



Connections to the parks to the north

Landscape improvements

SECTION 2 (p.146)

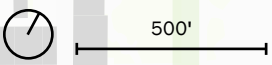
SECTION 1 (p.146)

Shallow swale

Four Greenways

Stormwater Management Network Plan

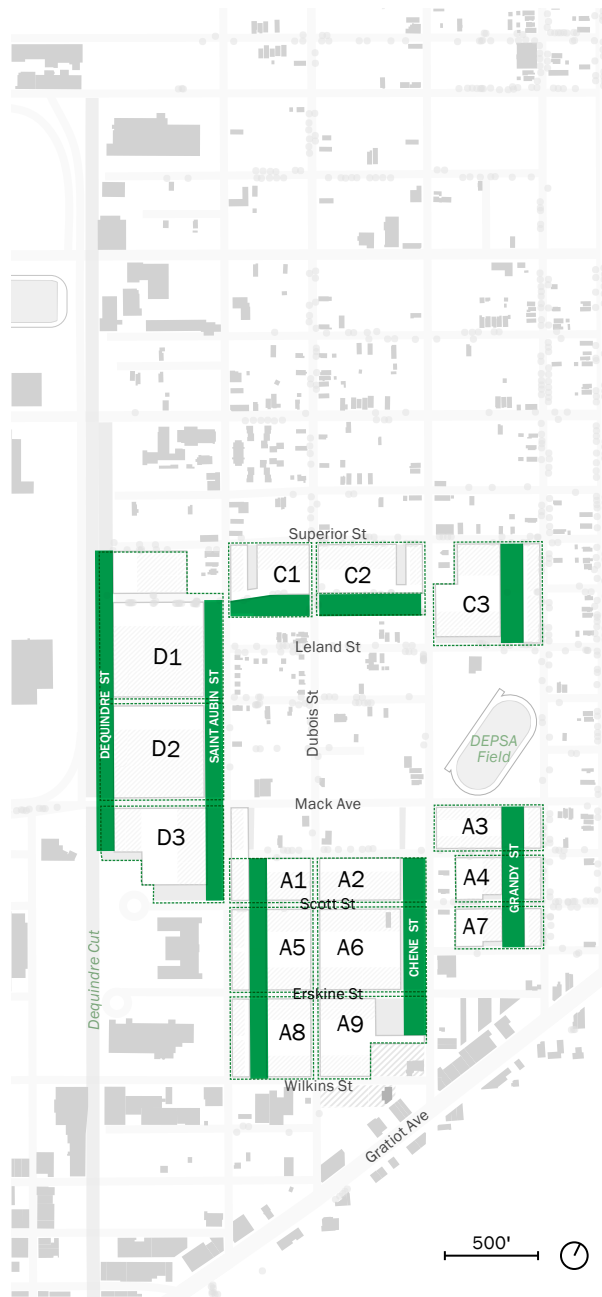
- Landscape Improvements
- Shallow Swale
- Linear Tree Grove
- Potential Program Node (future)



The Preferred Scenario

Based on the analysis of the three concept plan scenarios, it was determined that a modified version of Scenario 2 should be used as the basis for the SWMNP. Scenario 2 provides the most flexible approach to providing a comprehensive management plan that responds to the incremental growth of the GEM, provides the greatest amount of public benefit to the GEM and adjacent neighborhoods, and provides the greatest amount of ecological benefits to the district. Scenario 2 allows businesses to individually construct stormwater management practices, which is the most direct approach for meeting the City’s stormwater ordinances. The most significant modification to Scenario 2 is that developers are encouraged to utilize additional types of SMPs in addition to the subgrade storage in order to comply with City regulations. Additional SMPs that should be considered include green roofs, blue roofs, cisterns, pretreatment capture systems in parking areas, filter strips and oil/grit separators, and forebays. These additional SMPs would reduce the volume of runoff to be managed and the depth of the greenway swales, resulting in shallow swales that meet the DWSD criteria for drainage within a 24-hour period after a storm event. The other types of SMPs would need to be constructed independently of the greenway system as part of compliance with the PCSWMO. Owners could construct additional SMPs on their development sites to supplement the greenways’ stormwater management capacity and, if they meet the DWSD stormwater regulation guidelines, may receive drainage charge credit.

Stormwater Management Practice (SMP) Areas



Development parcels
 Stormwater management practice areas

The areas allocated for SMPs are sized proportionally to the associated block structure and development sites.



St. Albertus Church

Superior St

Dequindre St

Mack Ave

Saint Aubin St

Dequindre Cut

Detroit Edison Public School Academy

Greater Eastern Market

The GEM has large vacant tracts of land occasionally dotted with houses. The GEM affords a unique opportunity to rethink how an urban food district can be thoughtfully integrated into the city while improving quality of life and including green space.

Photo: Nadir Ali / 3andathird, August 2019





St. Albertus Church

Superior St

Dequindre St

Mack Ave

Dequindre Cut

Saint Aubin St

Detroit Edison Public School Academy

Greater Eastern Market

This aerial view shows a possible full build-out scenario of the GEM with mature linear tree groves.

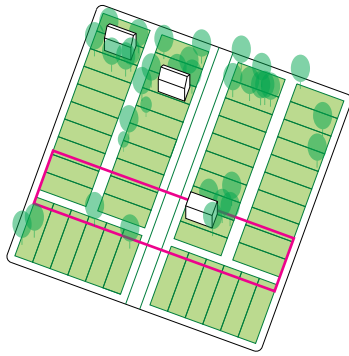


DEPSA Field

Grandy St

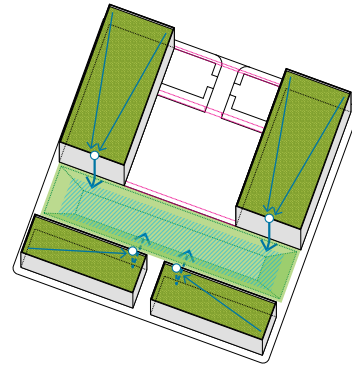
Chene St

Wilkins St



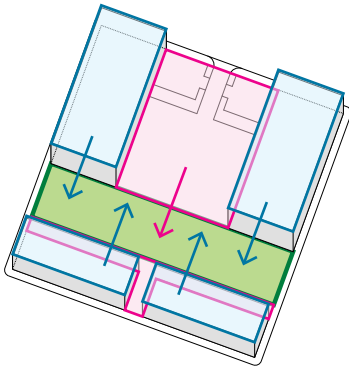
1. Existing Blocks

- Assemble the site.
- Establish a site plan and SMP area.
- Site preparation including the removal of buildings, foundations from previously demolished buildings, and trees.



