h,i}	Dry basin	100	0	100		×		×	×
		Constructed wetland	100	0	100		×		×	×
		Wet basin / pond	100	0	100		×		×	×
		Stormwater gallery	100	0	100		×			×
		Blue roof	100	0	100					
		Detention tank	100	0	100					

References:

1. [NYS DEC Stormwater Management Design Manual – Appendix A](#)

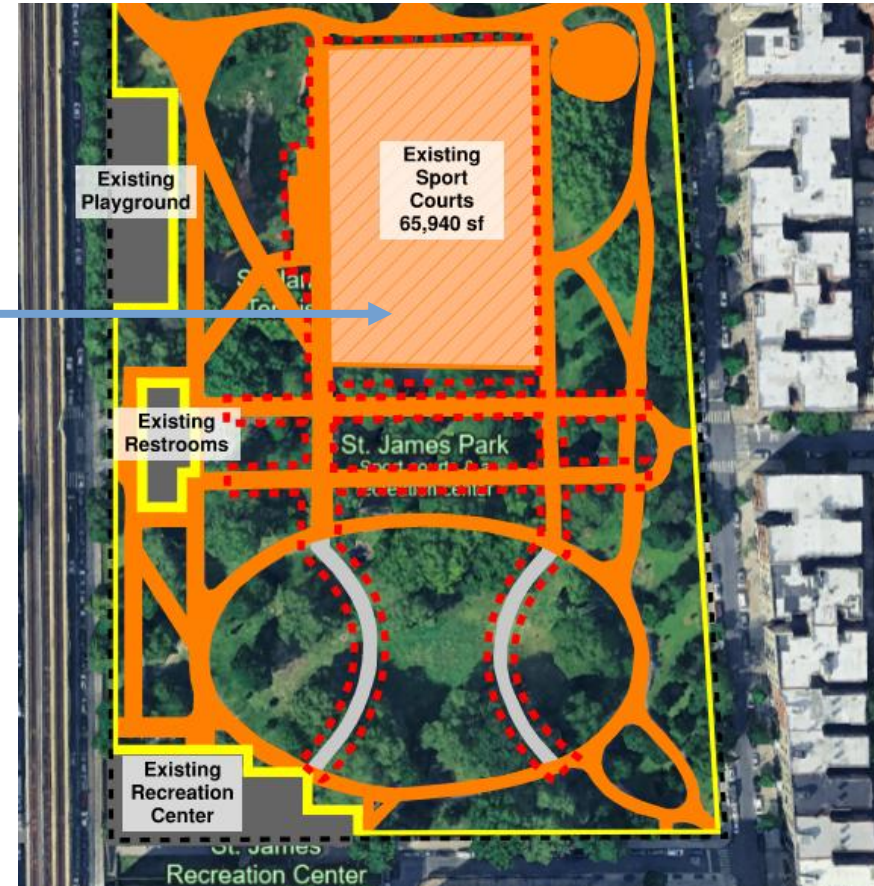
SMP Siting

Where Can I Site Tier 1 SMPs?

Evapotranspiration Practices cannot be sited because:

- ✓ All sport court surfaces will be actively used
- ✓ No roofs within the sport courts area

Concept Map: Tier 1 SMP Feasibility



LEGEND

	Existing Structures		Space Constraints
	Proposed Improvements		Feasible Tier 1 SMP Locations (ET Only)
	Surface Constraints		

SMP Siting

Where Can I Site Tier 1 SMPs?



Prioritizing Vegetated Retention Practices

Considerations:

- 15 RCNY Chapter 19.1 requires projects to maximize the use of vegetated retention practices, defined in NYC SWM as “Tier 1”.
- Projects are required to site Tier 1 practices to the maximum extent practicable first. Once Tier 1 SMPs have been sited, projects must then revisit their constraints plan to evaluate the feasibility of Tier 2 SMPs, then and Tier 3 SMPs, progressively.
- Recreational areas excluded in the Sustainable Roofing Zone may still be feasible for stormwater management requirements; they are not considered a valid constraint.

SMP Siting

What Tier 2 SMPs are feasible?

This project has surface and soil constraints.

No Tier 1 SMPs are feasible due to **surface** constraints.

No Tier 2 SMPs are feasible due to **soil** constraints:

- Infiltration rates <0.5 in/hr

References:

1. [NYS DEC Stormwater Management Design Manual – Appendix A](#)

SMP HIERARCHY CHECKLIST - CSS AREAS

Tier ^c	Function Type ^d	Practice Type ^e	Percent of SMP volume applied ^a			Site constraints that limit SMP feasibility ^b				
			WQv	RRv	Vv	Soil	Subsurface	Hotspot	Surfaces	Space
Tier 1	Infiltration (Vegetated)	Bioretention	100	100	50	×	×	×	×	×
		Rain garden	100	100	50	×	×	×	×	×
		Stormwater planter	100	100	50	×	×	×	×	×
		Tree planting / preservation	SC	SC	0					
		Dry basin	100	100	50	×	×	×	×	×
		Grass filter strip	SC	SC	0	×	×	×	×	×
		Vegetated swale	SC	SC	0	×	×	×	×	×
	Evapotranspiration ^f	Rain garden	100	100	0		×		×	×
		Stormwater planter	100	100	0				×	
		Tree planting / preservation	SC	SC	0					
		Green roof	100	100	0					
Tier 2	Infiltration (Non-vegetated)	Dry well	100	100	50	×	×	×		×
		Stormwater gallery	100	100	50	×	×	×		×
		Stone trench	100	100	50	×	×	×	×	×
		Porous pavement	100	100	50	×	×	×		×
		Synthetic turf field	100	100	50	×	×	×	×	×
Anytime / Optional	Reuse	Rain tank	100	100	SC					
		Cistern	100	100	SC					
Tier 3	Detention ^{g,h,i}	Dry basin	100	0	100		×		×	×
		Constructed wetland	100	0	100		×		×	×
		Wet basin / pond	100	0	100		×		×	×
		Stormwater gallery	100	0	100		×			×
		Blue roof	100	0	100					
		Detention tank	100	0	100					

SMP Siting

What Tier 3 SMPs are feasible?

This project has surface and soil constraints.

No Tier 1 SMPs are feasible due to **surface** constraints.

No Tier 2 SMPs are feasible due to **soil** constraints.

Tier 3 SMPs that can be considered include:

- Stormwater gallery
- Detention tank

References:

1. [NYS DEC Stormwater Management Design Manual – Appendix A](#)

SMP HIERARCHY CHECKLIST - CSS AREAS

Tier ^c	Function Type ^d	Practice Type ^e	Percent of SMP volume applied ^a			Site constraints that limit SMP feasibility ^b				
			WQv	RRv	Vv	Soil	Subsurface	Hotspot	Surfaces	Space
Tier 1	Infiltration (Vegetated)	Bioretention	100	100	50	×	×	×	×	×
		Rain garden	100	100	50	×	×	×	×	×
		Stormwater planter	100	100	50	×	×	×	×	×
		Tree planting / preservation	SC	SC	0					
		Dry basin	100	100	50	×	×	×	×	×
		Grass filter strip	SC	SC	0	×	×	×	×	×
		Vegetated swale	SC	SC	0	×	×	×	×	×
	Evapotranspiration ^f	Rain garden	100	100	0		×		×	×
		Stormwater planter	100	100	0				×	
		Tree planting / preservation	SC	SC	0					
		Green roof	100	100	0					
Tier 2	Infiltration (Non-vegetated)	Dry well	100	100	50	×	×	×		×
		Stormwater gallery	100	100	50	×	×	×		×
		Stone trench	100	100	50	×	×	×	×	×
		Porous pavement	100	100	50	×	×	×		×
		Synthetic turf field	100	100	50	×	×	×	×	×
Anytime / Optional	Reuse	Rain tank	100	100	SC					
		Cistern	100	100	SC					
Tier 3	Detention ^{g,h,i}	Dry basin	100	0	100		×		×	×
		Constructed wetland	100	0	100		×		×	×
		Wet basin / pond	100	0	100		×		×	×
		Stormwater gallery	100	0	100		×			×
		Blue roof	100	0	100					
		Detention tank	100	0	100					

SMP Siting

Goal: Establish Potential SMP Types & Locations

Key Questions

- What soil, subsurface, and hotspot constraints are present?
- What space and subsurface constraints are present?
- Which Tier 1, 2, and 3 SMPs are feasible?
- Where can I site SMPs?

This project has surface and soil constraints.

Only Tier 3 SMPs are feasible:

- ✓ Stormwater gallery
- ✓ Detention tank

Required Site-Wide Criteria

Required Site-Wide Criteria

Goal: Establish the Site-Wide Stormwater Management Requirements

Key Questions

- What is the required site-wide WQ_v ?
- What is the target and minimum required RR_v ?

Required Site-Wide Criteria

Numerical Criteria

Designers must use technical guidance in NYC SWM Chapter 2 to calculate numerical requirements for the applicable criteria:

- ✓ Water Quality Volume (WQ_V)
- ✓ Runoff Reduction Volume (RR_V)
- ✓ Sewer Operations Volume (V_V)
- ✓ Maximum Release Rate (Q_{DRR})

Note:

Calculations in this presentation are rounded for simplicity, with some decimal places omitted. Significant figures are used where appropriate, and final values are rounded to the nearest whole number.

Required Site-Wide Criteria

What are the required site-wide WQ_v and RR_v ?

Calculating Required Site WQ_v :

- **Step 1:** Identify Equation
- **Step 2:** Identify Site Contributing Area
- **Step 3:** Calculate Runoff Coefficient
- **Step 4:** Complete Site-Wide Calculation

Required Site-Wide Criteria

What are the required site-wide WQ_v and RR_v ?

WQ_v Step 1: Identify Equation

Use NYC SWM Eq. 2.1 to calculate WQ_v

EQ 2.1

$$WQ_v = \frac{1.5''}{12} * A * R_v$$

where:

WQ_v : water quality volume (cf)

A: contributing area (sf)

