Advancing Municipal Water Quality Protection through Green Infrastructure, Starting with Barriers in Local Codes & Ordinances

A MULTI-YEAR COLLABORATIVE EFFORT LED AND FUNDED BY:

1000 FRIENDS OF WISCONSIN

ORION PLANNING+DESIGN

MILWAUKEE COUNTY

sweet water
SOUTHEASTERN WISCONSIN WATERSHEDS TRUST, INC.

cleanwisconsin

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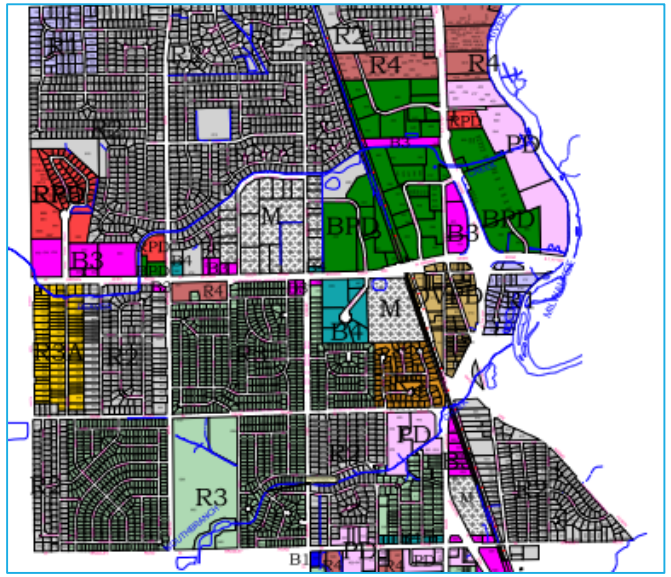
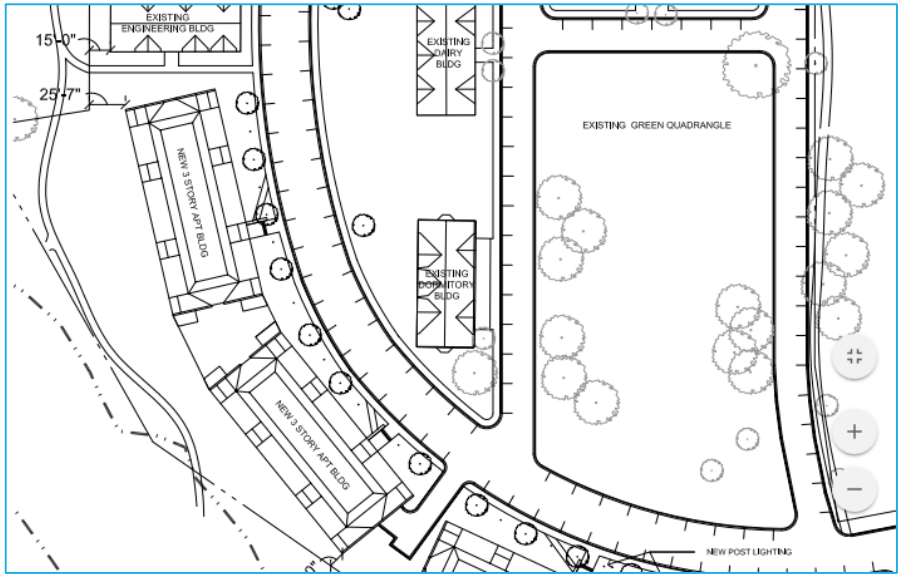
MMSD
PARTNERS FOR A CLEANER ENVIRONMENT





MODELING THE WATER QUALITY IMPACT OF CODE & ORDINANCE CHANGES

CLEAN RIVERS – CLEAN LAKE CONFERENCE 4/28/16

JULI BETH HINDS, AICP – ORION PLANNING & DESIGN

STEVAN KEITH, PE – MILWAUKEE COUNTY

Oh boy! More pictures of plants in parking lots!

GREEN INFRASTRUCTURE:

Enough with the pictures!

For purposes of this presentation: “Green Infrastructure” means…

Stormwater management measures OTHER THAN ponds that involve vegetation, PLUS permeable surfacing