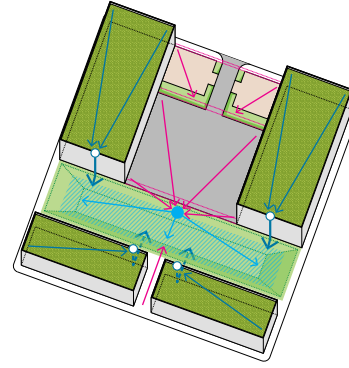
4. Roof Runoff

- Design roofs to retain runoff or convey it to a location where it can be piped to the greenway shallow swale.
- Green roofs, blue roofs, or cisterns could be considered as additional SMPs.



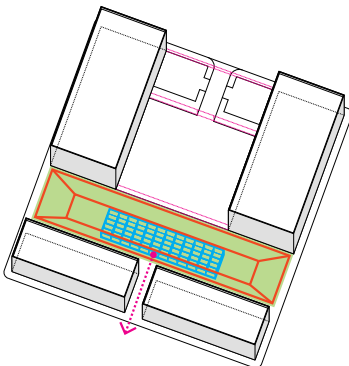
2. Planning for Detroit's Stormwater Management Regulations

- All roof and site runoff will be directed to on-site SMPs.



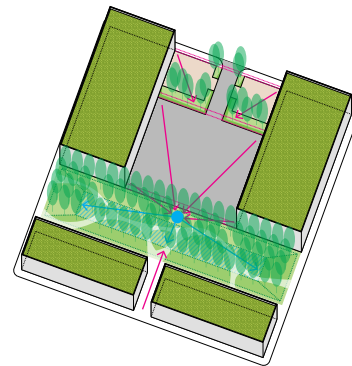
5. Site Runoff And Pretreatment

- Engineer parking and truck staging areas to convey runoff with sheet flow or a non-mechanical system to direct runoff to SMP.
- A sediment forebay (or an oil/grit separator) could be located between the paved areas and the SMP.
- Porous pavement and filter strips could be considered as additional SMPs.



3. Earthwork And Utilities

- Engineer the greenway SMP to accommodate roof and site runoff to achieve desired DWSD drainage charge reductions.
- Construct the SMP, plant it with specified meadow seed mix, and include a gravel path system.
- Add subgrade retention to reduce the depth of the SMP.
- Construct outlet controls as a controlled overflow to the existing sewer system.



6. Linear Tree Grove

- Construct landscape elements that complement the SMP.
- Plant the tree buffer.
- Develop and implement operations and maintenance protocols.

Sizing the Greenways for Performance

The most critical component in developing both the NFP and SWMNP is ensuring that the sizing of the linear greenways is appropriate. Existing conditions related to soil, topography (drainage patterns), vegetation, and infrastructure also must be factored into the design if developers and business owners choose to use this area for GSI.

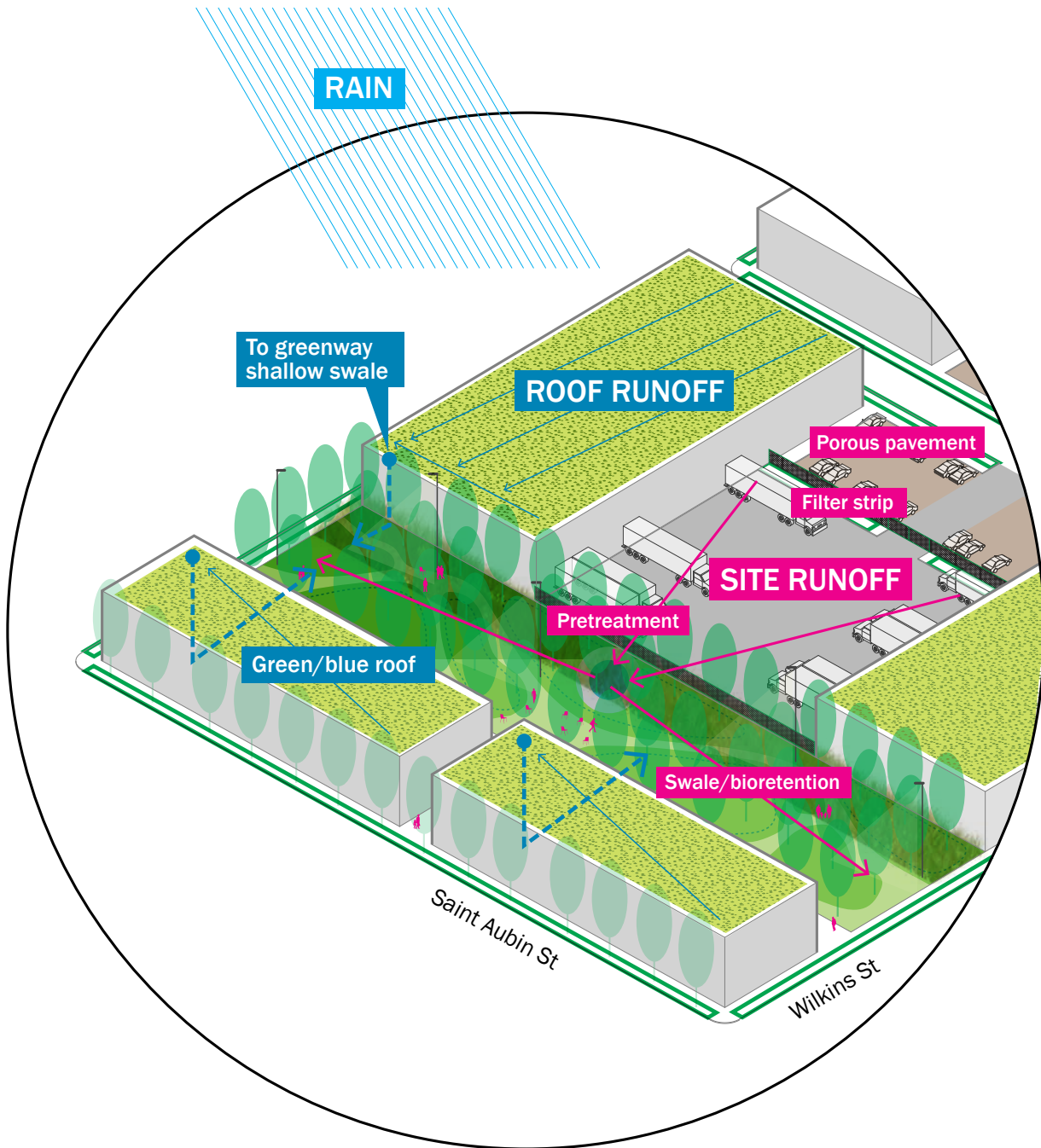
This report recommends site developers direct pavement runoff from their site(s) to a series of shallow swales. The swales should be located within greenways that are clearly delineated and contiguous across the GEM's development parcels. A requirement for the SMPs, if chosen to be constructed by individual site developers, is to reduce the amount of standing water, primarily in the interest of public safety. The proposed shallow swales would typically be dry and provide shaded corridors and green buffers within the GEM. The swales and other SMPs should have overflow connections to the city sewer system as protection against very large storm events.