R_v : runoff coefficient relating total rainfall and runoff

R_v : $0.05 + 0.009(I)$,

I: percent impervious cover

Required Site-Wide Criteria

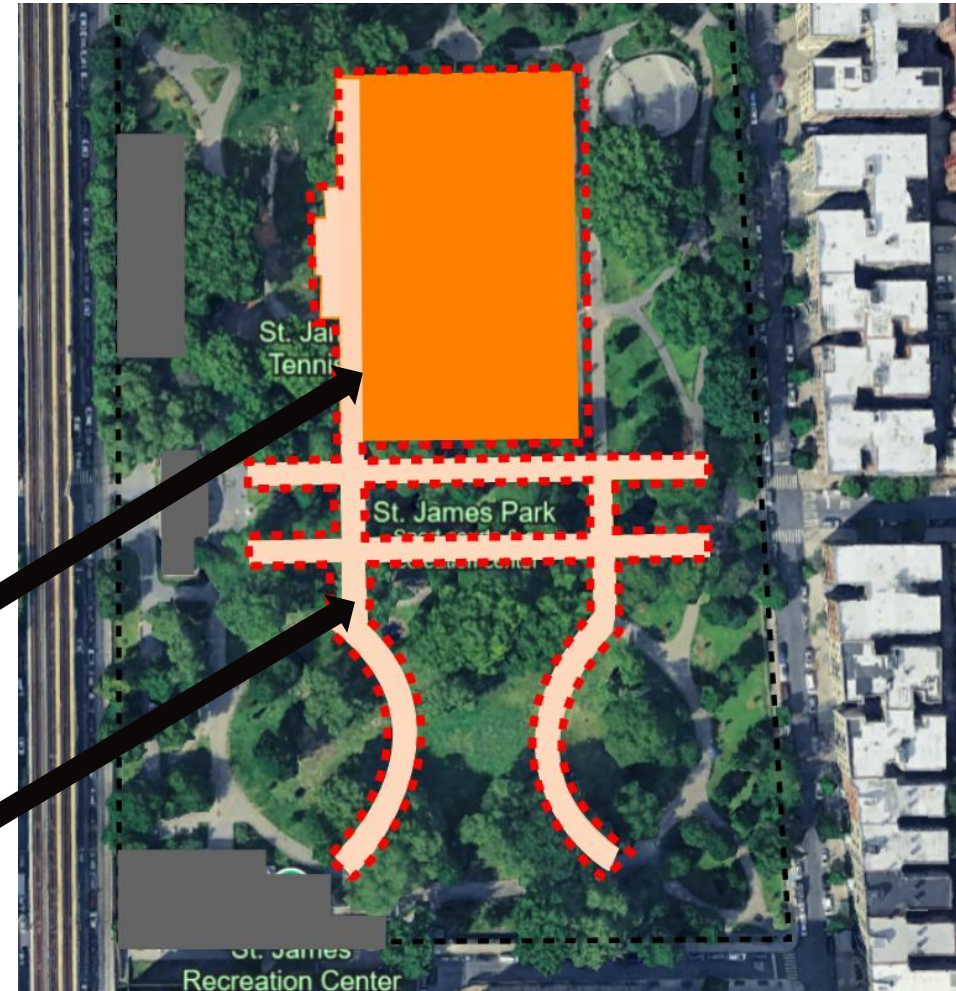
What are the required site-wide WQ_v and RR_v ?

WQ_v Step 2: Identify Site Contributing Area

The Contributing Area (A) includes all areas within the Limit of Disturbance that are listed in NYC SWM Table 2.3, as well as areas outside the Limit of Disturbance that drain to those areas.

The sport courts are listed in NYC SWM Table 2.3, so all areas that drain to the sport courts are included in the total contributing area and will require long-term SMP management.

The walkways are listed in NYC SWM Table 2.2, so these areas will require ESC only.



LEGEND

-  Limit of Property: 496,270 sf
-  Limit of Disturbance (LOD): 137,170 sf
-  ESC&SMP Criteria
-  ESC Only Criteria

Required Site-Wide Criteria

What are the required site-wide WQ_v and RR_v ?

WQ_v Step 2: Identify Site Contributing Area

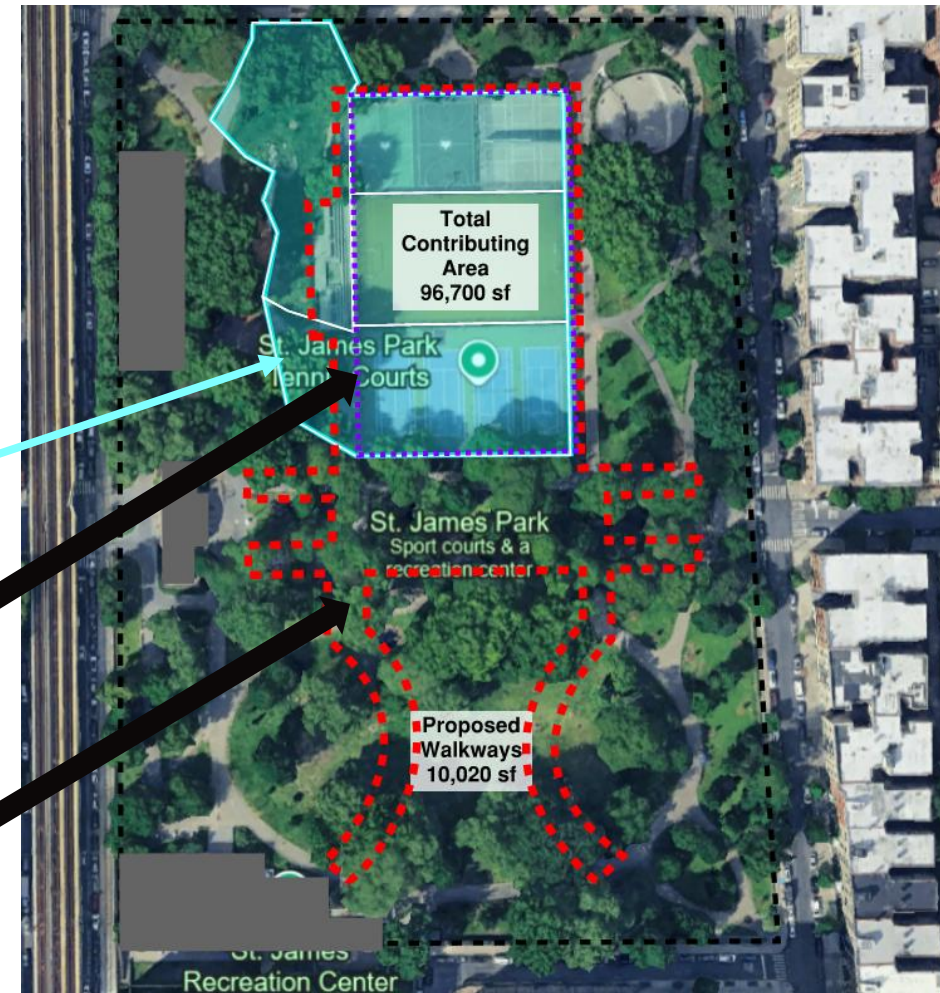
The Contributing Area (A) includes all areas within the Limit of Disturbance that are listed in NYC SWM Table 2.3, as well as areas outside the Limit of Disturbance that drain to those areas.

The sport courts are listed in NYC SWM Table 2.3, so all areas that drain to the sport courts are included in the total contributing area and will require long-term SMP management.

The walkways are listed in NYC SWM Table 2.2, so these areas will require ESC only.

$$A_{Site} = 96,700 \text{ sf}$$

Concept Map: Site Contributing Area (Preliminary)



LEGEND



Limit of Property: 496,270 sf

Limit of Disturbance (LOD): 137,170 sf

Developed Area with ESC&SMP Requirements



Total Contributing Area: 96,700 sf

Required Site-Wide Criteria

What are the required site-wide WQ_v and RR_v ?



Establishing the Contributing Area

Considerations:

- Areas disturbed for construction support that are restored to stabilized, pervious conditions and do not drain to developed areas are typically not included in the site Contributing Area (A), except in cases where DEP determines that these areas pose significant pollution risks
- Areas disturbed by activities listed in NYC SWM Table 2.2 must be included in the site Contributing Area (A) if they drain to portions of the site that have development activities listed in NYC SWM Table 2.3.
- The site Contributing Area (A) includes all tributary areas that drain to portions of the site that have development activities listed in NYC SWM Table 2.3, even those which may be outside the covered development project area.

Required Site-Wide Criteria

What are the required site-wide WQ_v and RR_v ?

WQ_v Step 3: Calculate Runoff Coefficient

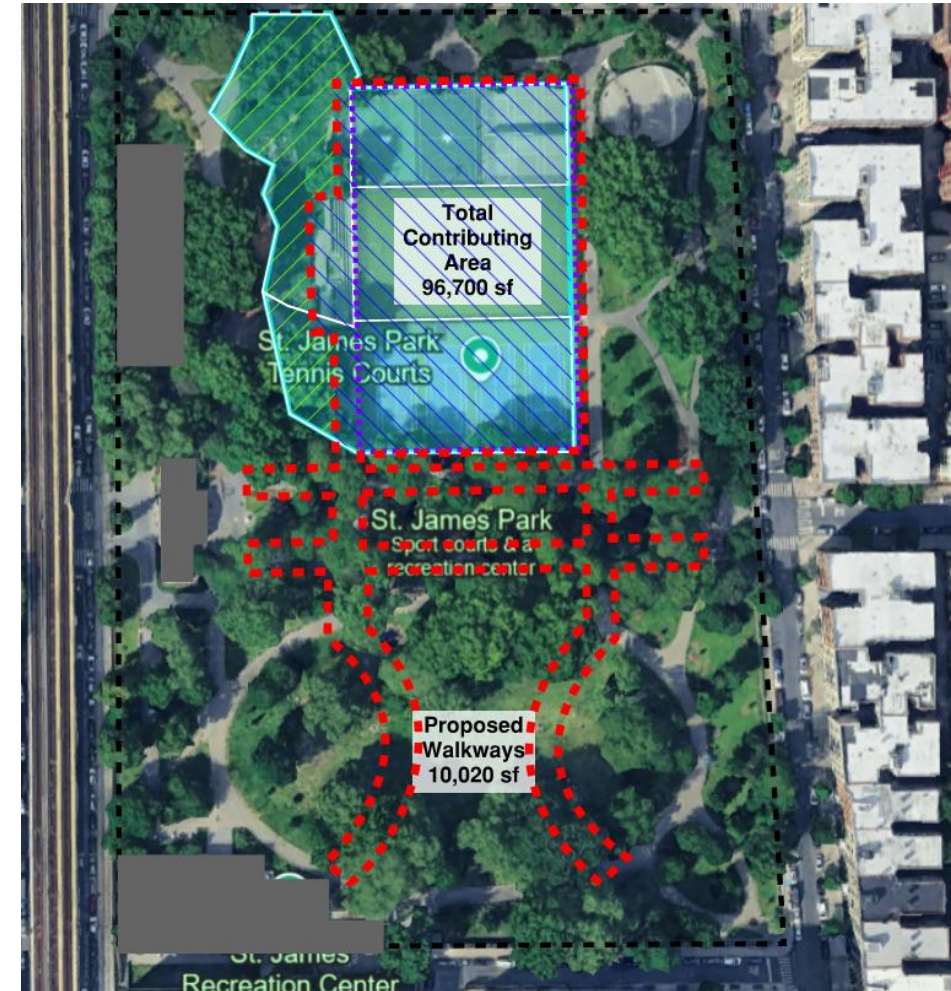
This coefficient relates the total rainfall to runoff on the project site and is based on the percent impervious cover (I) in the proposed condition.

$$R_v = 0.05 + 0.009(I)$$

$$I = \frac{\text{Impervious contributing area}}{\text{Total contributing area}} = \frac{76,040 \text{ sf}}{96,700 \text{ sf}} = 78.6\%$$

$$R_v = 0.05 + 0.009(78.6) = 0.758$$

Concept Map: Site Contributing Area Cover (Preliminary)



LEGEND



Limit of Property: 496,270 sf



Limit of Disturbance (LOD): 137,170 sf



Developed Area with ESC&SMP Requirements



Total Contributing Area: 96,700 sf



Impervious Contributing Area: 76,040 sf



Pervious Contributing Area: 20,660

Required Site-Wide Criteria

What are the required site-wide WQ_v and RR_v ?