Planter Boxes

Bio-retention

Permeable Surfacing

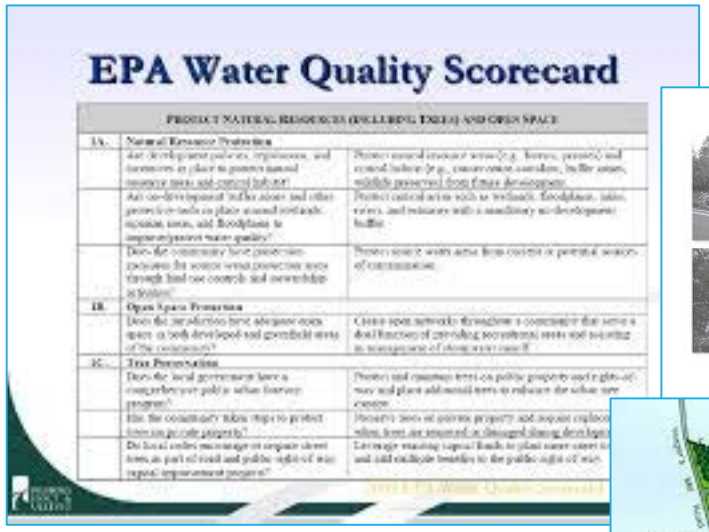
Green Walls

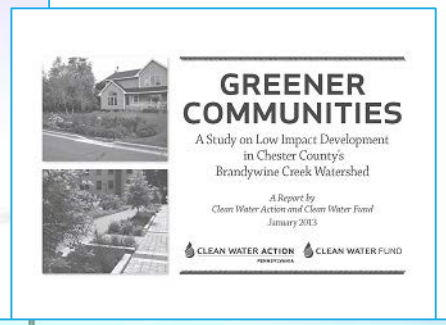
Deep Rooted Plantings

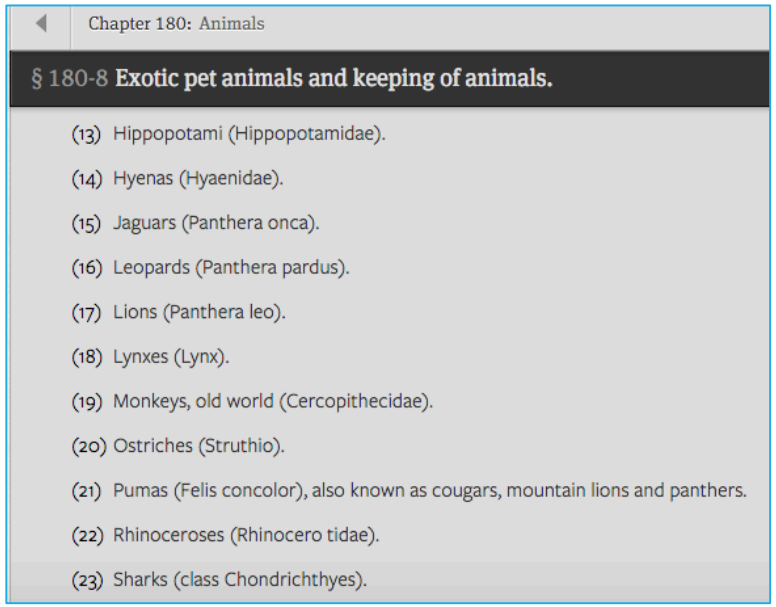
Infiltration Swales

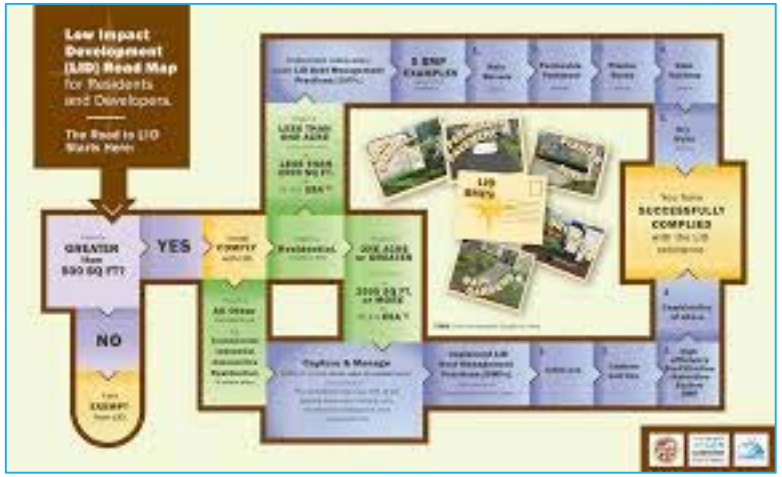
Rainwater Harvesting

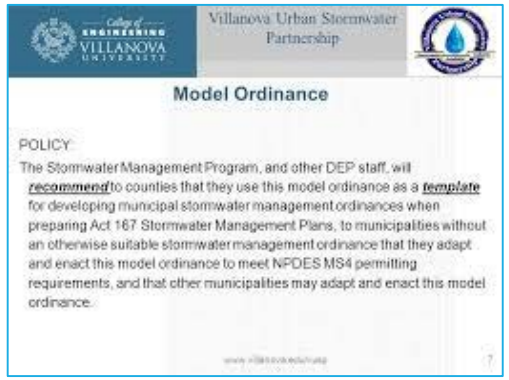
Oh boy! More guidance documents with sample language!











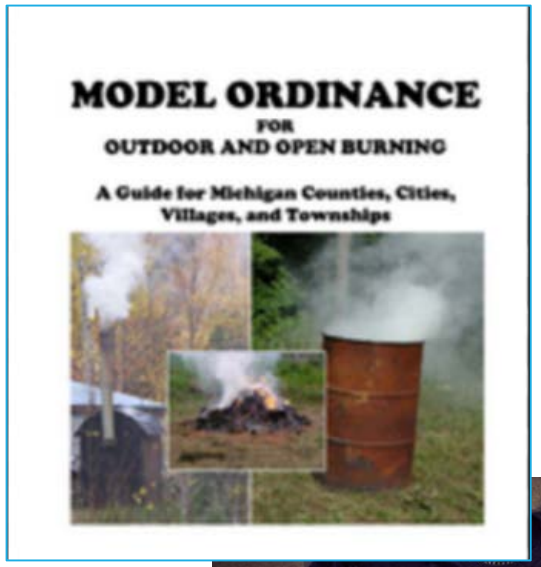
CODES & ORDINANCES:

Enough with the 'model regulations' and 'scorecards'!

Lots of pictures and words, but not so many answers that matter for WI municipalities:

- **What are the TSS and volume reduction benefits of using green infrastructure practices in redevelopment projects**
  - **ON ACTUAL SITES IN SOUTHEAST WISCONSIN**
  - **IN OUR COMPLICATED GLACIAL SOILS**
  - **UNDER THE ZONING REGULATIONS IN PLACE – OR MODIFIED IN WISCONSIN-MUNICIPAL-ESE, NOT BASED ON SOME 'MODEL CODE' FROM ANOTHER STATE WITH LIMITED APPLICABILITY HERE**
  - **USING WinSLAMM and NR 151/NR 216 STANDARDS**

- *In other words, **if our municipality adopts code changes and uses green infrastructure practices, how far do we get toward our water quality (TMDL?) goals?***



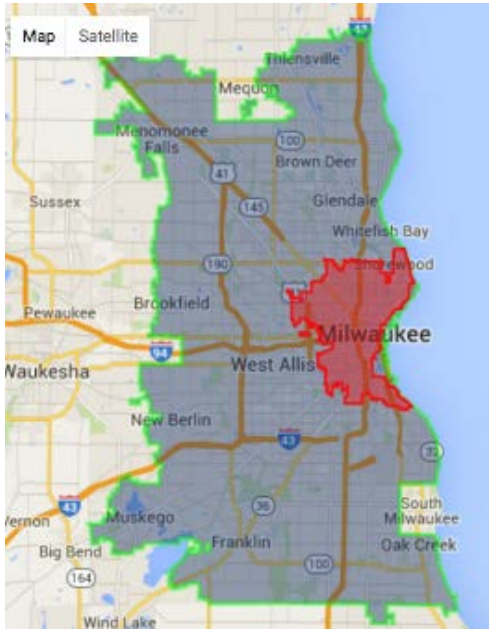
Model ordinances make excellent fuel

MMSD Green Infrastructure Codes & Ordinances Project

2012–2016, Multi-phase effort of MMSD, 1000 Friends of Wisconsin, Juli Beth Hinds, & Milwaukee County to ***identify and remove barriers to the use of green stormwater infrastructure practices in new development, redevelopment, and public projects in the MMSD service area***

Worked with and reviewed codes in all 28 MMSD municipalities:

- Reviewed all codes including many drafts in progress
- Met with engineering, planning/ development review staff
- Inventoried policies and specific provisions supporting or discouraging/preventing use of green infrastructure
- Drafted "redline" of code language in each community that would support the use of green infrastructure along with general water quality management practices
- And finally! **Modeled impact on TSS and volume of implementing one key, recommended code revision on a hypothetical redevelopment site or project in each community**



Key components of code review & meetings with municipal staff:

1. **STORMWATER STANDARDS:** THRESHOLD FOR MANAGEMENT, DESIGN STORM, VOLUME CREDIT FOR GSI, DEFINITIONS OF GSI

**Some review land disturbance below MMSD/DNR thresholds; larger/smaller design storm*

2. **LANDSCAPING**: BUFFERS/SCREENING, BERMS, TREES, TURFGRASS, NATIVES, GRASS > 8”

3. **PARKING LOTS**: REQUIRED NUMBER OF SPACES, DIMENSIONS, LANDSCAPING & CONFIGURATION

4. **SOURCE REDUCTION**: ANIMAL- AND FOOD RELATED USES, GAS/AUTO USES, TRASH & DUMPSTER MANAGEMENT

5. **PREFERENCES, EXPERIENCE WITH GI, AND “CIVIC HABITS”** (berms, ponds, permeable surfacing)

IMPORTANT ISSUES INCLUDE: Curbing, downspouts, landscaping, foundation plantings, driveways, surfacing, animal-related uses

Nightmare question from a boat guest:

"What happens if I pull this rope?"

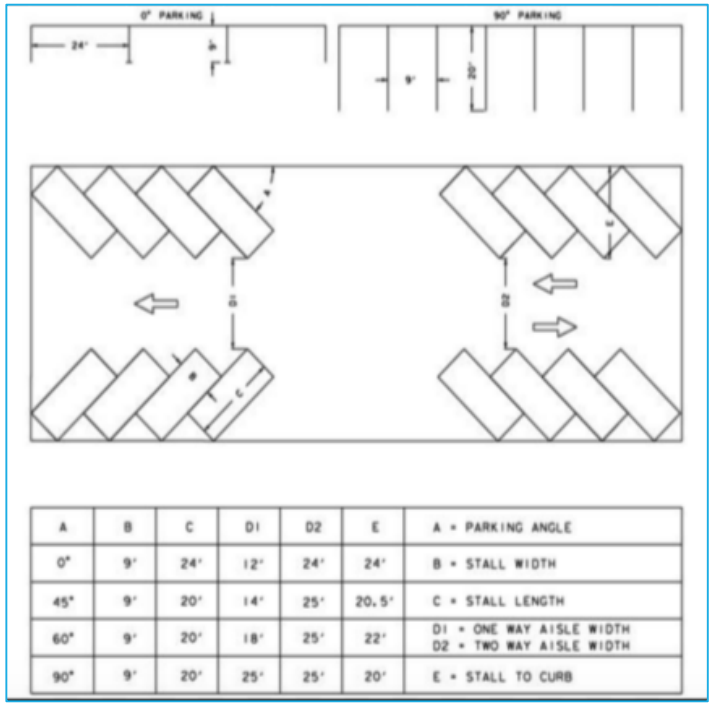
How do codes translate to stormwater volumes and pollutant loads?