Projected market expansion is mapped out with the assumption that roughly 20% of each development site will be used for the greenways. Up to 80% of the development sites' area would be covered by impervious surfaces such as buildings, truck docks, parking, and paved walkways. The SWMM model was developed to provide runoff estimates from each of the proposed development scenarios, allowing the planning team to study a variety of design iterations.

Greenway Hydrology, Conveyance, and Baseline Design Criteria

Based on the predicted runoff volume calculations from the SWMM model for the preferred scenario, retention volumes were calculated for each shallow swale based on the planned impervious surfaces for each development site. The resulting swales are shallow retention facilities that are designed to have maximum allowable side slopes of 5% or less. The designed volume for each swale is directly related to the size of the proposed adjacent development. This plan does not include engineered solutions for each swale, but does contain a series of metrics for how the facilities should be sized as they are developed in the future. The design for each swale must include engineered soils and infrastructure so that the swale adequately drains within a 24-hour period following a rain event. The topography of the swales must accommodate an accessible path network that traverses the entire length of each greenway.²⁰ In order to prevent erosion and encourage infiltration, the shallow swales should be planted with linear groves of trees and a low maintenance meadow.²¹ If predicted volumes are greater than the swale can manage, additional types of on-site stormwater management would need to be pursued within the development sites.

A stormwater utility conditions survey is necessary to verify the condition and sizes of the existing system. The proposed stormwater system within the greenway reduces the amount of water piped into the GEM's sewer infrastructure. Because the GEM is so flat, the location of infiltrating greenways are integrated into the revised block pattern which allows for minimal piping. The owner or developer would construct the proposed conveyance system that would pipe runoff to the proposed greenways.



All additional SMPs are shown as optional components of the stormwater management network. It is important to remember that these SMPs will take some of the burden off of the stormwater management facilities.

Additional Stormwater Management Practices

To achieve the goal of having the swales remain as dry as possible, the SWMNP acknowledges that developers are likely to utilize other methods to manage their stormwater. The City of Detroit's Stormwater design manual outlines sewer SMPs that should be considered by developers as part of compliance. Subsurface detention SMPs are underground structures that are used to temporarily detain and release stormwater. They can include vaults, stone storage, pipe storage, and plastic grid storage. Subsurface detention SMPs can be combined with other SMPs in series to meet the DWSO Stormwater Regulations. An outlet control structure regulates the level of water within the stormwater wetlands.

The following lists summarize what would be needed to achieve a maximum drainage charge credit for peak flow detention. Additional SMPs can provide additional benefits to property owners:

Peak Rain

- The “design storm” (rainfall at a rate of 2.9 inches per hour) rains on a green roof.
- The green roof contains the beginning of the storm and fills up.
- By the peak of the design storm, the roof is already full and runoff enters the piped conveyance network at a rate of 2.9 inches per hour.
- Runoff reaches the SMP.
- The green roof slowly drains the stored stormwater to the SMP, taking up much less capacity in the sewer than the peak flow.

Average Annual Rain

- A small rain event (rainfall at a rate of less than one inch per hour) rains on a green roof.
- The green roof contains the entire rain event, or nearly contains it.
- The green roof slowly releases stormwater to the piped conveyance network (if anything).
- Runoff rarely reaches the SMP.