WQ_v Step 4: Complete Site-Wide Calculation

Use NYC SWM Eq. 2.1 to calculate WQ_v

$$WQ_v = \frac{1.5''}{12} * A * R_v$$

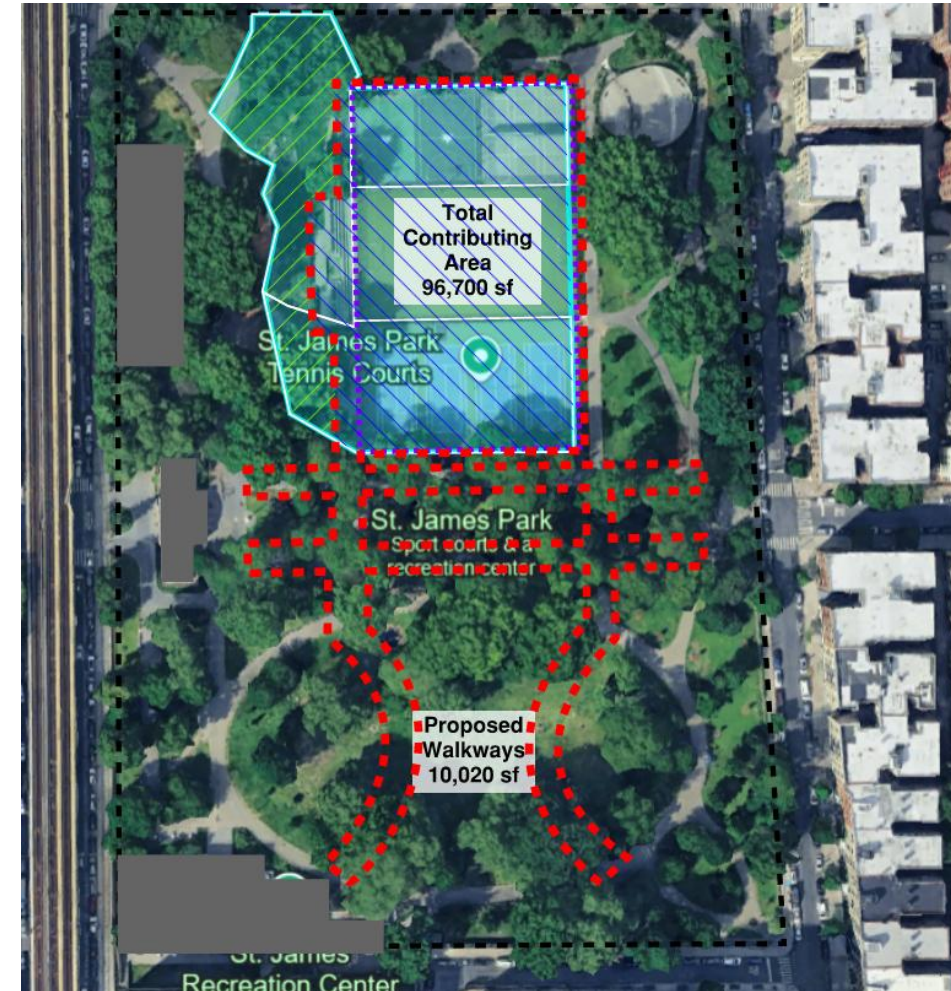
$$A_{Site} = 96,700 \text{ sf}$$

$$R_{v,Site} = 0.05 + 0.009(78.6) = 0.758$$

$$WQ_{v,Site} = \frac{1.5''}{12} * 96,700 * 0.758$$

$$WQ_{v,Site} = 9,159 \text{ cf}$$

Concept Map: Site Contributing Area Cover (Preliminary)



LEGEND



Limit of Property: 496,270 sf



Limit of Disturbance (LOD): 137,170 sf



Developed Area with ESC&SMP Requirements



Total Contributing Area: 96,700 sf



Impervious Contributing Area: 76,040 sf



Pervious Contributing Area: 20,660

Required Site-Wide Criteria

What are the required site-wide WQ_v and RR_v ?

Calculating Required Site WQ_v :

- **Step 1:** Identify Equation
- **Step 2:** Identify Site Contributing Area
- **Step 3:** Calculate Runoff Coefficient
- **Step 4:** Complete Site-Wide Calculation

$$WQ_{v,Site} = 9,159 \text{ cf}$$

Required Site-Wide Criteria

What are the required site-wide WQ_v and RR_v ?

Calculating Target RR_v and Minimum RR_v :

- **Step 1:** Establish Target RR_v
- **Step 2:** Identify Minimum RR_v Equation
- **Step 3:** Establish New Impervious Area Proposed
- **Step 4:** Calculate the Specific Reduction Factor
- **Step 5:** Complete Site-Wide Minimum RR_v Calculation

Required Site-Wide Criteria

What are the required site-wide WQ_v and RR_v ?

RR_v Step 1: Establish Target RR_v

15 RCNY Chapter 19.1 requires the use of vegetated retention practices to the maximum extent practicable. Therefore, projects should always aim to reduce the entire WQ_v using Tier 1 practices.

Target RR_v is met when the site WQ_v is managed using Tier 1 and Tier 2 practices.

$$\text{Target } RR_v = WQ_{v,Site} = 9,159 \text{ cf}$$

Required Site-Wide Criteria

What are the required site-wide WQ_v and RR_v ?

RR_v Step 2: Identify Minimum RR_v Equation

Use NYC SWM Eq. 2.2 to calculate Minimum RR_v

Minimum RR_v must be met for all projects, without exception.

Meeting Minimum RR_v does not exempt projects from having to demonstrate that they have met Target RR_v to the maximum extent practicable.

EQ 2.2

$$*RR_v = \frac{1.5''}{12} * 0.95 * Aic * S$$

* *Min*

where:

Aic: total area of new impervious cover (sf)

S: specific reduction factor, see Table 2.5

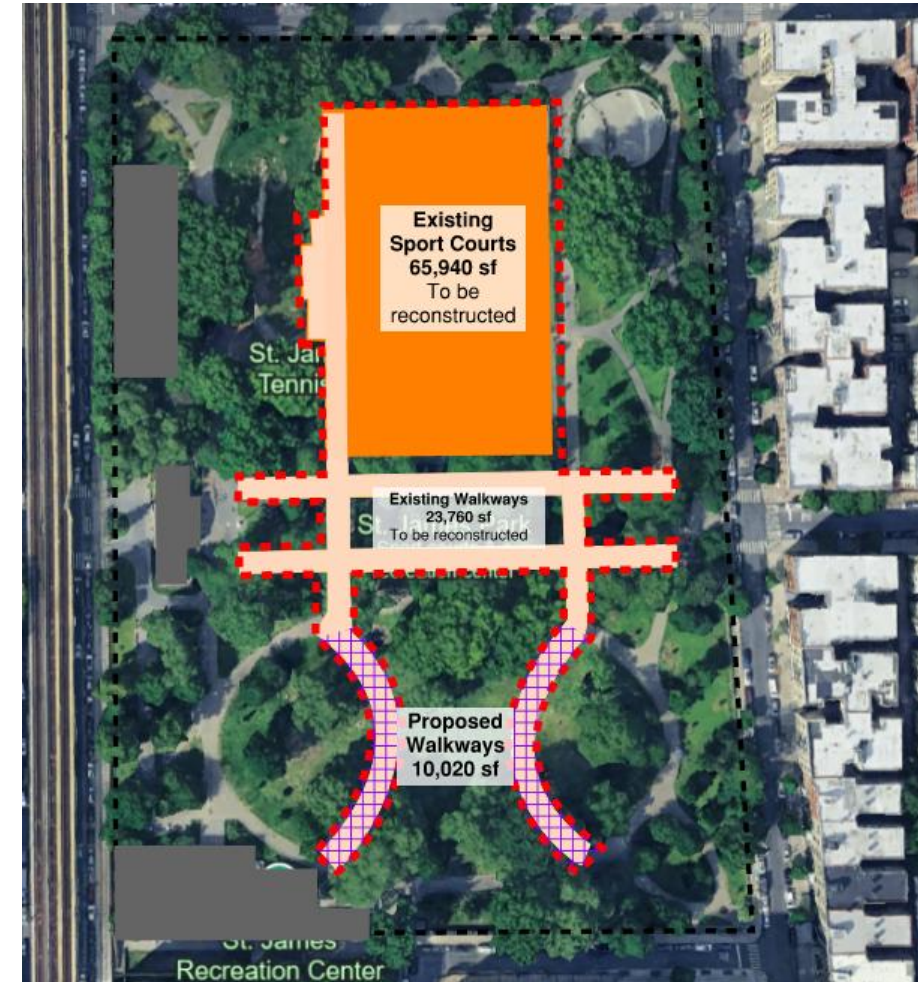
Required Site-Wide Criteria

What are the required site-wide WQ_v and RR_v ?

RR_v Step 3: Establish New Impervious Area Proposed

Compare pre- and post-development site plans to determine how much new impervious area is proposed in the developed area.

Project Area Stormwater Management Requirement	Impervious Area		
	Pre- development	Post- development	New
ESC&SMP (Table 2.3)	65,940 sf	65,940 sf	0 sf
ESC Only (Table 2.2)	13,740	23,760	10,020 sf



LEGEND



Limit of Property: 496,270 sf



Limit of Disturbance (LOD): 137,170 sf



ESC&SMP Criteria



ESC Only Criteria



New Impervious Area

Required Site-Wide Criteria

What are the required site-wide WQ_v and RR_v ?

RR_v Step 3: Establish New Impervious Area Proposed

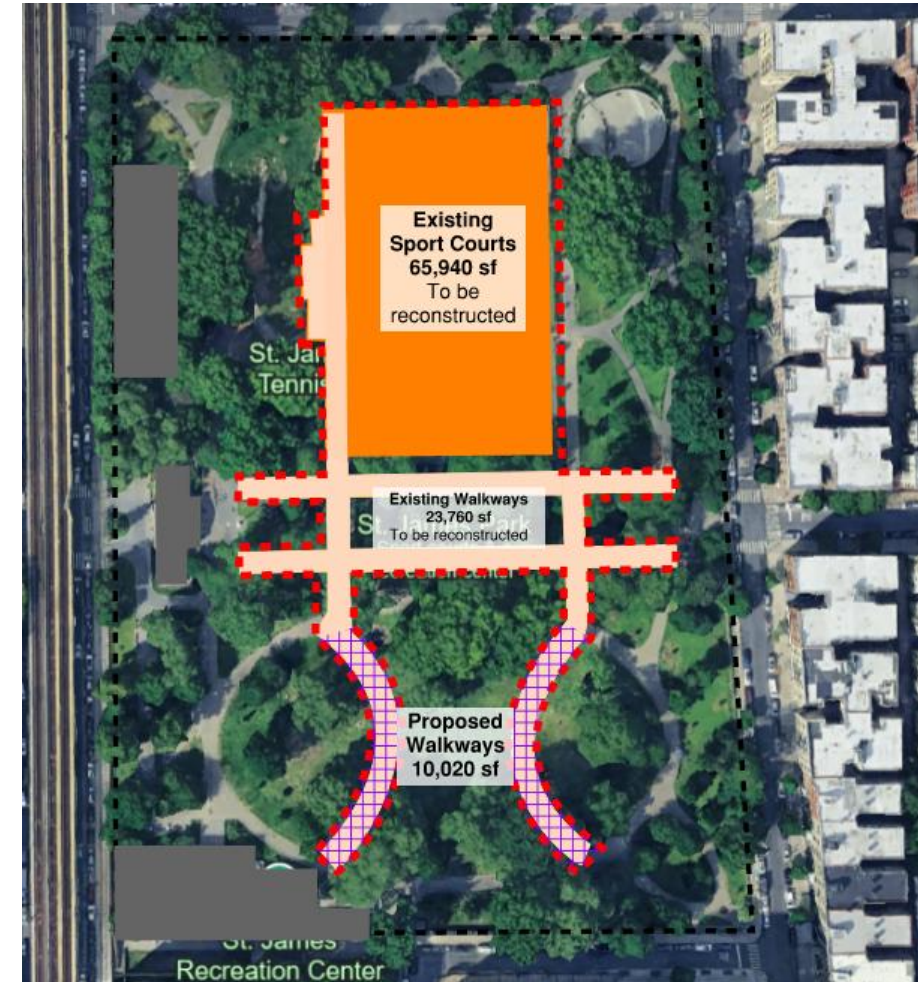
Compare pre- and post-development site plans to determine how much new impervious area is proposed in the developed area.