Stormwater Ordinance:

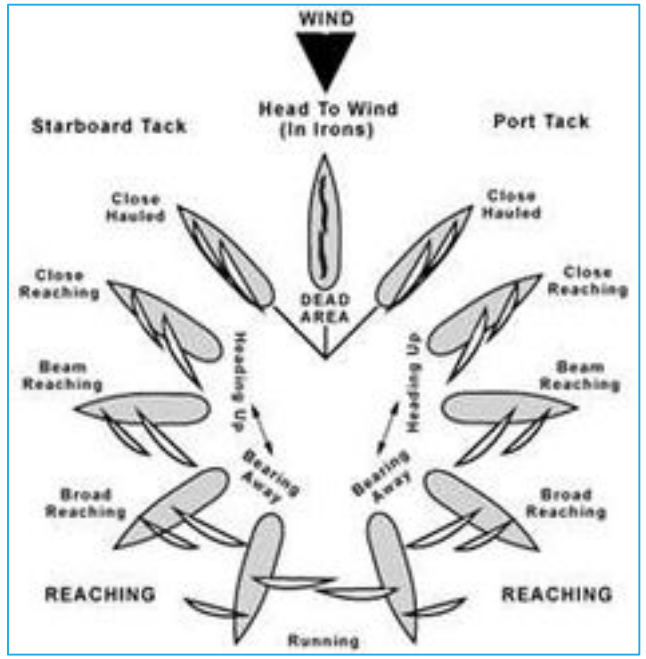
- What is the design storm?
- What are the volume/TSS management requirements?
- What BMPs can I use?

Zoning/DPW/Code Standards: HOW MUCH TOTAL IMPERVIOUS COVER must be constructed?

- Parking requirements
- Parking DIMENSIONS
- Roadway widths/dimensions
- Building standards, setbacks
- *Type, configuration, location, species of landscaping



A	B	C	D1	D2	E	A = PARKING ANGLE
0°	9'	24'	12'	24'	24'	B = STALL WIDTH
45°	9'	20'	14'	25'	20.5'	C = STALL LENGTH
60°	9'	20'	18'	25'	22'	D1 = ONE WAY AISLE WIDTH D2 = TWO WAY AISLE WIDTH
90°	9'	20'	25'	25'	20'	E = STALL TO CURB



Codes & standards translate to volume & load from development…*and* how much space is available:

Zoning & Code Requirements:

LAND USES

DENSITIES

PHYSICAL CONFIGURATION OF EACH SITE

Amount of Impervious Cover &

Pollutant Loads from the Impervious Cover

STORMWATER RUNOFF VOLUME TO BE MANAGED

POLLUTANT LOADS TO BE MANAGED

AREA OF SITE AVAILABLE FOR STORMWATER MANAGEMENT…before you're headed underground

TYPES OF SURFACE AREA/LANDSCAPE/ OPEN SPACE FEATURES AVAILABLE TO BECOME STORMWATER MANAGEMENT FEATURES, IF YOU USE GREEN INFRASTRUCTURE PRACTICES

Why?

- Required parking ratio: 1 space per 200 GSF of building
- Sharing with adjacent “power center” uses: Not permitted, parking for uses is additive
- Space size for 90’ parking: 10’ x 20’
- Aisle width & configuration: two-way, 24’ wide
- Fire dept access: paved alley/access no more than 15’ from buiding façade on all four sides of building
- Permeable surfacing: Not permitted
- Landscaping: Trees, parking lot islands not required; foundation plantings in specific strip along building facade

MODELING QUESTION: What is the net reduction in volume and TSS if some or all of the associated code changes are adopted?

Why?

- Larger design storm required
- Landscaping standard requires shrubs/ trees to be spaced every 15’ along all interior roadways
- *Code does not permit or “count” stormwater treatment towards required landscape areas, and vice versa
- Pond design requires shallow slope, mowed grass along edges
- “Dense evergreen buffer” between non-residential and residential uses

MODELING QUESTION: Could “dense evergreen buffer” be modified to provide treatment and control? How much control could be provided if required landscape areas receive sheet flow?

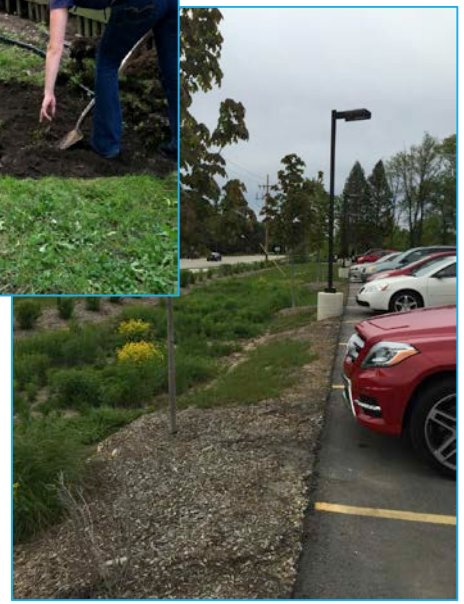
Modeling Code Change Impacts: Not Why, but How Much Less

What are the water quality outcomes if codes are changed and sites are re-developed under the amended standards?

1) Chose an important code recommendation OR municipal GI initiative in each community
2) Selected a site in the same municipality where application of the recommended code change or GSI practice could be modeled
3) *Assume* a municipal project, or substantial redevelopment occurs on the site that triggers stormwater management plan requirements
4) Run WinSLAMM model to look at volume and TSS load change from existing conditions

WinSLAMM Model Assumptions

- All practices were modeled with WinSLAMM Version 10
- All bio-retention practices were modeled with the same geometry
- Bio-retention specifications:
  - GIS layer used for soils to determine infiltration rates; if data not sufficient, clay assumed
  - One 6” drain tile underdrain; vertical standpipe, broad crested weir.
  - 24” of engineered soil (75% sand/25% compost)
  - 12” rock fill under engineered media



Code Change: Reduce size of parking spaces from 10’ x 20’ to 9’ x 18’ and reduce width of drive aisles from 25’ to 22’

14.24 F INSTITUTIONAL DISTRICT, REGULATION. In an F-Institutional District, no building may be erected or enlarged, and no exterior alterations shall be made to an existing building, except in conformity with the following:

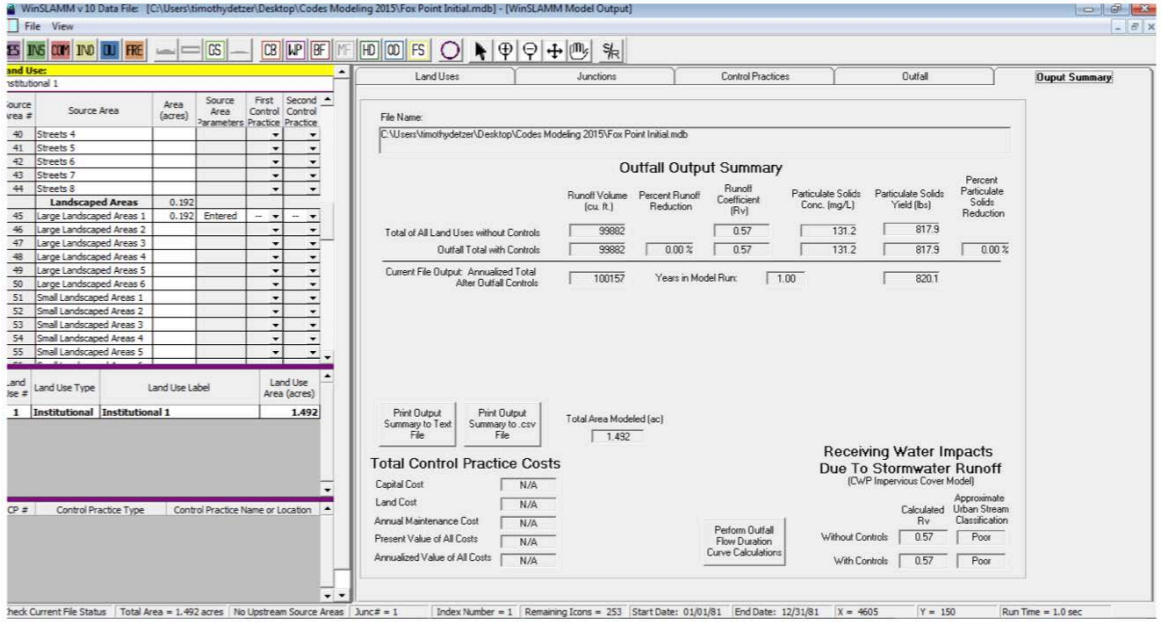
(2) Off-street parking areas shall be provided for nonresidential buildings subject to the following:

(a) At least ~~117 square feet of parking area~~ one parking space for every three seats shall be provided ~~for each seat~~ on the basis of the posted, or, (in the case of proposed construction), the proposed seating capacity for a church, club, lodge, or hall for assembly. The parking square footage includes the area used for parking stalls and the driving areas between and at the end of rows of parking areas; it excludes the driveways leading into the parking area from streets, structures, other parking areas etc. The dimensions for parking spaces shall be as follows: 9′ x 18~~9~~′ stalls, 22~~5~~′ wide aisles at 90 angle parking two way traffic; 9′ x 20~~21~~′ stalls, 18′ wide aisles at 60 angle parking one way traffic; and 9′ x 19~~20~~′ stalls, 14′ wide aisles at 45 angle parking one way traffic; 9′ x 18~~9~~′ stalls, 22′ wide aisles at 90 parking one way traffic.

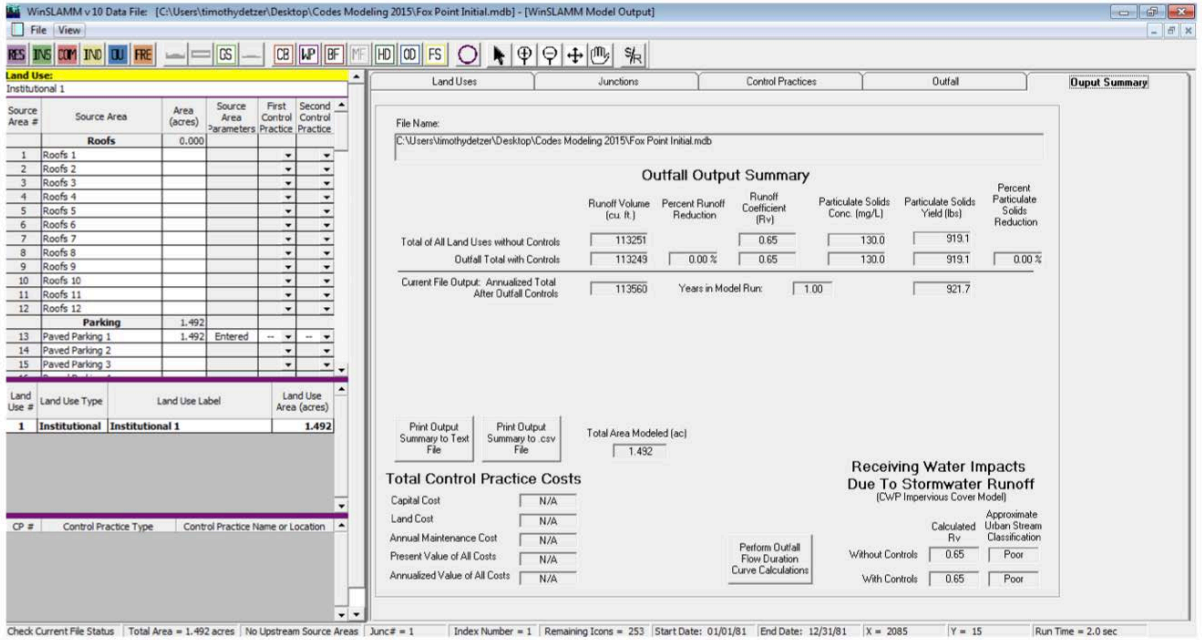
- Reduce stalls from 9x19 to 9x18
- Reduce aisle width from 25’ to 22’
- Replace paved areas with grass

Volume reduction: 11.8%
TSS reduction: 11%
(Proportional to reduction in total surface area of parking lot)

Existing Condtition



Proposed condition with pavement reductions



Code Change: Incorporate bio-retention and permeable surfacing as parking lot runoff treatment

16.07 DISTRICT 4 - CHURCHES, PUBLIC BUILDINGS AND GROUNDS

18.05MINIMUM STANDARDS.

(7) YARDS. Yards shall be kept substantially clear of debris and shall be provided with adequate lawn, ground cover, vegetation, hedges, bushes, or other vegetation, maintained as necessary to create a neat and attractive appearance. To the extent practicable, yards shall be kept free of noxious weeds as identified in Sec. 66.96 (2) Wis. Stats. **Except where native plantings have been installed and such planting areas are demarcated with a mowed area, decorative fence, or other means,** All weeds and grasses shall be kept cut to a height not to exceed six (6) inches. The Village may cause all weeds and grasses in excess of six inches **not otherwise approved** to be cut and removed and any dead or overgrown brush to be removed and the cost thereof charged to the property under Wis. Stats. §66.60 (16), provided that the Building Inspector first provides written notice to cure the condition to the property owner, at the property taxpayer's address, at least five (5) days in advance. (Ord. 1627)

(3) PROVISIONS FOR OFF-STREET PARKING

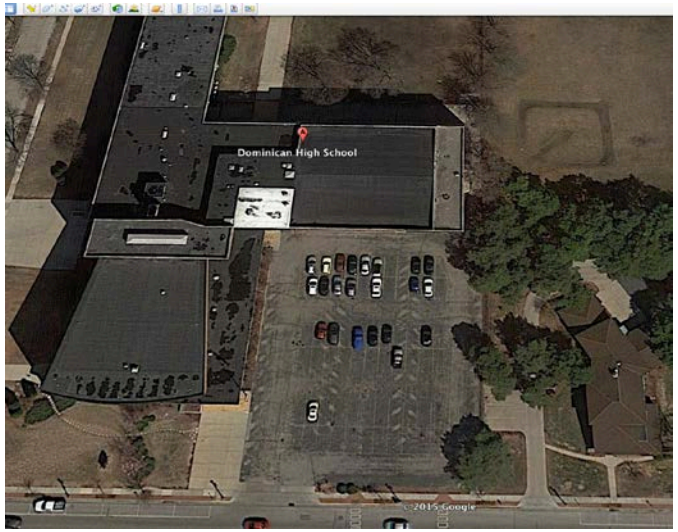
Secondary schools and colleges-universities shall **adhere to the standards for screening in Section 16.095(1)(a) (4) through (6) and shall** provide off-street parking in accordance with the requirements of Section 16.095 as follows:

16.095 DISTRICT 7 - AUTOMOBILE PARKING DISTRICT

(1)(a) 4. The premises shall be screened from any public street upon which it abuts or from adjoining residential property, except for openings for access or egress (1) by a wall, opaque fence, or chain wire fence located in compliance with setback requirements and adequately screened by a substantial growth of shrubbery, or (2) by a substantial growth of shrubbery; not to exceed 3' in height, in either case within 10' of entrances and exits. [CONSIDER ADDING] **Vegetated stormwater management measures and "green walls" are encouraged to be incorporated into such landscape screening areas provided sufficient visual screening is achieved by the combination of measures proposed.**

5. The premises shall be provided the smallest number of entrances and exits consistent with efficient and safe traffic movement, the width, number and location of which shall be approved by the Village Manager.