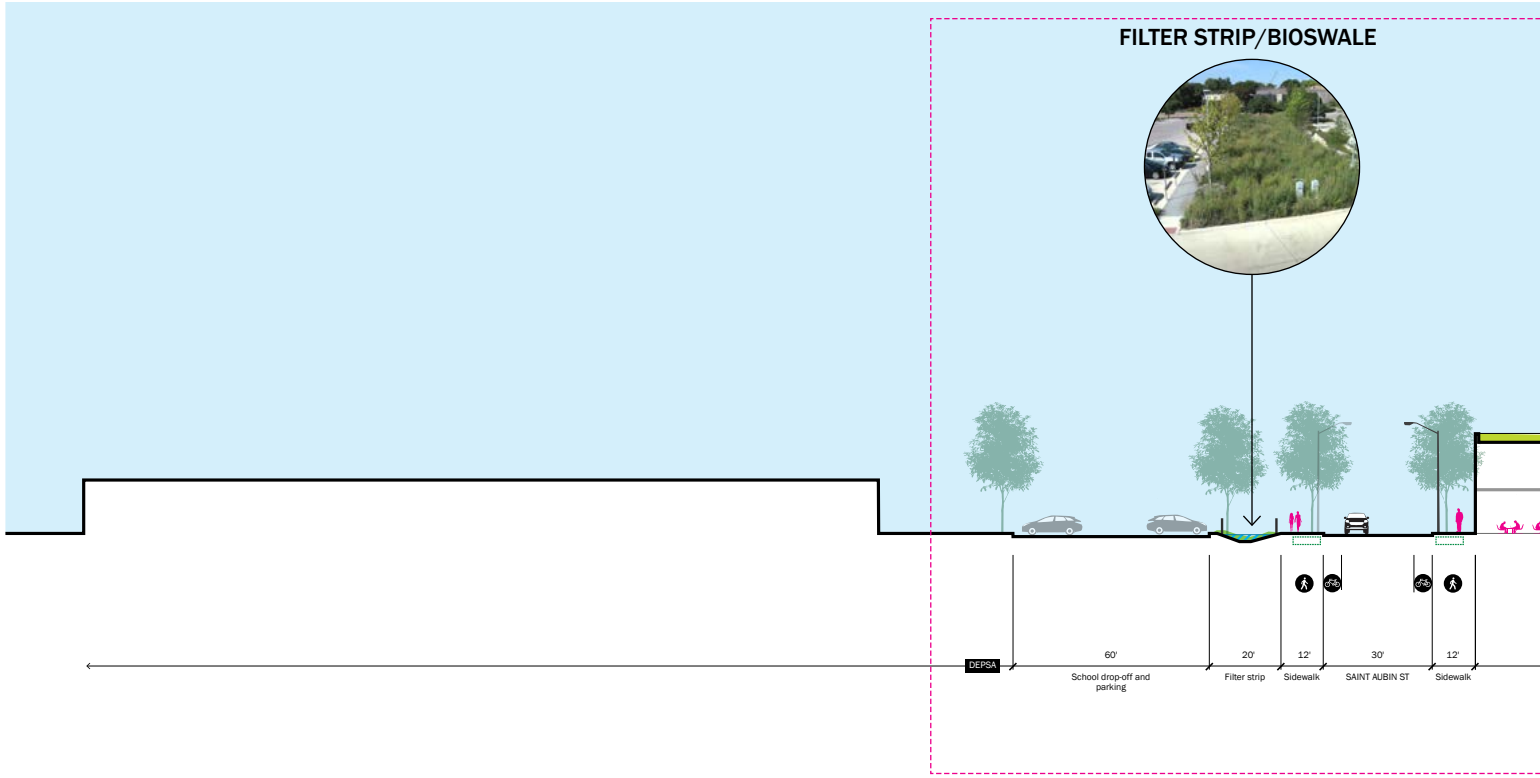
Additional SMPs



In order to achieve a maximum drainage charge credit property owners could consider the inclusion of green roofs (*top*), vegetated forebays (*middle*), or subgrade storage tanks (*bottom*).