Project Area Stormwater Management Requirement	Impervious Area			RRv Calc	
	Pre-development	Post-development	New	Aic	Min RRv
ESC&SMP (Table 2.3)	65,940 sf	65,940 sf	0 sf	0 sf	0 cf
ESC Only (Table 2.2)	13,740	23,760	10,020 sf	N/A	N/A

The RRv calculation is not applicable to development areas included in Table 2.2 that have ESC only requirements

$$\text{Min } RR_v = \frac{1.5''}{12} * 0.95 * Aic * S$$

$$\text{Min } RR_v = 0 \text{ cf}$$



LEGEND



Limit of Property: 496,270 sf



Limit of Disturbance (LOD): 137,170 sf



ESC&SMP Criteria



ESC Only Criteria



New Impervious Area

FAQ

Does new sidewalk or pathway count as new impervious area for the Minimum RR_v calculation?

In most cases, yes, except for specific scenarios as listed in Table 2.2.

If the proposed sidewalks, bike paths or walking paths are listed in Table 2.2, then the path's disturbance area requires ESC only.

Note: If the proposed path's impervious area drains to a site area that includes ESC and SMP requirements (as listed in Table 2.3), then the proposed path's impervious area must be included as part of the total contributing drainage area for that development project.

Table 2.2. Covered development projects that require the preparation of a SWPPP that includes only erosion and sediment control (ESC) requirements.	
Covered Development Activity	
Installation of underground, linear utilities such as gas lines, fiber-optic cable, cable TV electric, telephone, sewer mains, and water mains	
Environmental enhancement projects, such as wetland mitigation projects, stormwater retrofits and stream restoration projects	
Pond construction	
Linear bike paths running through areas with vegetative cover, including bike paths surfaced with an impervious cover	
Cross-country ski trails and walking/hiking trails	
Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are not part of residential, commercial or institutional development	
Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that include incidental shoulder or curb work along an existing highway to support construction of the sidewalk, bike path or walking path	
Slope stabilization projects	
Slope flattening that changes the grade of the site, but does not significantly change the runoff characteristics	
Spoil areas that will be covered with vegetation	
Vegetated open space projects (i.e. recreational parks, lawns, meadows, fields, downhill ski trails) excluding projects that alter hydrology from pre- to post-development conditions	
Athletic fields (natural grass) that do not include the construction or reconstruction of impervious area and do not alter hydrology from pre to post development conditions	
Demolition project where vegetation will be established, and no redevelopment is planned	
Overhead electric transmission line project that does not include the construction of permanent access roads or parking areas surfaced with impervious cover	
Temporary access roads, median crossovers, detour roads, lanes, or other temporary impervious areas that will be restored to pre construction conditions once the construction activity is complete	
Road reconstruction projects where the total soil disturbance from all activities is less than 1-acre	

Required Site-Wide Criteria

What are the required site-wide WQ_v and RR_v ?

Calculating Required Site WQ_v :

- **Step 1:** Identify Equation
- **Step 2:** Identify Site Contributing Area
- **Step 3:** Calculate Runoff Coefficient
- **Step 4:** Complete Site-Wide Calculation

$$WQ_{v,Site} = 9,159 \text{ cf}$$

$$\textit{Target } RR_v = 9,159 \text{ cf}$$

Calculating Target RR_v and Minimum RR_v :

- **Step 1:** Establish Target RR_v
- **Step 2:** Identify Minimum RR_v Equation
- **Step 3:** Establish New Impervious Area Proposed
- **Step 4:** Calculate the Specific Reduction Factor
- **Step 5:** Complete Site-Wide Minimum RR_v Calculation

$$\textit{Min } RR_v = 0 \text{ cf}$$

SMP Design

SMP Design

Practice-Based Requirements

In addition to Site-Wide Requirements, Designers must calculate the practice-based WQ_v for each SMP using the *practice* contributing area.

SMP Design

Goal: Design SMPs to Meet the Applicable Stormwater Management Criteria

SMP design consists of establishing:

- ✓ **Required $WQ_{V,SMP}$**
This is the volumetric requirement that each SMP must meet, based on its contributing area.
- ✓ **V_{SMP}**
This is the storage volume that the SMP is designed to provide.
- ✓ **Provided WQ_v , RR_v , V_v**
These are the contributions that the SMP makes to each requirement, based on its V_{SMP} and function.

Tier 1 & 2 SMP Design

Goal: Design Tier 1 & 2 SMPs to Meet the Applicable Stormwater Management Criteria

Key Questions

- What are the Tier 1 SMP design requirements?
- What are the Tier 2 SMP design requirements?
- Are all requirements met?

Tier 1 & 2 SMP Design

What are the Tier 1 & 2 SMP requirements?

Tier 1 SMPs are not feasible because:

- Soil and surface constraints
- All surfaces will be actively used for sports

Tier 2 SMPs are not feasible because:

- Soil constraints do not allow sufficient infiltration

SMP HIERARCHY CHECKLIST - CSS AREAS

Percent of SMP volume applied^a

Site constraints that limit SMP feasibility^b

Tier ^c	Function Type ^d	Practice Type ^e	WQv	RRv	Vv	Soil	Subsurface	Hotspot	Surfaces	Space
Tier 1	Infiltration (Vegetated)	Bioretention	100	100	100	×	×	×	×	×
		Rain garden	100	100	100	×	×	×	×	×
		Stormwater planter	100	100	100	×	×	×	×	×
		Tree planting / preservation	SC	SC	0					
		Dry basin	100	100	100	×	×	×	×	×
		Grass filter strip	SC	SC	0	×	×	×	×	×
		Vegetated swale	SC	SC	0	×	×	×	×	×
	Evapotranspiration ^f	Rain garden	100	100	0		×		×	×
		Stormwater planter	100	100	0				×	
		Tree planting / preservation	SC	SC	0					
		Green roof	100	100	0					
Tier 2	Infiltration (Non-vegetated)	Dry well	100	100	100	×	×	×		×
		Stormwater gallery	100	100	100	×	×	×		×
		Stone trench	100	100	100	×	×	×	×	×
		Porous pavement	100	100	100	×	×	×		×
		Synthetic turf field	100	100	100	×	×	×	×	×
Anytime / Optional	Reuse	Rain tank	100	100	SC					
		Cistern	100	100	SC					
Tier 3	Detention ^{g,h,i}	Dry basin	100	0	100		×		×	×
		Constructed wetland	100	0	100		×		×	×
		Wet basin / pond	100	0	100		×		×	×
		Stormwater gallery	100	0	100		×			×
		Blue roof	100	0	100					
		Detention tank	100	0	100					

References:

1. [NYS DEC Stormwater Management Design Manual – Appendix A](#)

Tier 1 & 2 SMP Design

What are the Tier 1 & 2 SMP requirements?

Tier 1 & 2 SMPs are not feasible.

Establish detention requirements then move to Tier 3 SMP design

Tier 3 SMP Design *(css only)*

Tier 3 SMP Design *(CSS Only)*

Goal: Design Tier 3 SMPs to Meet the Applicable Stormwater Management Criteria

Key Questions

- Which criteria dictate Tier 3 Design Requirements?
- What are the Tier 3 Design Requirements?
- Are all requirements met?

Tier 3 SMP Design *(CSS Only)*

Which criteria dictate Tier 3 SMP requirements?

Tier 3 detention SMPs should consider the remaining Water Quality volume (WQ_v), Sewer Operations volume (V_v) and Maximum Release Rate (Q_{DRR}) requirements.

Remaining Site $WQ_v = 9,159\text{ cf}$

$V_v = ??$

$Q_{DRR} = ??$

Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP design requirements?

SMP Tier 3 Design Steps *[when driven by Sewer Operations Requirements]*:

- **Step 1:** Determine Contributing Areas
- **Step 2:** Calculate Weighted Runoff Coefficient C_W
- **Step 3:** Calculate Required Sewer Operations Volume V_V
- **Step 4:** Calculate Maximum Release Rate Q_{DRR}
- **Step 5:** Calculate Developed Flow Q_{DEV} to Confirm Q_{DRR} Applicability
- **Step 6:** Design Detention System to meet V_V & Q_{DRR}

Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP design requirements?

Step 1: Determine Contributing Areas

In this case, the contributing area includes area outside the developed area that drain to the stormwater gallery

$$A_{site} = 96,700 \text{ sf}$$



LEGEND

- | | | | |
|--|--|--|-------------------------------------|
| | Limit of Property: 496,270 sf | | Detention System Design Point |
| | Limit of Disturbance (LOD): 137,170 sf | | Drainage Point and ID |
| | Total Contributing Area: 96,700 sf | | Schematic Inlet & Internal Drainage |
| | Non-Contributing Areas in LOD: 63,960 sf | | Existing Internal Drainage System |
| | | | NYC Combined Sewer System |

Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP design requirements?

Step 2: Calculate Weighted Runoff Coefficient

- *Complete surface cover design*

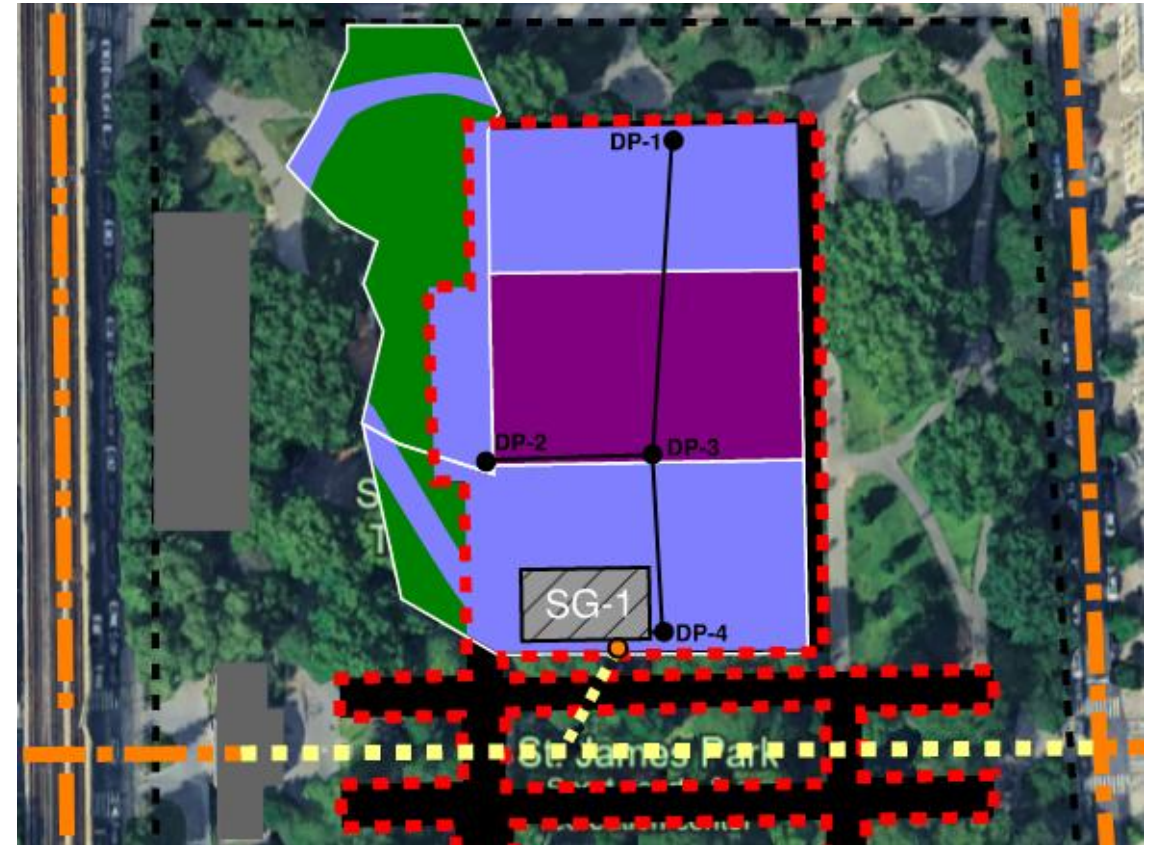
The sewer operations volume V_v requirements depends on the site cover types in the proposed condition. Therefore, it must be calculated **after** Tier 1 and Tier 2 surface SMPs have been sited.

Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP design requirements?

Step 2: Calculate Weighted Runoff Coefficient

- *Complete surface cover design*
- *Establish area of all cover types on the proposed site*



LEGEND

	Limit of Property: 496,270 sf		Detention System Design Point
	Limit of Disturbance (LOD): 137,170 sf		Drainage Point and ID
	Grass Area: 15,925 sf		Schematic Inlet & Internal Drainage
	Synthetic Turf Area: 25,050 sf		Existing Internal Drainage System
	Paved Area: 55,725 sf		NYC Combined Sewer System
	Non-Contributing Areas in LOD: 63,960 sf		

Note:

C values vary by **surface** type, not by pervious or impervious cover which is used for WQv calculations.

Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP design requirements?

Step 2: Calculate Weighted Runoff Coefficient

- Complete surface cover design
- Establish area of all cover types on the proposed site
- Refer to NYC SWM Table 2.8 to find C values for each surface type.

Table 2.8. C values for various surface types.

C	Surface Description	$A_{site} = 96,700 \text{ sf}$
0.95	Roof areas	
0.85	Paved areas	$A_{Paved} = 55,725 \text{ sf}$
0.70	Green roof with min. 4 in. growing media	
0.70	Porous asphalt/Porous Concrete ^a	
0.70	Synthetic turf fields ^a	$A_{Turf} = 25,050 \text{ sf}$
0.65	Gravel parking lot	
0.30	Undeveloped areas	
0.20	Grass, bio-swales, or landscaped areas	$A_{Grass} = 15,925 \text{ sf}$

^aUsing a C value of 0.7 for the indicated surface types typically requires the use of an outlet pipe, with approval at the discretion of DEP.

$$C_w = \frac{55,725 * 0.85 + 25,050 * 0.70 + 15,925 * 0.20}{96,700}$$

$$C_w = 0.70$$

Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP design requirements?

Step 3: Calculate Required Sewer Operations Volume V_V

- Use NYC SWM Eq. 2.3 to calculate required V_V

EQ 2.3

$$V_V = \frac{R_D}{12} * A * C_W$$

where:

V_V : sewer operations volume (cf)

R_D : rainfall depth (in)

A : contributing area (sf)

C_W : weighted runoff coefficient relating peak rate of rainfall and runoff

Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP design requirements?

Step 3: Calculate Required Sewer Operations

Volume V_v

- Use NYC SWM Eq. 2.3 to calculate required V_v
- Refer to NYC SWM Table 2.7 to establish rainfall depth based on the sewershed type (CSS/MS4) and proposal type for the project (HCP/SCP).

Table 2.7. Applied rainfall depth by sewershed type and connection proposal type.

R_D	Description
1.85	CSS areas with SCP
1.50	CSS areas with HCP
1.50	MS4 areas with SCP
1.10	MS4 areas with HCP

$$R_D = 1.85$$

Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP design requirements?

Step 3: Calculate Required Sewer Operations Volume V_V

- Use NYC SWM Eq. 2.3 to calculate required V_V
- Refer to NYC SWM Table 2.7 to establish rainfall depth based on the sewershed type (CSS/MS4) and proposal type for the project (HCP/SCP).
- Finalize calculation using contributing area from Step 1 and weighted runoff coefficient from Step 2.

EQ 2.3

$$V_V = \frac{R_D}{12} * A * C_W$$

where:

V_V : sewer operations volume (cf)

R_D : rainfall depth (in)

A : contributing area (sf)

C_W : weighted runoff coefficient relating peak rate of rainfall and runoff

$$\left. \begin{array}{l} R_D = 1.85 \text{ in} \\ A = 96,700 \text{ sf} \\ C_W = 0.70 \end{array} \right\} V_V = \frac{1.85}{12} * 96,700 * 0.70$$

$$V_V = 10,497 \text{ cf}$$

Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP design requirements?

Step 4: Calculate maximum release rate Q_{DRR}

- Use NYC SWM Eq. 2.5 to calculate Q_{DRR}

EQ 2.5

$$Q_{DRR} = \frac{q \left(\frac{cfs}{acre} \right) * A(sf)}{43560 \left(\frac{sf}{acre} \right)} \text{ or } 0.046 \text{ [whichever is greater]}$$

Q_{DRR} : maximum release rate, site (cfs)

q : maximum release rate, per acre (cfs/acre)

A : contributing area (sf)

Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP design requirements?

Step 4: Calculate maximum release rate Q_{DDR}

- Use NYC SWM Eq. 2.5 to calculate Q_{DDR}
- Refer to NYC SWM Table 2.9 to establish max release rate per acre based on the sewershed type.

Table 2.9. Maximum release rate per acre (cfs/acre) by sewershed type.

q (cfs/acre)	Description
1.0	MS4 areas
0.1	CSS areas

$$q = 0.1 \frac{cfs}{acre}$$

Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP design requirements?

Step 4: Calculate maximum release rate Q_{DRR}

- Use NYC SWM Eq. 2.5 to calculate Q_{DRR}
- Refer to NYC SWM Table 2.9 to establish max release rate per acre based on the sewershed type.
- Complete calculation using contributing area from Step 1.

EQ 2.5

$$Q_{DRR} = \frac{q \left(\frac{cfs}{acre} \right) * A(sf)}{43560 \left(\frac{sf}{acre} \right)} \text{ or } 0.046 \text{ [whichever is greater]}$$

Q_{DRR} : maximum release rate, site (cfs)

q : maximum release rate, per acre (cfs/acre)

A : contributing area (sf)

$$\left. \begin{array}{l} q = 0.1 \frac{cfs}{acre} \\ A_{Site} = 96,700 sf \end{array} \right\} Q_{DRR,Calc} = \frac{0.1 \frac{cfs}{acre} * 96,700 sf}{43560 \frac{sf}{acre}}$$

$$Q_{DRR,Calc} = 0.22 cfs$$

Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP design requirements?

Step 4: Calculate maximum release rate Q_{DDR}

- Use NYC SWM Eq. 2.5 to calculate Q_{DDR}
- Refer to NYC SWM Table 2.9 to establish max release rate per acre based on the sewershed type.
- Complete calculation using contributing area from Step 1.
- Select the appropriate Q_{DDR}

EQ 2.5

$$Q_{DDR} = \frac{q \left(\frac{cfs}{acre} \right) * A(sf)}{43560 \left(\frac{sf}{acre} \right)} \text{ or } 0.046 \text{ [whichever is greater]}$$

Q_{DDR} : maximum release rate, site (cfs)

q: maximum release rate, per acre (cfs/acre)

A: contributing area (sf)

$$Q_{DDR,Calc} = 0.22 \text{ cfs}$$

$$0.22 \text{ cfs} > 0.046 \text{ cfs}$$

$$Q_{DDR} = 0.22 \text{ cfs}$$

Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP design requirements?

If the developed flow (Q_{DEV}) is greater than the maximum release rate (Q_{DRR}),

Designer must design detention practices in accordance with Chapter 4 of the NYC SWM to ensure that the maximum release rate for the site is not exceeded.

Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP design requirements?

Step 5: Calculate Developed Flow Q_{DEV} to Confirm Q_{DRR} Applicability

- Refer to NYC SWM p. 2-18 to calculate Q_{Dev}

$$Q_{Dev} = \frac{C_{ws}A_s}{7,320}$$

where:

Q_{Dev} = the developed site average storm runoff rate of flow in cfs, based on a rainfall event with a 5 yr. return period, and a 6 minute (min.) time of concentration

C_{ws} = the weighted runoff coefficient for the site

A_s = the site area in ft^2

7,320 = 43,560 ft^2/ac divided by 5.95 inches per hour (in/hr), the average rainfall intensity for the event with a 5 yr. return period and a 6 min. time of concentration

Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP design requirements?

Step 5: Calculate Developed Flow Q_{DEV} to Confirm Q_{DRR} Applicability

- Refer to NYC SWM p. 2-18 to calculate Q_{Dev}
- Complete calculation using contributing area from Step 1 and weighted runoff coefficient from Step 2.
- Confirm whether Q_{DRR} Applies

$$Q_{Dev} = \frac{C_{WS}A_S}{7,320}$$

$$Q_{Dev} = \frac{0.70 * 96,700}{7,320}$$

$$Q_{Dev} = 9.30 \text{ cfs} \quad > \quad Q_{DRR,Site} = 0.22 \text{ cfs}$$

Since $Q_{Dev} > Q_{DRR}$ the detention system must be designed to meet Q_{DRR}

Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP requirements?

Select Tier 3 SMPs to meet remaining site requirements:

- ✓ *In this case, a stormwater gallery may be used to meet all remaining requirements.*
- ✓ *The stormwater gallery must be sized to meet the required Vv, which will also manage remaining required WQv.*