6. ~~All setback areas and side yards not devoted to shrubbery screening shall be adequately sodded and maintained as lawn.~~ [CONSIDER REVISION with reference to a "natural lawn" procedure if one is developed **Setback areas and side yards shall be kept in a landscaped condition. Landscaping may include vegetated stormwater management measures and native landscaping, provided any rain garden or native grasses in front yards are planted and maintained per 18.05(7) of the Village Code.**]



Runoff (volume) reduction:

Step 1	**22.39%**
Steps 1 + 2	**42.2%**

TSS reduction:

Step 1	**40.85%**
Steps 1 + 2	**79.98%**

- Increase depth of landscaping along E. Silver Spring to 8' and make bio-retention per DNR specs
- Increase width of landscaping along building at north end of parking to 6' and make bio-retention;
- As second step, make stalls permeable; keep aisles standard.

Important Assumptions:
Modeled parking lot only, not entire site

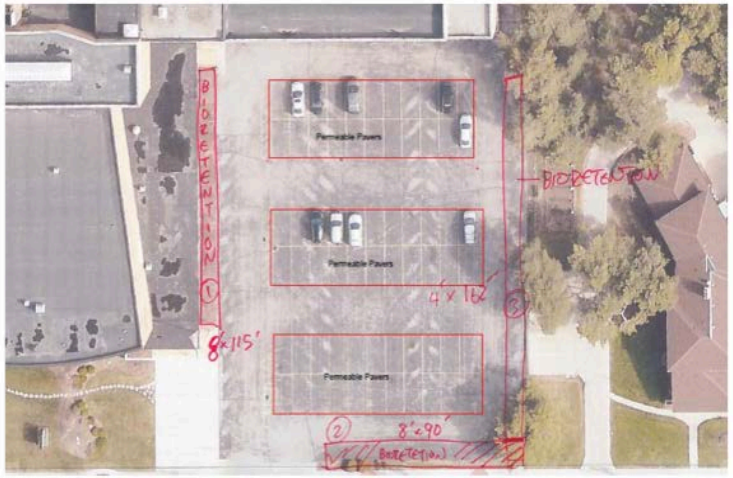
Step 1: Added 3 bio-retention areas; ran w/ bio-retention as only BMP

Step 2: Parking lot modeled with permeable pavers in parking stalls only (not aisles)

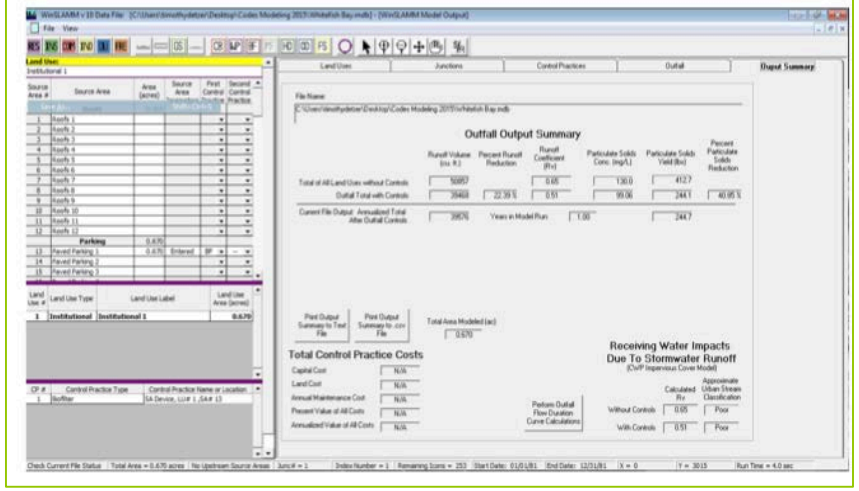
<u>Bio-infiltration only:</u>
Runoff (volume) – 22.39%
TSS – 40.85%

<u>Pavers only:</u>
Runoff (volume) – 42.2%
TSS – 79.98%

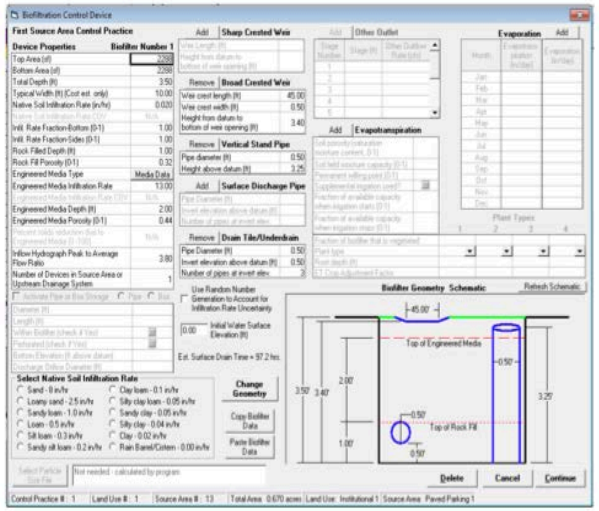
Modeled only the parking lot, not the entire site. Three bioretention areas were added. The model war run with bioretention as the only BMP. The parking lot was then modeled with permeable pavers as the sole BMP. Finally, both BMPs were modeled together assuming all stormwater would be treated by both practices.



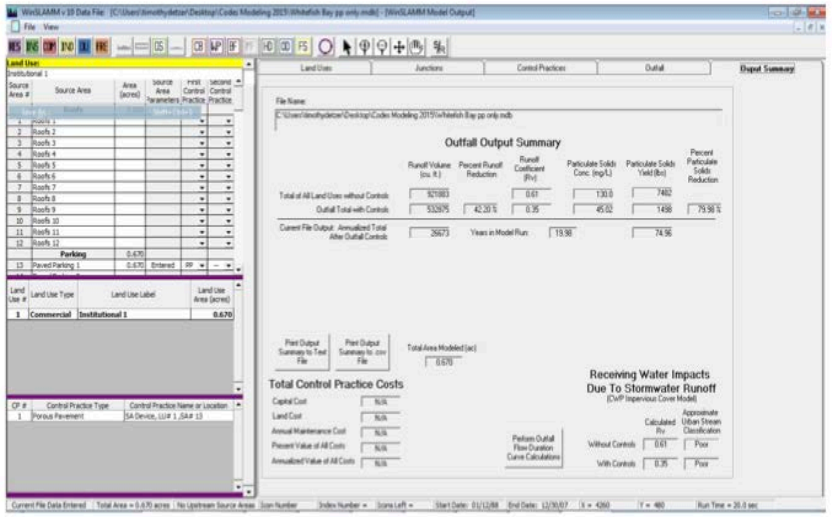
Bioinfiltration only
Runoff Reduction 22.39%
TSS Reduction 40.85%



Bioinfiltration Details



Permeable Pavers Only (20-year run)
Runoff Reduction 42.2%
TSS Reduction 79.98%



Code Change: Allow foundation-level planter boxes with underdrain to stormwater system

§ 535-6. Definitions and word usage.

PLANTER BOX

A structure with vertical walls and an open or closed bottom, which may be attached to a building or structure, that is planted with a soil medium and vegetation intended to collect, absorb and treat runoff from impervious surfaces.