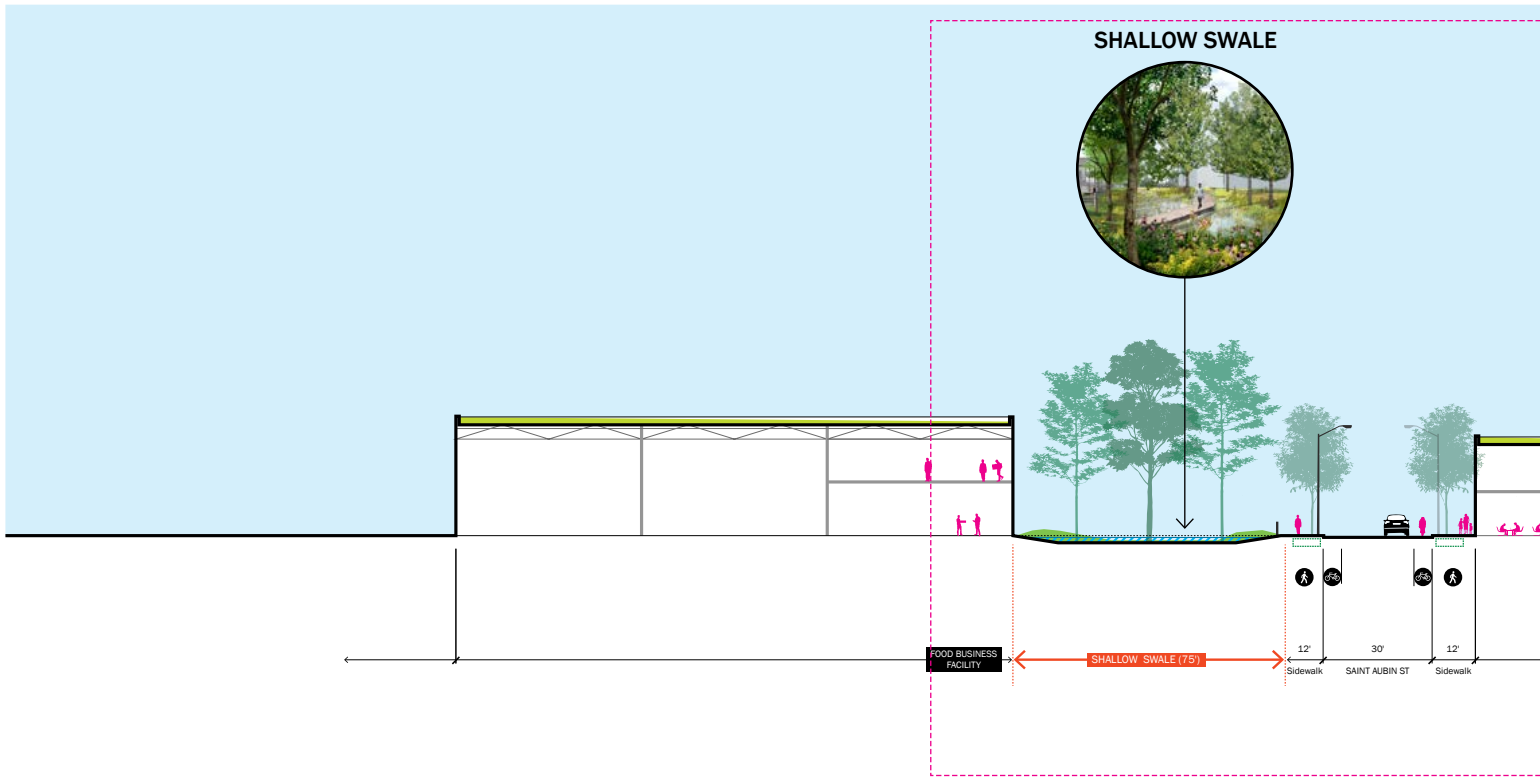
Site Section 1

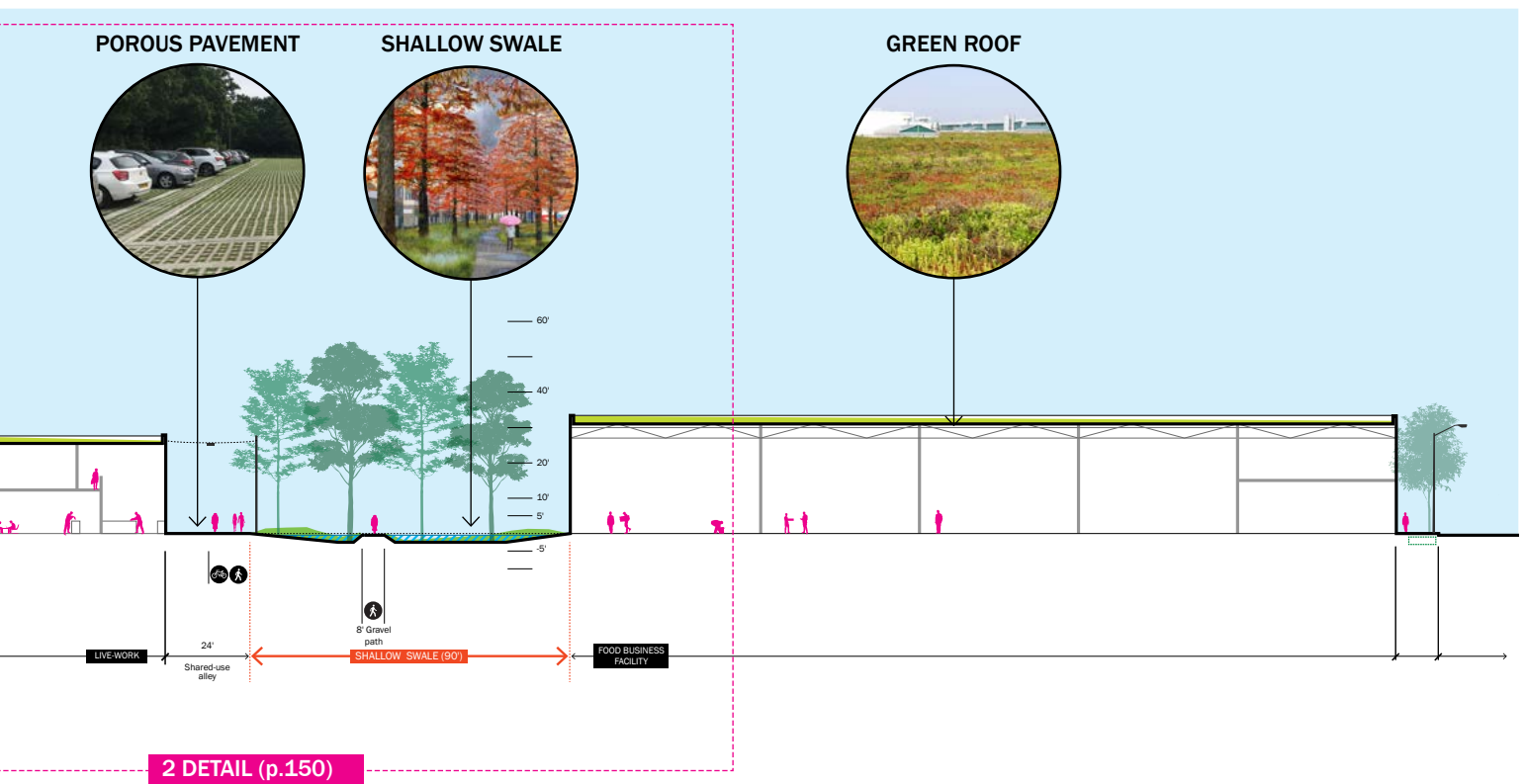
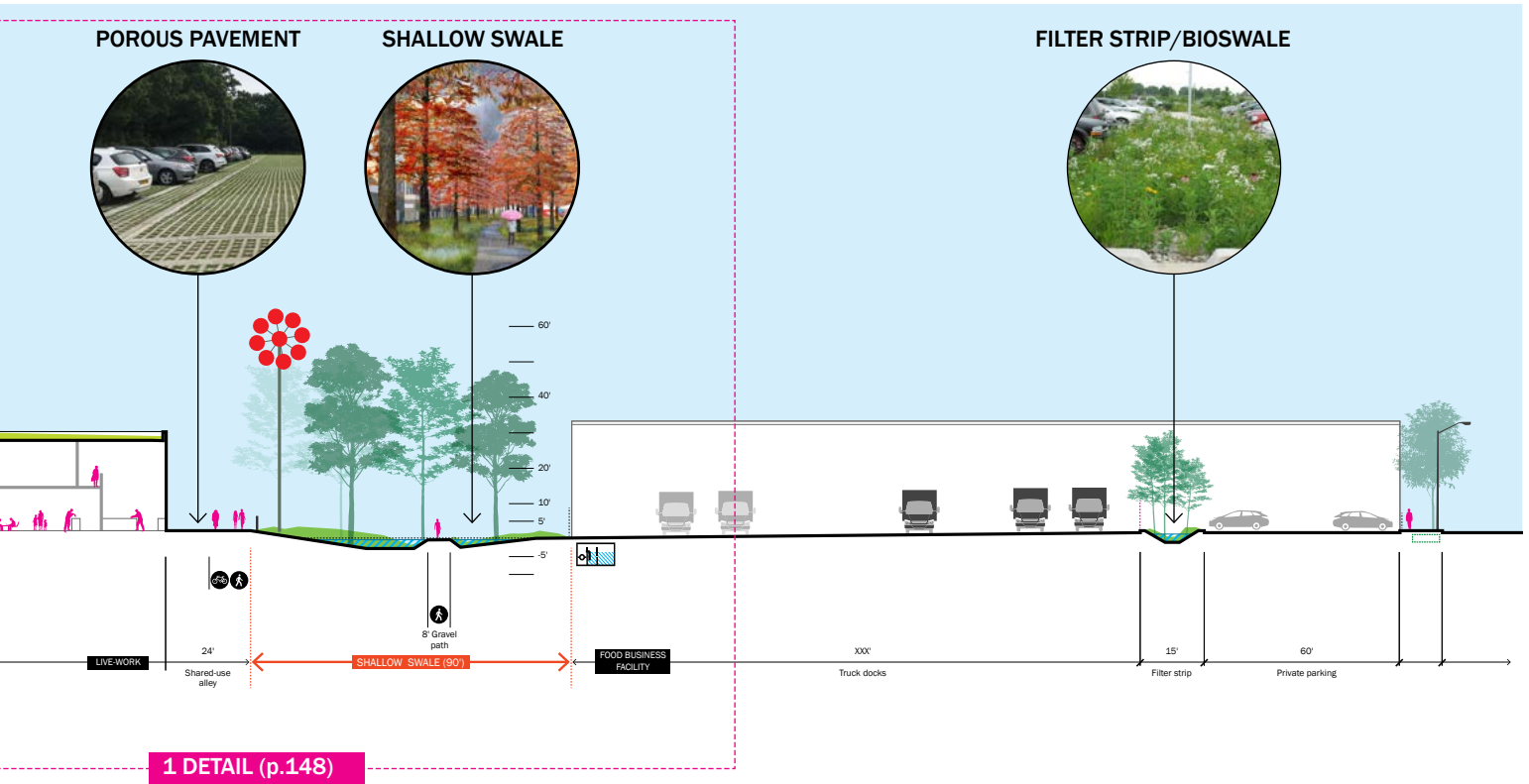
See the Stormwater Management Network Plan on page 138 for the location of this section.