SMP HIERARCHY CHECKLIST - CSS AREAS

Percent of SMP volume applied^a

Site constraints that limit SMP feasibility^b

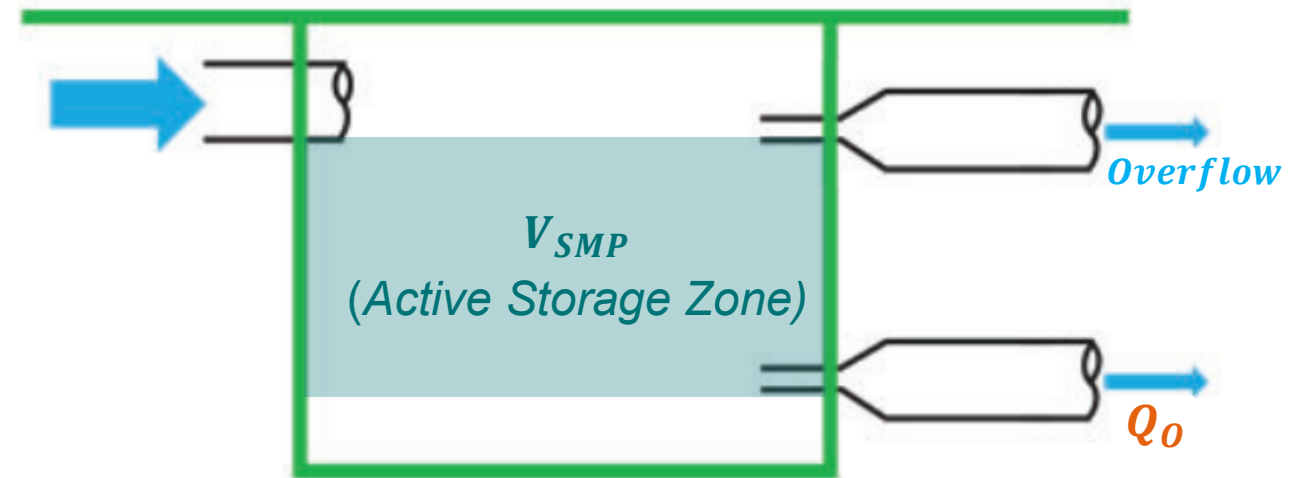
Tier ^c	Function Type ^d	Practice Type ^e	WQv	RRv	Vv	Soil	Subsurface	Hotspot	Surfaces	Space
Tier 1	Infiltration (Vegetated)	Bioretention	100	100	100	×	×	×	×	×
		Rain garden	100	100	100	×	×	×	×	×
		Stormwater planter	100	100	100	×	×	×	×	×
		Tree planting / preservation	SC	SC	0					
		Dry basin	100	100	100	×	×	×	×	×
		Grass filter strip	SC	SC	0	×	×	×	×	×
		Vegetated swale	SC	SC	0	×	×	×	×	×
	Evapotranspiration ^f	Rain garden	100	100	0		×		×	×
		Stormwater planter	100	100	0				×	
		Tree planting / preservation	SC	SC	0					
		Green roof	100	100	0					
Tier 2	Infiltration (Non-vegetated)	Dry well	100	100	100	×	×	×		×
		Stormwater gallery	100	100	100	×	×	×		×
		Stone trench	100	100	100	×	×	×	×	×
		Porous pavement	100	100	100	×	×	×		×
		Synthetic turf field	100	100	100	×	×	×	×	×
Anytime / Optional	Reuse	Rain tank	100	100	SC					
		Cistern	100	100	SC					
Tier 3	Detention ^{g,h,i}	Dry basin	100	0	100		×		×	×
		Constructed wetland	100	0	100		×		×	×
		Wet basin / pond	100	0	100		×		×	×
		Stormwater gallery	100	0	100		×			×
		Blue roof	100	0	100					
		Detention tank	100	0	100					

Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP requirements?

Tier 3 detention SMP design consists of ensuring:

- ✓ $V_{SMP} > V_V$
The SMP active storage volume must exceed the Required Sewer Operations Volume
- ✓ $Q_o < Q_{DRR}$
The release rate from the SMP controlled-flow device (Q_o) must not exceed the Maximum Release Rate (Q_{DRR}) for the contributing area when the 10-year detention volume is being provided (V_V).



Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP requirements?

Step 6: Design Detention System

- *Refer to NYC SWM Section 4.10 for guidance on designing SMP components*

Design Decisions for Case Study:

- ✓ Stormwater gallery has a re-entrant orifice tube outlet
- ✓ Smallest allowable orifice diameter set in NYC Stormwater Manual is 1 inch
- ✓ The invert of the existing sewer connection is a constraint for the depth of the proposed SMP and orifice
- ✓ The orifice diameter must be sized so the release rate does not exceed the Q_{DRR} **while also** not exceeding the maximum drawdown time for a stormwater gallery

Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP requirements?

Step 6: Design Detention System

- Refer to NYC SWM Section 4.10 for guidance on designing SMP components
- Select the orifice type and use NYC SWM Eq. 4.15 to calculate an appropriate orifice diameter for the detention SMP

The existing sewer connection that will be reused is 6.1 ft deep. This depth constrains the max H for the proposed system.

EQ 4.15

$$Q_O = C_D * A_O * \sqrt{2gH}$$

where:

Q_O = maximum release rate of orifice (cfs)

C_D = coefficient of discharge; 0.61 (flush), 0.52 (re-entrant)

A_O = area of orifice (ft²)

g = acceleration due to gravity, 32.2 (ft/s²)

H = maximum hydraulic head above the centerline of the orifice (ft)

$$Q_O = Q_{DRR} = 0.22 \text{ cfs}$$

$$C_D = 0.52$$

$$H = 5.00 \text{ ft}$$

$$0.22 \text{ cfs} = 0.52 * A_O * \sqrt{2 * 32.2 \frac{\text{ft}}{\text{s}^2} * 5.00 \text{ ft}}$$

$$A_O = 0.024 \text{ sf}$$

$$A_O = \frac{\pi}{4} * D_O^2$$

$$0.024 \text{ sf} = \frac{\pi}{4} * D_O^2$$

$$D_O = 0.17 \text{ ft} = 2.09 \text{ in} \geq D_{O,min} = 1 \text{ in} \quad \checkmark$$

Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP requirements?

Step 6: Design Detention System

- Refer to NYC SWM Section 4.10 for guidance on designing SMP components
- Select the orifice type and use NYC SWM Eq. 4.15 to calculate an appropriate orifice diameter for the detention SMP

EQ 4.15

$$Q_O = C_D * A_o * \sqrt{2gH}$$

where:

Q_O = maximum release rate of orifice (cfs)

C_D = coefficient of discharge; 0.61 (flush), 0.52 (re-entrant)

A_O = area of orifice (ft²)

g = acceleration due to gravity, 32.2 (ft/s²)

H = maximum hydraulic head above the centerline of the orifice (ft)

$$D_O = 0.17 \text{ ft} = 2.09 \text{ in} \geq D_{O,min} = 1 \text{ in}$$

Set the orifice diameter to the nearest 0.25-inch interval rounding down

$$D_O = 2.0 \text{ in}$$

Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP requirements?

Step 6: Design Detention System

- Refer to NYC SWM Section 4.10 for guidance on designing SMP components
- Select the orifice type and use NYC SWM Eq. 4.15 to calculate an appropriate orifice diameter for the detention SMP
- Use NYC SWM Eq. 4.16 to calculate the maximum detention storage depth for a re-entrant orifice tube outlet, based on the maximum release rate and orifice diameter

EQ 4.16

$$S_{DR} = 1,930(Q_{DRR})^2/(d_o)^4 + d_o/24$$

where:

S_{DR} = the maximum storage depth in ft. for a Re-entrant orifice tube outlet

Q_{DRR} = the detention facility maximum release rate in cfs

d_o = the nominal dia. of the orifice tube outlet in in.

$$S_{DR} = \frac{1,930 * Q_{DRR}^2}{d_o^4} + \frac{d_o}{24}$$

$$S_{DR} = \frac{1,930 * 0.22 \text{ cfs}^2}{2 \text{ in}^4} + \frac{2 \text{ in}}{24}$$

$$S_{DR} = 6.03 \text{ ft} \geq H = 5.00 \text{ ft} \quad \checkmark$$

Note:

If the active storage depth is too high or low, iterate this step by changing the orifice size or choosing a different orifice configuration.

Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP requirements?

Step 6: Design Detention System

- Refer to NYC SWM Section 4.10 for guidance on designing SMP components
- Select the orifice type and use NYC SWM Eq. 4.15 to calculate an appropriate orifice diameter for the detention SMP
- Use NYC SWM Eq. 4.16 to calculate the maximum detention storage depth for a re-entrant orifice tube outlet, based on the maximum release rate and orifice diameter
- Establish the required SMP footprint to meet volumetric requirements

$$S_{DR} = 6.03 \text{ ft}$$

$$V_V = S_{DR} * A_{SMP}$$

$$A_{SMP} = \frac{10,497 \text{ cf}}{6.03 \text{ ft}} = 1,741 \text{ sf}$$

Note:

This calculated minimum SMP footprint area is a starting point for system design based on the maximum storage depth. Design iterations can be performed with different stormwater gallery configurations, depths, and footprints to provide the required management.

Tier 3 SMP Design *(CSS Only)*

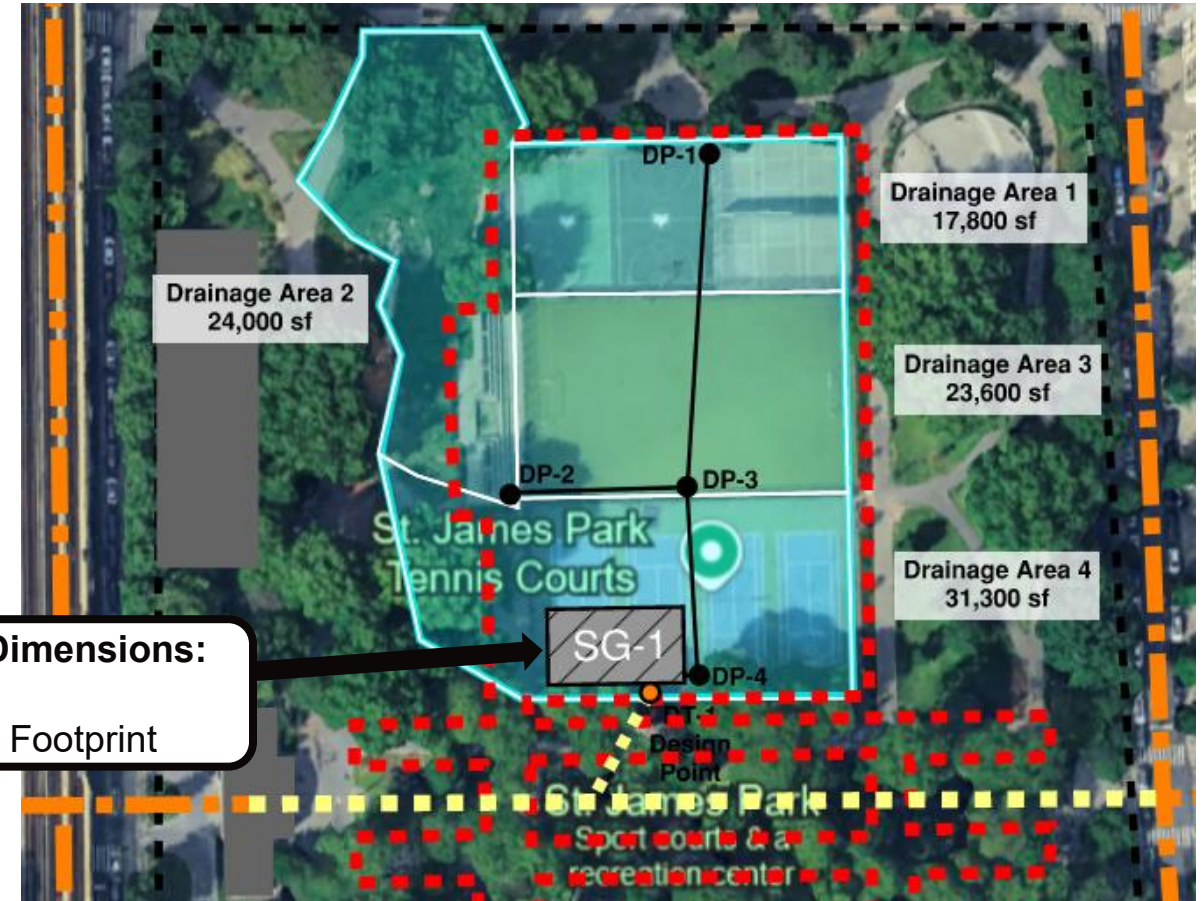
What are the Tier 3 SMP requirements?