§ 535-32. Yards.

A. The yard requirements stipulated elsewhere in this chapter may be modified as follows: (2) Architectural projections, such as eaves, planter boxes, and building ornamentation, may project into any required yard, but such projection shall not exceed 18 inches.

415-18 (B) Stormwater.

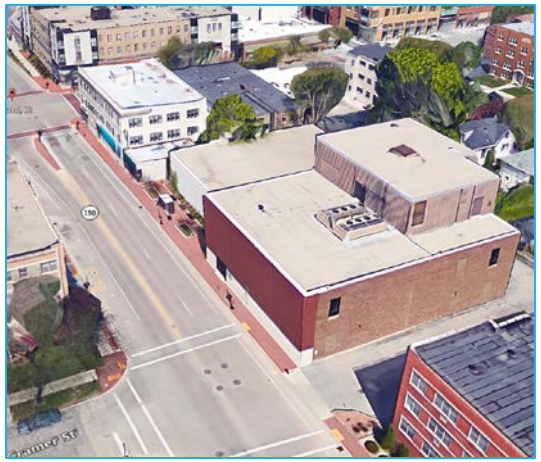
(1) Except as provided in Subsection **B(2)**, water from such leaders shall not be allowed to discharge upon the streets, sidewalks or adjacent premises but shall be conducted by proper pipes to the sewer, a rain garden sited and installed in accordance with MMSD or Wisconsin Department of Natural Resources guidance, or to a rainwater harvesting or other stormwater management system

Blank, unarticulated walls along active pedestrian streets are prohibited.

- A change in materials or stepbacks (from 6 inches to 10 feet) shall be incorporated to articulate the ground or first floor from upper floors. Stepbacks and patios can also be incorporated on upper floors to further articulate the building.
- Storefront facades shall be horizontal, contiguous, and harmonious with adjacent and facing structures.
- Facade elements shall be utilized to provide a change in plane, creating interest in light and shadow. Facades shall be proportioned to respect the human scale.
- Facades shall be articulated to express vertical rhythm related to structural columns and bays.
- At least 60% of the first-floor primary facades (facades facing streets, plazas, and parking lots) shall be clear, non-tinted windows or entrances. At least 25% of upper floors shall be windows or doors. At least 25% of first-floor facades facing rear parking areas or alleys used by pedestrians shall be windows or doors.
- Metal security gates are not allowed.

ADD: Planter boxes and rainwater harvesting systems may be incorporated into building facade designs.

9.14

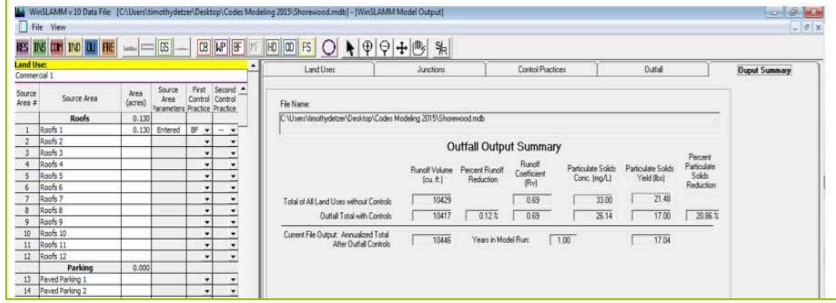


Add 18” wide, 36” tall planter box along façade of building at NW corner of Cramer and E. Capitol Drive; assume flow-through/underdrained to storm sewer.

Planter boxes were modeled as bioinfiltration basins with no subsurface infiltration.

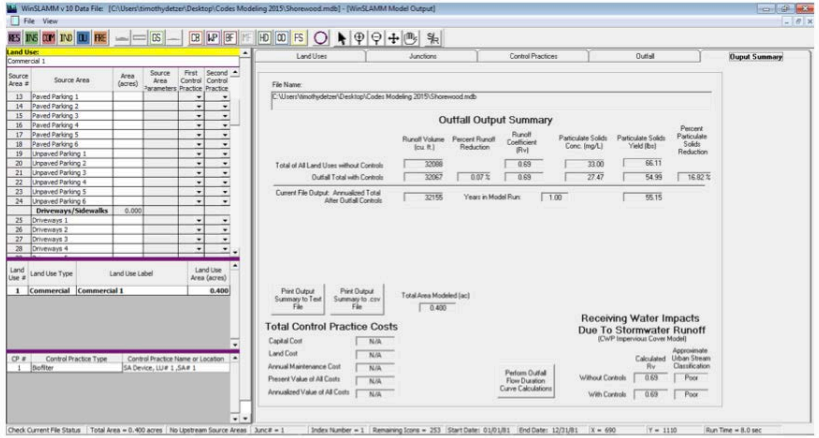
Model results with only Roof 1 directed to planter box. Results are for the roof only and does not include the rest of the site (parking areas etc.)

Runoff Reduction 0.12%
TSS Reduction 20.86%



Model results with only Roofs 1,2 and 3 directed to planter box. Results do not include the rest of the site (parking areas etc.)

Runoff Reduction 0.07%
TSS Reduction 16.82%



	Volume	TSS
Roof 1	0.12%	20.86%
Roof 1 + 2	0.04%	4.58%
Roofs 1, 2 + 3	0.07%	16.82%

- Chiefly dealt with roof runoff
- Modeled with NO subsurface infiltration
- Little runoff reduction but reasonable TSS
- Can be combined urban landscape/ filtration measure

Code Changes:
(1) Allow use of permeable surfacing in loading/circulation areas
(2) encourage use of bio-retention landscaping in parking lots
(3) reduce required parking ratio from 1/150 GSF to 1/250 GSF

Sec. 106-207. Off-street parking, "D," "D-1" and "E" districts.

(r) *Off-street loading.* There shall be provided off-street loading berths not less than the minimum requirements specified in this section in connection with any building, structure or use that is to be erected or substantially altered, and that requires the receipt or distribution of materials or merchandise by trucks or similar vehicles.

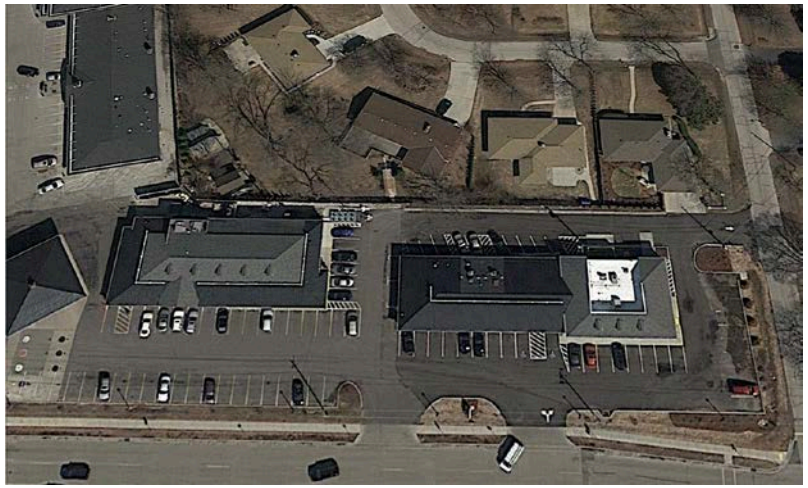
(3) *Surfacing.* All open off-street loading berths shall be improved with a compacted macadam base not less than seven inches thick, or equal, surfaced with not less than two inches of asphaltic concrete or some comparable all-weather, dustless material, which may include permeable surfacing, and shall be subject to approval of the village engineer.