Site Section 2

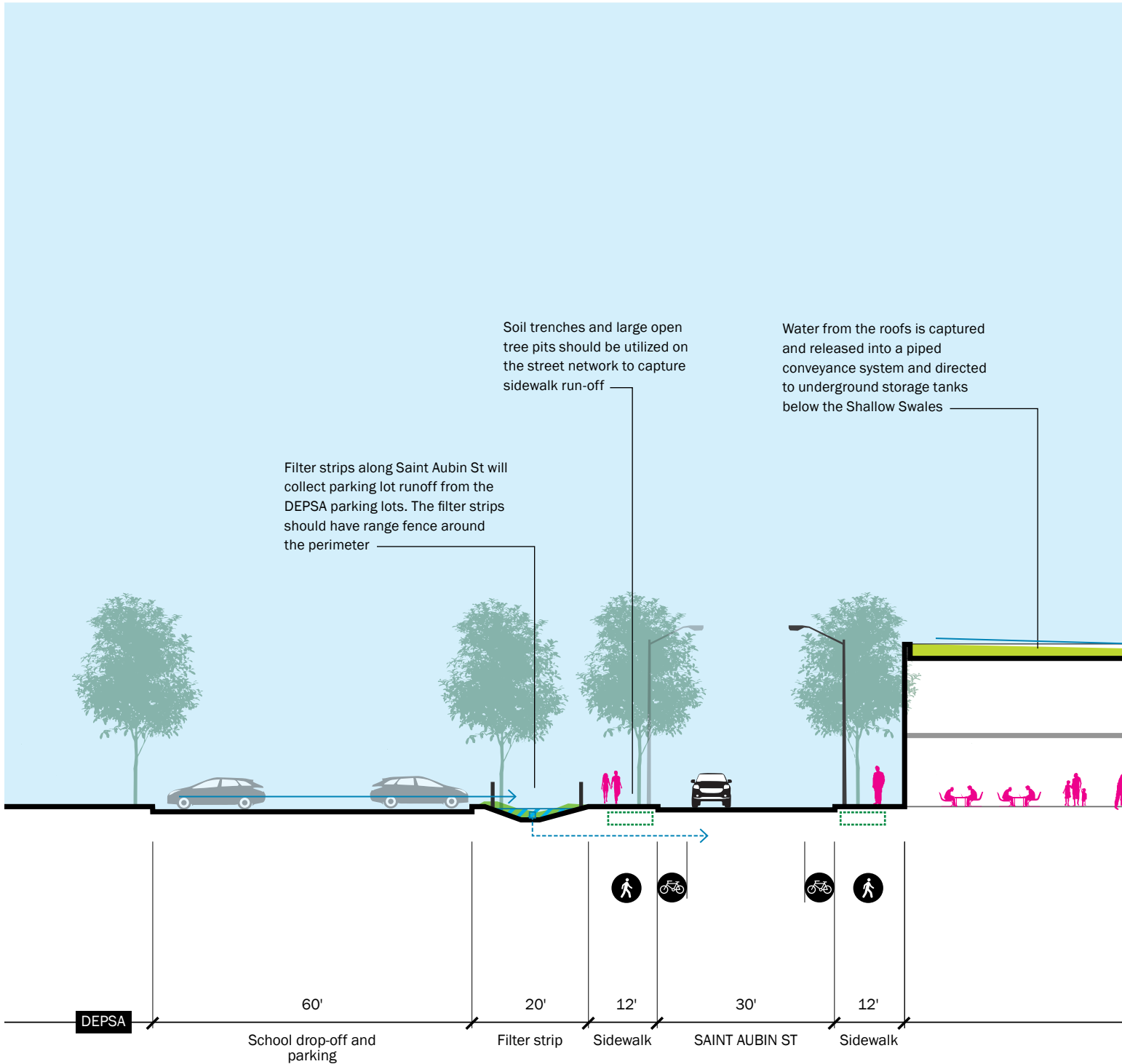
See the Stormwater Management Network Plan on page 138 for the location of this section.