Step 6: Design Detention System

- Refer to NYC SWM Section 4.10 for guidance on designing SMP components
- Select the orifice type and use NYC SWM Eq. 4.15 to calculate an appropriate orifice diameter for the detention SMP
- Use NYC SWM Eq. 4.16 to calculate the maximum detention storage depth for a re-entrant orifice tube outlet, based on the maximum release rate and orifice diameter
- Establish the required SMP footprint to meet volumetric requirements
- Design stormwater gallery active storage zone dimensions to provide the necessary storage volume to meet volumetric requirements

SG-1 Proposed Dimensions:

- 5.09 ft Depth
- 45 ft W x 67 ft L Footprint



LEGEND

- | | | | |
|--|--|--|-------------------------------------|
| | Limit of Property: 496,270 sf | | Stormwater Gallery: 2,970 sf |
| | Limit of Disturbance (LOD): 137,170 sf | | DP-# Drainage Point and ID |
| | Existing Internal Drainage System | | Schematic Inlet & Internal Drainage |
| | NYC Combined Sewer System | | |

Tier 3 SMP Design *(CSS Only)*

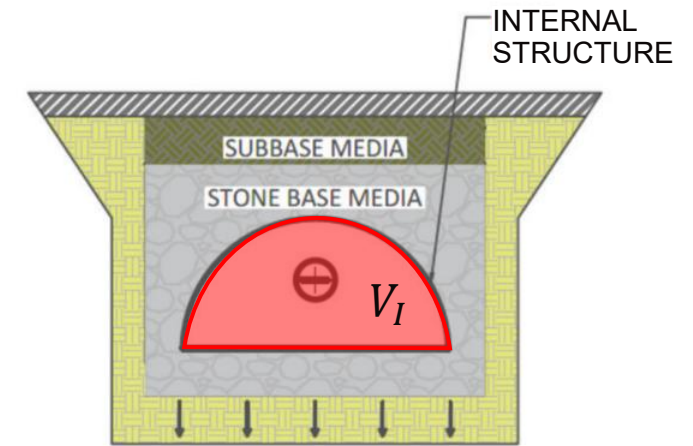
What are the Tier 3 SMP requirements?

Step 6: Design Detention System

- Refer to NYC SWM Section 4.10 for guidance on designing SMP components
- Select the orifice type and use NYC SWM Eq. 4.15 to calculate an appropriate orifice diameter for the detention SMP
- Use NYC SWM Eq. 4.16 to calculate the maximum detention storage depth for a re-entrant orifice tube outlet, based on the maximum release rate and orifice diameter
- Establish the required SMP footprint to meet volumetric requirements
- Design stormwater gallery active storage zone dimensions to provide the necessary storage volume to meet volumetric requirements

$$V_{SMP} = \cancel{V_P} + \cancel{V_S} + V_I + V_D$$

$$V_{SMP,SG} = V_{I,SG} + V_{D,SG}$$



Stormwater Gallery

EQ 4.5

$$V_I = V_M * N_M$$

where:

V_I = volume of voids created by internal structure (cf)

V_M = interior volume of one modular structure (cf)

N_M = number of modular structures (unit less)

$$V_{I,SG} = 10.74 \text{ cf} * (31 \text{ rows} * 26 \text{ columns})$$

$$V_{I,SG} = 8,656 \text{ cf}$$

Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP requirements?

Step 6: Design Detention System

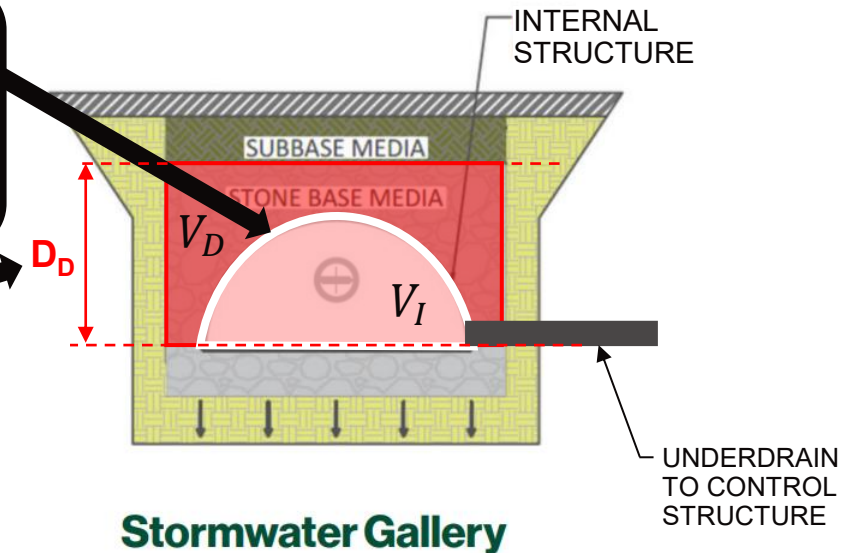
- Refer to NYC SWM Section 4.10 for guidance on designing SMP components
- Select the orifice type and use NYC SWM Eq. 4.15 to calculate an appropriate orifice diameter for the detention SMP
- Use NYC SWM Eq. 4.16 to calculate the maximum detention storage depth for a re-entrant orifice tube outlet, based on the maximum release rate and orifice diameter
- Establish the required SMP footprint to meet volumetric requirements
- Design stormwater gallery active storage zone dimensions to provide the necessary storage volume to meet volumetric requirements

$V_{I,d}$ includes any volume within the drainage layer that does not provide storage volume (e.g., void space of internal structures, internal structure wall volume, pillars, etc.)

For detention systems, D_D is the depth of the drainage media within the active storage zone, which spans the distance from the invert elevation of the controlled outlet orifice to the elevation at which the maximum release rate is incurred (typically set to the overflow elevation).

$$V_{SMP} = \cancel{V_P} + \cancel{V_S} + V_I + V_D$$

$$V_{SMP,SG} = V_{I,SG} + V_{D,SG}$$



EQ 4.7

$$V_D = (A_{SMP} * D_D - V_{I,d}) * n_D$$

where:

V_D = volume of voids in the drainage media (cf)

A_{SMP} = area of the SMP (sf)

D_D = depth of the drainage media (ft)

$V_{I,d}$ = volume of voids created by internal structures within the drainage media (cf)

n_D = porosity of drainage media (cf/cf)

$$V_{D,SG} = (3,015 \text{ sf} * 4.68 \text{ ft} - 9,126 \text{ cf}) * 0.40$$

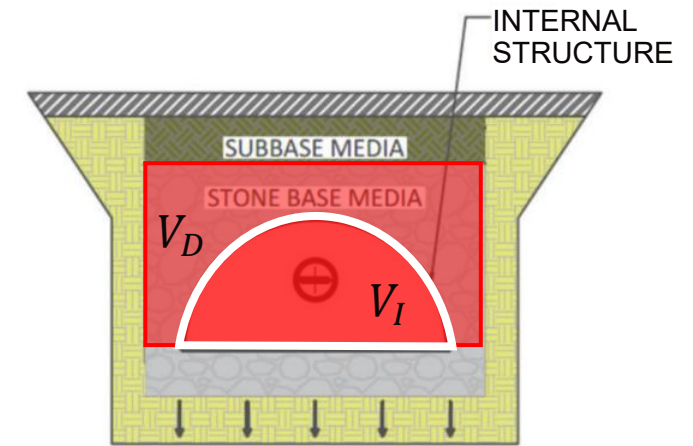
$$V_{D,SG} = 1,991 \text{ cf}$$

Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP requirements?

Step 6: Design Detention System

- Refer to NYC SWM Section 4.10 for guidance on designing SMP components
- Select the orifice type and use NYC SWM Eq. 4.15 to calculate an appropriate orifice diameter for the detention SMP
- Use NYC SWM Eq. 4.16 to calculate the maximum detention storage depth for a re-entrant orifice tube outlet, based on the maximum release rate and orifice diameter
- Establish the required SMP footprint to meet volumetric requirements
- Design stormwater gallery active storage zone dimensions to provide the necessary storage volume to meet volumetric requirements



Stormwater Gallery

$$V_{SMP} = \cancel{V_P} + \cancel{V_S} + V_I + V_D \quad V_{I,SG} = 8,656 \text{ cf}$$

$$V_{SMP,SG} = V_{I,SG} + V_{D,SG} \quad V_{D,SG} = 1,906 \text{ cf}$$

$$V_{SMP,SG} = 8,656 \text{ cf} + 1,991 \text{ cf} = 10,647 \text{ cf}$$

$$V_{SMP,SG} = 10,647 \text{ cf}$$

Tier 3 SMP Design *(css Only)*

What are the Tier 3 SMP requirements?

Step 6: Design Detention System

- Refer to NYC SWM Section 4.10 for guidance on designing SMP components
- Select the orifice type and use NYC SWM Eq. 4.15 to calculate an appropriate orifice diameter for the detention SMP
- Use NYC SWM Eq. 4.16 to calculate the maximum detention storage depth for a re-entrant orifice tube outlet, based on the maximum release rate and orifice diameter
- Establish the required SMP footprint to meet volumetric requirements
- Design stormwater gallery active storage zone dimensions to provide the necessary storage volume to meet volumetric requirements

Table 4.1. Percent of SMP volume that may be applied to SW management criteria by SMP function.

SMP Function	Percent of SMP Volume Applied to Requirement (F _A)		
	WQv	RRv	Vv
Infiltration	100	100	100
Evapotranspiration	100	100	0
Reuse ^A	100	100	50
Filtration	100 ^B	40 ^C	0
Detention	100 ^D	0	100

^A Designers must demonstrate continuous and reliable capacity throughout the year (see Section 4.11)

^B Applies to MS4 areas only

^C Applies to practices with engineered soils only

^D Applies to CSS areas and select detention practices with treatment abilities in MS4 areas

$$V_{V,Provided} = V_{SMP,SG} * 100\% = 10,647\ cf$$

$V_{V,Provided} = 10,647\ cf \geq V_{V,Req} = 10,497cf$
✓

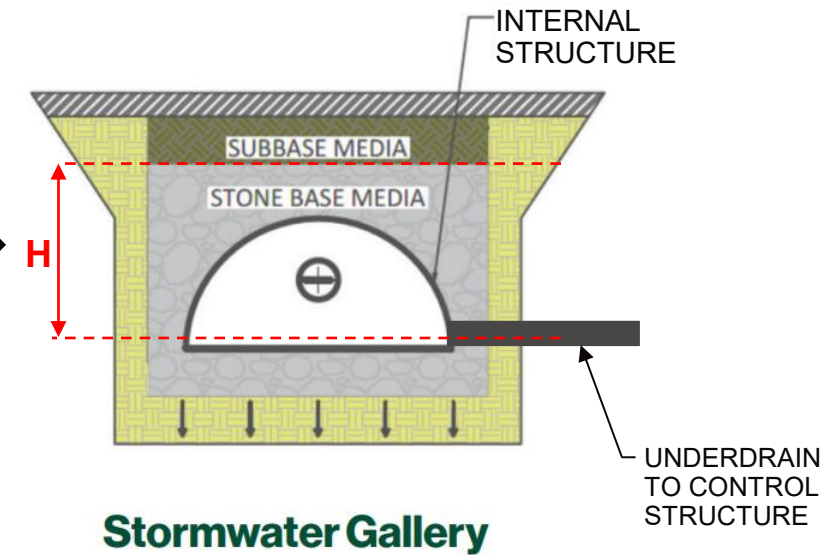
Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP requirements?