(4) *Screening and landscaping.* All open off-street parking areas containing more than four parking spaces shall be effectively screened on each side adjoining or fronting on any residence district by a wall or fence not less than five feet high or more than six feet high, or a densely planted, compact hedge not less than five feet in height; and wheelstops of masonry, steel or heavy timber shall be placed no nearer than five feet from the street line in districts where a front yard is not required or from side lot lines. A combination of planting and fencing may be used to accommodate the co-design of screening and landscaping areas to provide stormwater management, so long as effective visual screening is provided.

(q) *Required spaces.* The minimum number of off-street parking spaces accessory to designated uses shall be provided as follows:

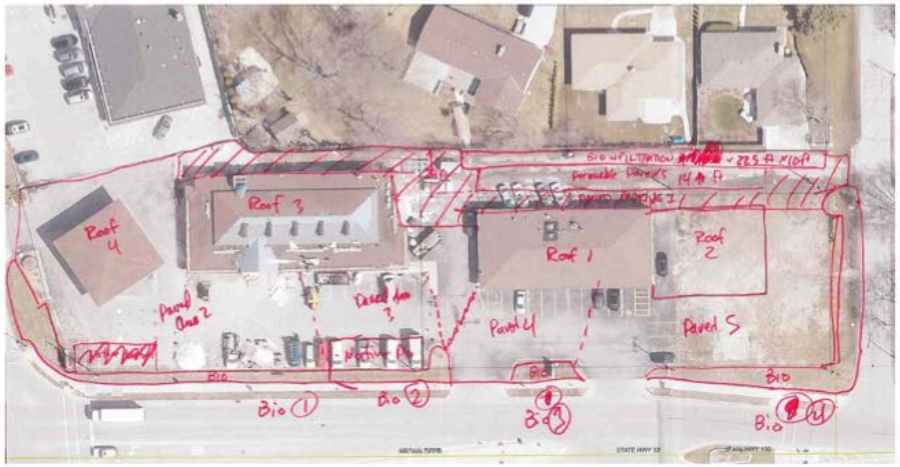
(4) *Business uses.*

n. All other business and commercial establishments, one parking space for each ~~150~~ 250 square feet of floor area.



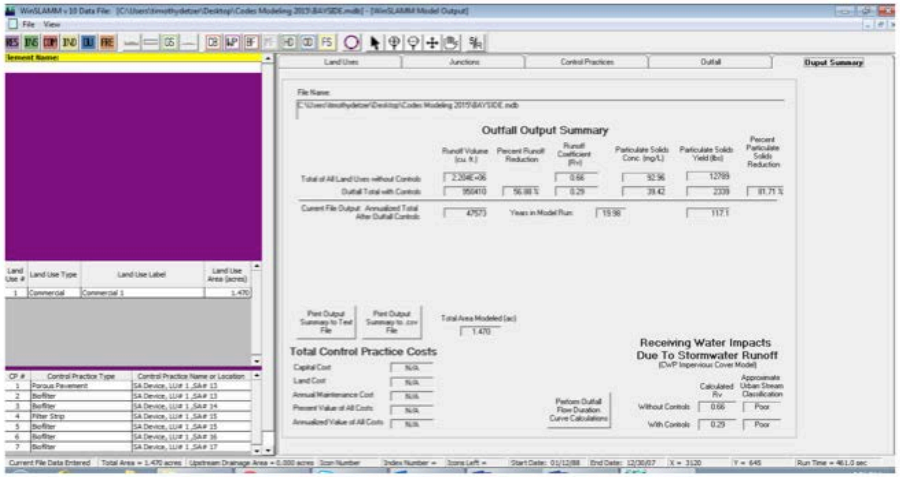
- Narrow rear exit lane to 14' from edge of parking stall; use remaining space between aisle to property boundary as bio-retention
- Make exit lane permeable for length of building
- Make islands along Brown Deer Road and N. Mohawk bio-retention

- Currently parked at 78 spaces for approximately 18,000 GSF (below zoning requirement of 1/150 SF or 120 spaces)
- If parked at 1/250 SF, would reduce requirement to 72 spaces
- Allows removal of 6 spaces facing Brown Deer Road & landscape with deep-rooted native plantings

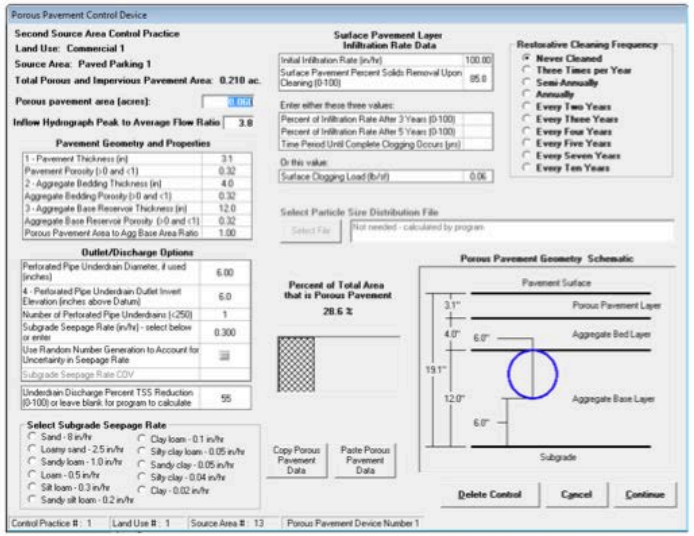


The entire site was modeled as a whole with five bioinfiltration areas, permeable pavers and a filter strip of native vegetation. Runoff from the site was divided among the practices. Runoff from certain areas would be expected to hit two BMPs. Runoff from the roof areas were directly connected and did not receive any treatment from the BMPs.

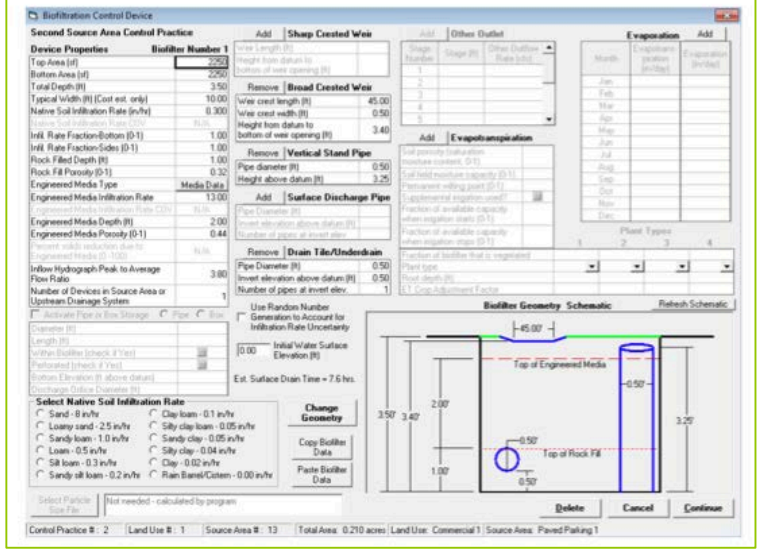
Runoff Reduction: 56.88%
TSS Reduction: 81.71%
Model Run: 20 years



Permeable Paver set up



Biofilter set up (all five were the same except for area)