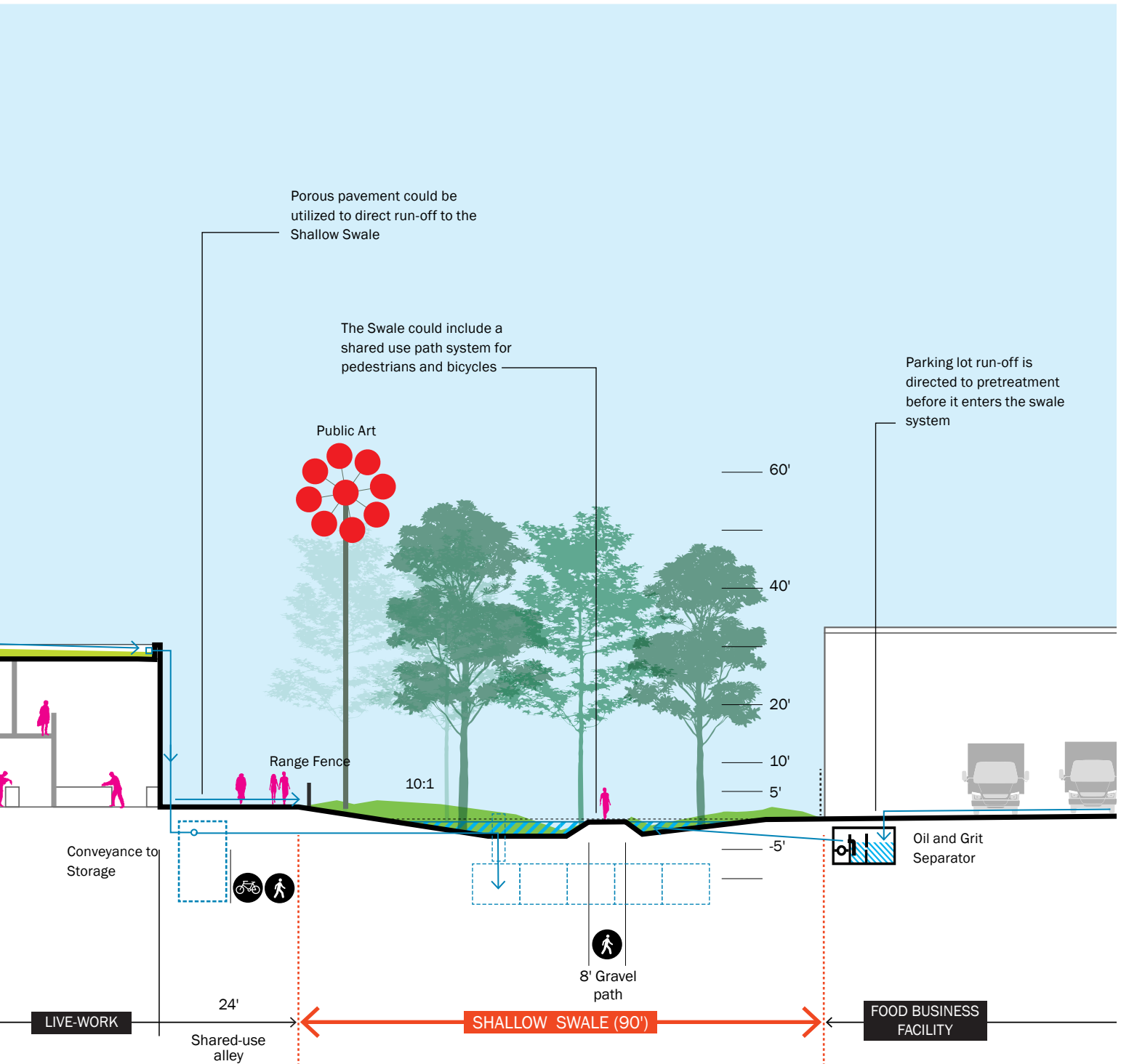




Detail of Site Section 1

See Site Section 1 on page 148 for the location of this section.