Step 6: Design Detention System

- Refer to NYC SWM Section 4.10 for guidance on designing SMP components
- Select the orifice type and use NYC SWM Eq. 4.15 to calculate an appropriate orifice diameter for the detention SMP
- Use NYC SWM Eq. 4.16 to calculate the maximum detention storage depth for a re-entrant orifice tube outlet, based on the maximum release rate and orifice diameter
- Establish the required SMP footprint to meet volumetric requirements
- Design stormwater gallery active storage zone dimensions to provide the necessary storage volume to meet volumetric requirements
- Use NYC SWM Table 4.5 and Eq. 4.14 to confirm the selected orifice size meets drawdown time requirements

When calculating H, use the top of active storage zone to centerline of the orifice



EQ 4.14

$$dt_{SMP} = \frac{V_{SMP}}{0.5C_D A_o \sqrt{2gH}} * \frac{1}{3600}$$

where:

dt_{SMP} = drawdown time of filtration SMP (hr)

V_{SMP} = volume of filtration SMP (cf)

C_D = coefficient of discharge; 0.61 (flush), 0.52 (re-entrant), or 0.73 (long re-entrant)

A_o = area of the orifice (ft²)

g = acceleration due to gravity, 32.2 (ft/s²)

H = maximum hydraulic head above the centerline of the orifice (ft)

$$V_{SMP,SG} = 10,647 \text{ cf}$$

$$C_D = 0.52$$

$$D_o = 2.00 \text{ in}$$

$$A_o = \frac{\pi}{4} * D_o^2 = \frac{\pi}{4} * \left(2.00 \text{ in} * \frac{1 \text{ ft}}{12 \text{ in}} \right)^2 = 0.022 \text{ ft}^2$$

$$H = 4.76 \text{ ft}$$

$$dt_{SMP} = \frac{10,647 \text{ cf}}{0.5 * 0.52 * 0.022 \text{ ft}^2 * \sqrt{2 * 32.2 \frac{\text{ft}}{\text{s}^2} * 4.76 \text{ ft}}} * \frac{1}{3600}$$

$$dt_{SMP} = 29.8 \text{ hr}$$

Tier 3 SMP Design *(css Only)*

What are the Tier 3 SMP requirements?

Step 6: Design Detention System

- Refer to NYC SWM Section 4.10 for guidance on designing SMP components
- Select the orifice type and use NYC SWM Eq. 4.15 to calculate an appropriate orifice diameter for the detention SMP
- Use NYC SWM Eq. 4.16 to calculate the maximum detention storage depth for a re-entrant orifice tube outlet, based on the maximum release rate and orifice diameter
- Establish the required SMP footprint to meet volumetric requirements
- Design stormwater gallery active storage zone dimensions to provide the necessary storage volume to meet volumetric requirements
- Use NYC SWM Table 4.5 and Eq. 4.14 to confirm the selected orifice size meets drawdown time requirements

Table 4.5. Basic design requirements for detention SMPs.

Design Parameter	Dry Basin	Constructed Wetland ^a	Wet Basin/ Pond ^a	Stormwater Gallery	Blue Roof	Detention Tank
MAX. (MIN.) loading ratio, practice-to-contributing area	1:40	(1:100)	(1:100)	-	-	-
MAX. (MIN.) contributing area	5 acre	(25 acre)	(25 acre)	5 acre	-	-
MIN. infiltration rate of underlying soils	-	-	-	-	-	-
Vertical separation from groundwater / bedrock ^b	3' MIN	3' MIN	3' MIN	3' MIN	-	3' MIN
Has a permanent pool?	No	Yes	Yes	No	No	No
Slope of surface media	1:3 MAX	1:3 MAX	1:3 MAX	-	-	-
Slope of bottom of practice	3% MAX	3% MAX	3% MAX	No Slope	-	-
MAX. Drawdown time	Temp. Storage Area = 48hr	Temp. Storage Area = 48hr	Temp. Storage Area = 48hr	Temp. Storage Area = 48hr	Temp. Storage Area = 24hr	Temp. Storage Area = 72hr

EQ 4.14

$$dt_{SMP} = \frac{V_{SMP}}{0.5C_D A_o \sqrt{2gH}} * \frac{1}{3600}$$

where:

dt_{SMP} = drawdown time of filtration SMP (hr)

V_{SMP} = volume of filtration SMP (cf)

C_D = coefficient of discharge; 0.61 (flush), 0.52 (re-entrant), or 0.73 (long re-entrant)

A_o = area of the orifice (ft²)

g = acceleration due to gravity, 32.2 (ft/s²)

H = maximum hydraulic head above the centerline of the orifice (ft)

$$dt_{SMP} = 29.8 \text{ hr} \leq dt_{Max} = 48 \text{ hr} \quad \checkmark$$

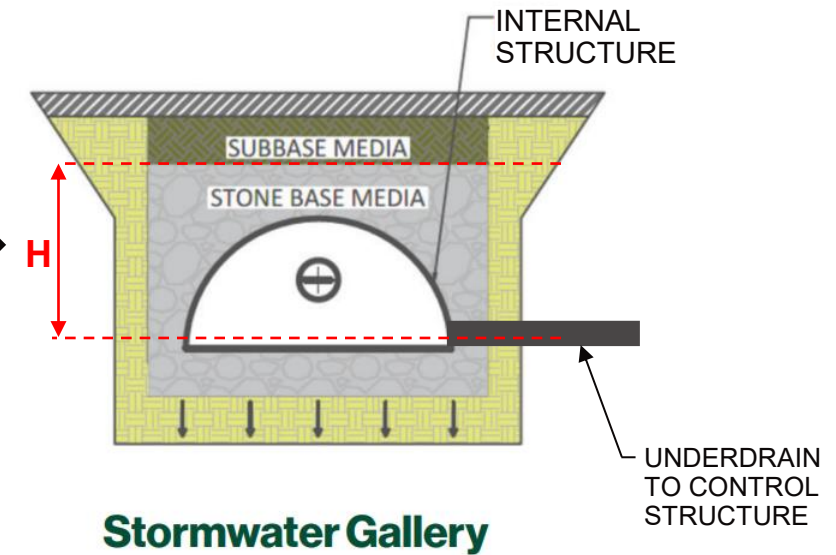
Tier 3 SMP Design *(CSS Only)*

What are the Tier 3 SMP requirements?

Step 6: Design Detention System

- Refer to NYC SWM Section 4.10 for guidance on designing SMP components
- Select the orifice type and use NYC SWM Eq. 4.15 to calculate an appropriate orifice diameter for the detention SMP
- Use NYC SWM Eq. 4.16 to calculate the maximum detention storage depth for a re-entrant orifice tube outlet, based on the maximum release rate and orifice diameter
- Establish the required SMP footprint to meet volumetric requirements
- Design stormwater gallery active storage zone dimensions to provide the necessary storage volume to meet volumetric requirements
- Use NYC SWM Table 4.5 and Eq. 4.14 to confirm the selected orifice size meets drawdown time requirements
- Use NYC SWM Eq. 4.15 to re-confirm that the maximum release rate is not exceeded with the SMP design

When calculating H, use the top of active storage zone to centerline of the orifice



EQ 4.15

$$Q_O = C_D * A_O * \sqrt{2gH}$$

where:

QO = maximum release rate of orifice (cfs)

CD = coefficient of discharge; 0.61 (flush), 0.52 (re-entrant)

AO = area of orifice (ft²)

g = acceleration due to gravity, 32.2 (ft/s²)

H = maximum hydraulic head above the centerline of the orifice (ft)

$$C_D = 0.52$$

$$A_O = \frac{\pi}{4} * D_O^2 = \frac{\pi}{4} * \left(2.00 \text{ in} * \frac{1 \text{ ft}}{12 \text{ in}} \right)^2 = 0.022 \text{ ft}^2$$

$$H = 4.76 \text{ ft}$$

$$Q_O = 0.52 * 0.022 \text{ ft}^2 * \sqrt{2 * 32.2 \frac{\text{ft}}{\text{s}^2} * 4.76 \text{ ft}}$$

$$Q_O = 0.20 \text{ cfs} \leq Q_{DRR} = 0.22 \text{ cfs}$$



What are the Tier 3 SMP requirements?

- 5.09 ft Depth
- 45 ft W x 66 ft L Footprint

<u>Provided by SMP</u>		<u>Required</u>	
$V_{SMP,SG} = 10,647 \text{ cf}$	$\geq$	$V_V = 10,497 \text{ cf}$	✓
$Q_O = 0.20 \text{ cfs}^*$	$\leq$	$Q_{DRR} = 0.22 \text{ cfs}$	✓
$dt_{SMP} = 29.8 \text{ hr}$	$\leq$	$dt_{Max} = 48 \text{ hr}$	✓

This aerial map illustrates the layout of St. James Park, highlighting four distinct drainage areas and a network of proposed walkways. The park is bounded by a dashed orange line. The drainage areas are defined by red dotted lines and labeled as follows:

- Drainage Area 1:** 17,800 sf, located in the upper right quadrant.
- Drainage Area 2:** 24,000 sf, located in the upper left quadrant.
- Drainage Area 3:** 23,600 sf, located in the middle right quadrant.
- Drainage Area 4:** 31,300 sf, located in the middle right quadrant, adjacent to Drainage Area 3.

The central area of the park is labeled "St. James Park Tennis Courts" and "St. James Park Sport courts & a recreation center". A specific area within the tennis courts is labeled "SG-1". Four design points are marked: DP-1, DP-2, DP-3, and DP-4. A "Design Point" is also indicated near the center of the park. A large area in the lower half of the park is outlined by a red dotted line and labeled "Proposed Walkways 10,020 sf". The bottom of the map shows the "St. James Recreation Center".

 Limit of Property: 496,270 sf
 Limit of Disturbance (LOD): 137,170 sf
 Existing Internal Drainage System
 Combined Sewer System

 Stormwater Gallery: 2,970 sf
 Drainage Point and ID
 Schematic Inlet & Internal Drainage

SMP Design

What are the Tier 3 SMP requirements?



Verifying Sufficient Provided Stormwater Volume

Considerations:

- In circumstances where the chosen designed orifice flow rate (Q_o) is less than the maximum site release rate (Q_{DRR}), DEP may require verification that sufficient stormwater volume is provided in accordance with the flow rate equation in the detention series calculation (NYC SWM Appendix G):

$$t_V = 0.27 \left(\frac{C_W A_t}{Q_o} \right)^{0.5} - 15$$

$$V_V = \left(\frac{0.19 C_W A_t}{t_V + 15} - 40 Q_o \right) t_V$$

- The provided SMP volume (V_{SMP}) must exceed this required stormwater volume (V_V)

**Confirming all Requirement
are Met**

Confirming All Requirements Were Met

Are all requirements met?

Table 4.1. Percent of SMP volume that may be applied to SW management criteria by SMP function.

SMP Function	Percent of SMP Volume Applied to Requirement (F _A)		
	WQ _v	RR _v	V _v
Infiltration	100	100	100
Evapotranspiration	100	100	0
Reuse ^A	100	100	50
Filtration	100 ^B	40 ^C	0
Detention	100 ^D	0	100

SMP ID	Required WQ _{v,SMP} (cf)	V _{SMP} (cf)	Provided WQ _v (cf)	Provided RR _v (cf)	Provided V _v (cf)
SG-1	9,159*	10,647	9,159	0	10,497

Site-Wide Parameters	WQ _v (cf)	RR _v (cf)	V _v (cf)
Total Volume Provided	9,159	0	10,497
Total Volume Required	9,159	0 (Minimum)	10,497
Remaining Volume to be Managed	0	0	0
	✓	✓	✓

*SMP design was driven by required V_v in this case, not required WQ_v

Questions