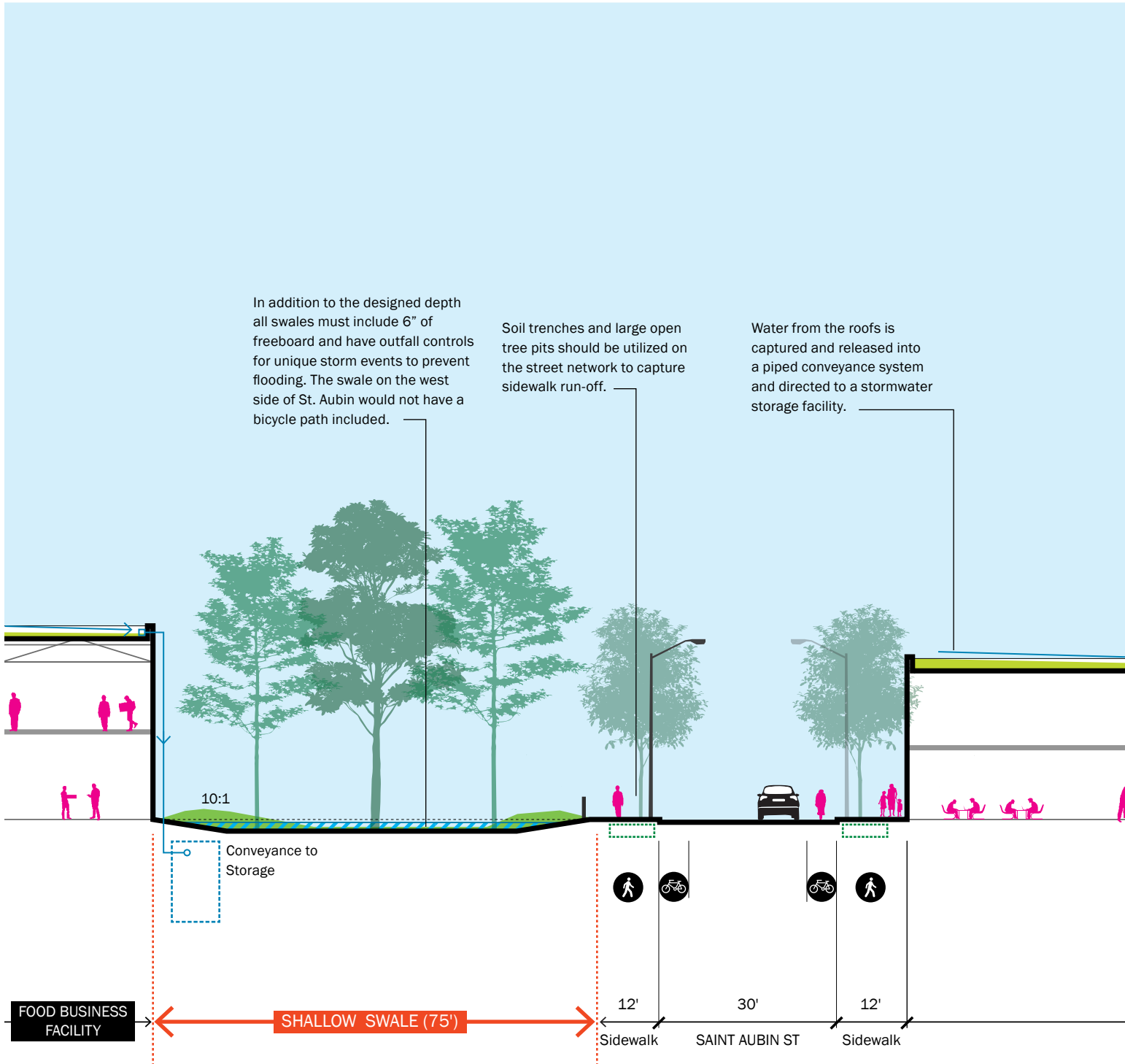


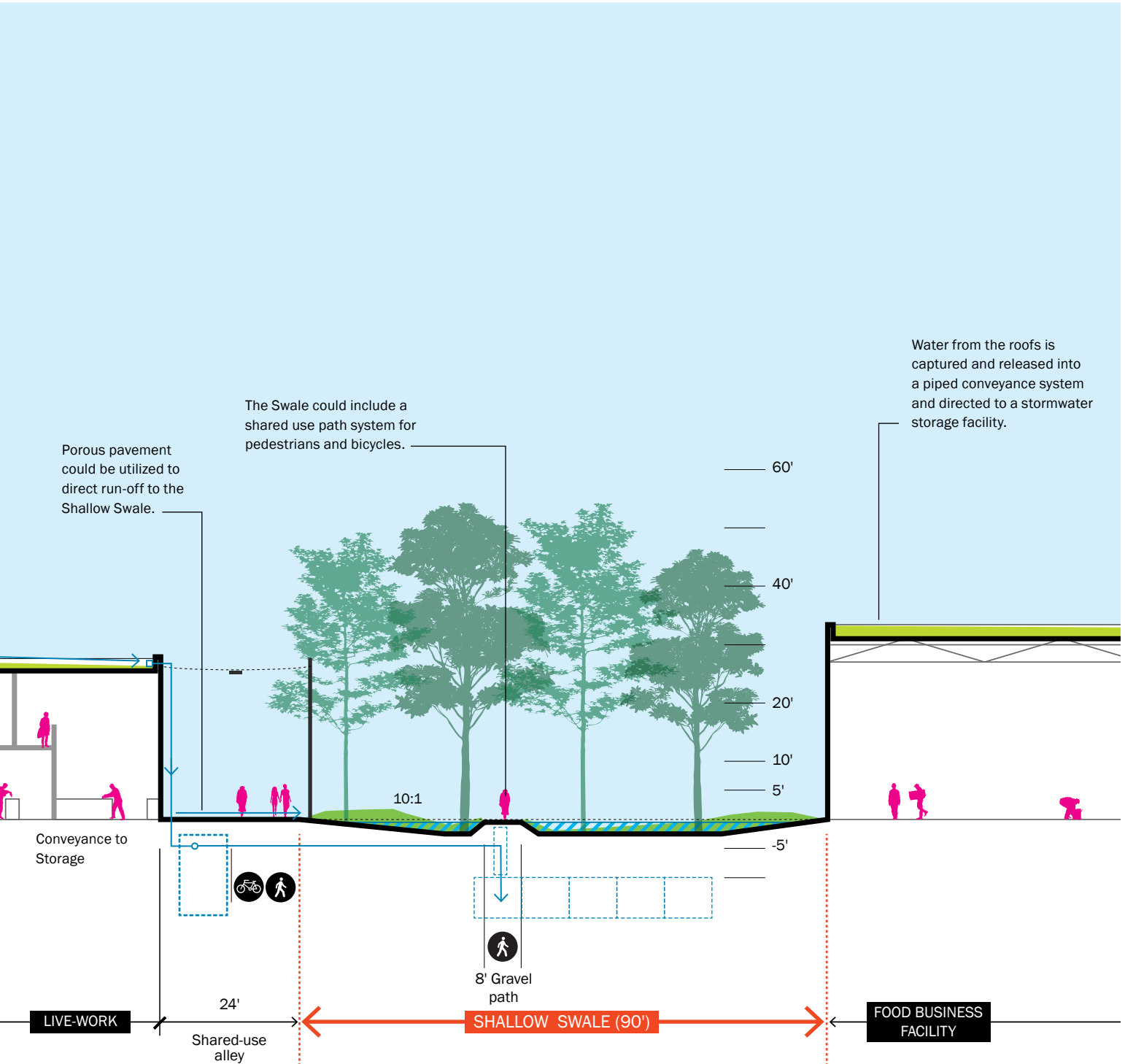


The blue hatch in the shallow swale depicts stormwater that will be held for a short time after rain events. Typically the swale would be dry.

Detail of Site Section 2

See Site Section 1 on page 148 for the location of this section.





The blue hatch in the shallow swale depicts stormwater that will be held for a short time after rain events. Typically the swale would be dry.

Endnotes

- ¹ For more information on the proposed mobility routes for the GEM, see pages 58–9 and 73.
- ² For more information on the City of Detroit Post-Construction Stormwater Management Ordinance, see pages 132–3.
- ³ For more detailed information on existing public and open space in the GEM, see pages 36–9.
- ⁴ For more detailed information on brownfields, see Appendix B, available at <https://detroitmi.gov/departments/planning-and-development-department/central-design-region/eastern-market>.
- ⁵ For more information on the proposed block plan for the GEM, see page 64.
- ⁶ For more information on the linear tree groves, see page 128.
- ⁷ For more information on the proposed block plan, see pages 64 and 124.
- ⁸ For more detailed information on design guidelines than is provided in this section, see Appendix C, available at <https://detroitmi.gov/departments/planning-and-development-department/central-design-region/eastern-market>.
- ⁹ For more detailed information on primary and secondary tree species for the GEM greenways, see Appendix C, available at <https://detroitmi.gov/departments/planning-and-development-department/central-design-region/eastern-market>.
- ¹⁰ For more detailed information on design guidelines for ground cover species and maintenance than is provided in this section, see Appendix C, available at <https://detroitmi.gov/departments/planning-and-development-department/central-design-region/eastern-market>.
- ¹¹ See note 10 above.
- ¹² For more detailed information on the SWMNP Concept Scenarios than is provided in this section, see Appendix F, available at <https://detroitmi.gov/departments/planning-and-development-department/central-design-region/eastern-market>.
- ¹³ See note 3 above.
- ¹⁴ See note 12 above.
- ¹⁵ See note 8 above.
- ¹⁶ See note 8 above.
- ¹⁷ For more detailed information on this SWMNP Concept Scenario than is provided in this section, see Appendix F, available at <https://detroitmi.gov/departments/planning-and-development-department/central-design-region/eastern-market>.
- ¹⁸ See note 17 above.
- ¹⁹ See note 17 above.
- ²⁰ For more information on the path network, see page 128 and the greenway design guidelines in Appendix C, available at <https://detroitmi.gov/departments/planning-and-development-department/central-design-region/eastern-market>.
- ²¹ For more information on the linear tree grove and ground cover species, see page 128 and the greenway design guidelines in Appendix C, available at <https://detroitmi.gov/departments/planning-and-development-department/central-design-region/eastern-market>.

References

City of Detroit Stormwater Management Regulations

<https://detroitmi.gov/departments/water-and-sewerage-department/customer-care/stormwater-management-regulations>

City of Detroit Post-Construction Stormwater Ordinance

<https://detroitmi.gov/sites/detroitmi.localhost/files/2019-02/Ordinance%20-%20Post-Construction%20Stormwater.pdf>

City of Detroit Stormwater Management Design Manual

<https://detroitmi.gov/sites/detroitmi.localhost/files/2018-11/Stormwater%20Mgmt%20Design%20Manual%202018-11.pdf>

A Guide to the Non-Residential Drainage Charge

<https://detroitmi.gov/departments/water-and-sewerage-department/drainage-charge/nonresidential-drainage-credits>

A Guide to the Drainage Charge Credits

<https://detroitmi.gov/document/guide-drainage-charge-credits>



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