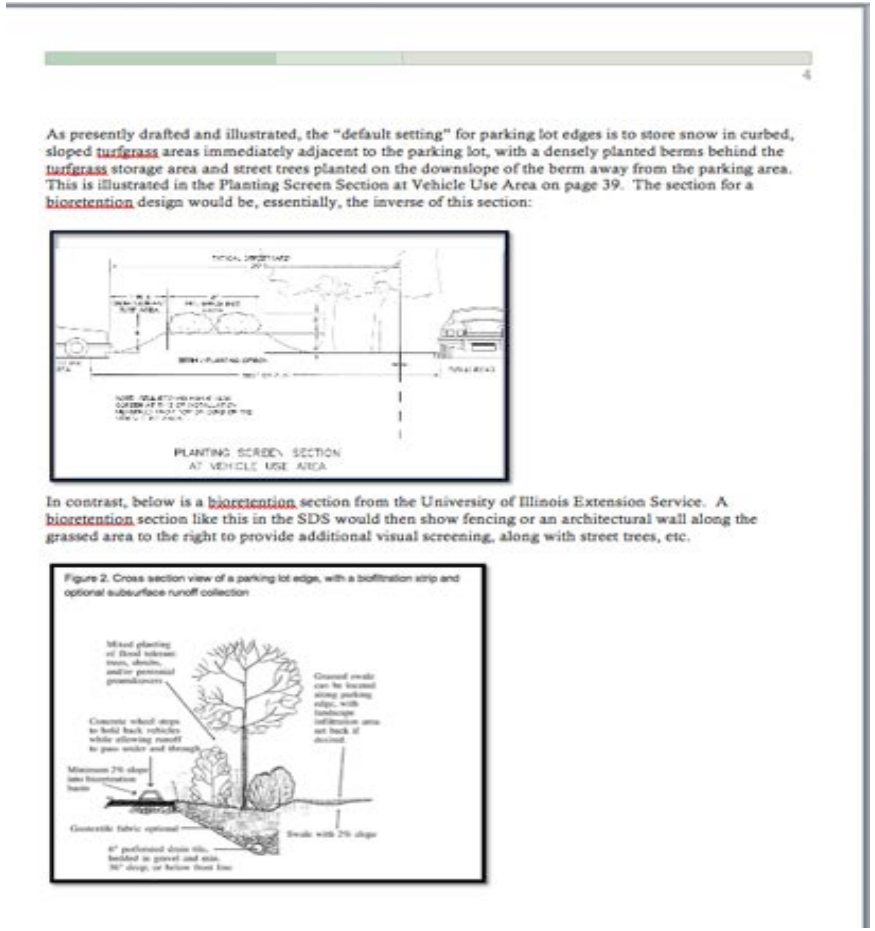


- Five biofiltration areas
- Permeable pavers in limited areas
- Filter strip of deep-rooted vegetation along rear (assume fence + deep rooted plants for screening)
- Some areas in 'treatment train' of two BMPs
- Roof runoff directly connected

Volume Reduction: 56.88%

TSS Reduction: 81.71%

Code Change: incorporate bio-retention into landscaping instead of berms & evergreens



4

As presently drafted and illustrated, the "default setting" for parking lot edges is to store snow in curbed, sloped turfgrass areas immediately adjacent to the parking lot, with a densely planted berms behind the turfgrass storage area and street trees planted on the downslope of the berm away from the parking area. This is illustrated in the Planting Screen Section at Vehicle Use Area on page 39. The section for a bioretention design would be, essentially, the inverse of this section:

PLANTING SCREEN SECTION
AT VEHICLE USE AREA

In contrast, below is a bioretention section from the University of Illinois Extension Service. A bioretention section like this in the SDS would then show fencing or an architectural wall along the grassed area to the right to provide additional visual screening, along with street trees, etc.

Figure 2. Cross section view of a parking lot edge, with a biofiltration strip and optional subsurface runoff collection

- Total drainage area: 324,172 SF (7.44 AC); silty/loamy soils
- Bio-retention area: 43,097 SF
- **% Runoff Reduction: 72.8%**
- **% TSS Reduction: 79.3%**

Code Change: Reduce minimum parking ratio, set maximum number of drive-through lanes

VILLAGE OF BUTLER
Zoning Code Section 13-1-92(k)
Option for changing parking ratios and adding shared parking provisions

(k) The Following Guide Specifies the Minimum Number of Parking Spaces Required

The reference herein to "the work shift with the largest number of employees" means the maximum number of full-time or part-time employees present at the facility at any one (1) time. For example, the largest work shift may be a particular day of the week, or a lunch or dinner period in the case of a restaurant. The reference herein to "maximum capacity" means the maximum number of persons which may be accommodated by the use as determined by its design or by applicable building code regulations, whichever is greater. In the case of structures or uses not specified herein, the number of spaces specified for a use which is similar shall apply. In developments involving the establishment of two (2) or more uses on one (1) lot or parcel, the number of spaces required for each use shall determine the total number of spaces required.

[PLEASE NOTE THAT 'EMPLOYEE MAX' BELOW IS AN ABBREVIATION FOR 'EMPLOYEES AT MAXIMUM SHIFT']

(1) Residential uses.

Use	Required Parking	Notes
Single-family and two-family dwellings	2.0 spaces per dwelling unit	*Rec. keeping current standard*
Multi-family dwellings	2.0 spaces per dwelling unit	ADD NOTE: For buildings with more than 8 units where all spaces are in common (i.e. not reserved) requirement is reduced to 1.2 per DU plus 1 per every 4 units.
Housing for the elderly	0.75 spaces per dwelling unit	*Rec. keeping current standard*

(2) Retail sales and customer service uses; places of entertainment.

Use	Required Parking	Notes
General retail sales and	1 per 200 SF Gross Floor Area	*Current standard 1/150 customer*

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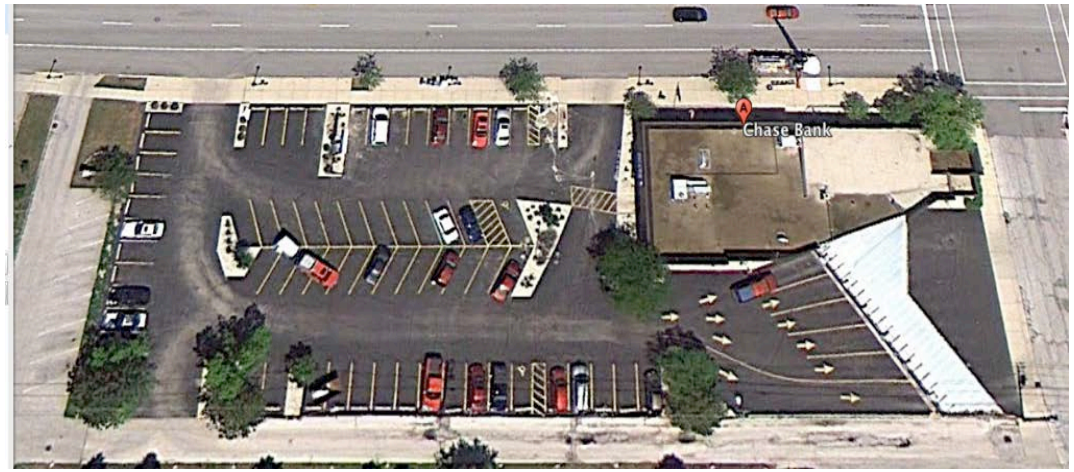

- Remove 2 drive-through lanes
- Park at 5.5 spaces/1000 SF = 44 spaces instead of 64
- Drainage area 33,000 SF; 5700 SF bio-retention

- **% Runoff Reduction: 48.0%**
- **% TSS Reduction: 60.4%**

Code Change: Allow use of permeable surfacing in alleys

(3) *Surfacing.* All driveways shall be surfaced ~~with an asphaltic or portland cement pavement~~ in accordance with Village standards and specifications so as to provide a durable and dustfree surface, and shall be so graded and drained as to dispose of all surface water. Permeable surfacing may be used upon review and approval by the Village Engineer.

- Drainage area: 25,000 SF
- Paver area: 5,600 SF

- Change alley to permeable surface:
  Runoff Reduction: 63%
  TSS Reduction: 63%

- Direct roof drainage to permeable area:
  Runoff Reduction: 93%
  TSS Reduction: 93%

Code Change: Enable shared parking, remove curbing requirement around parking lot landscaping areas

D. *Off-street parking requirements for mixed or combined uses located within the same building or on the same lot or parcel.* As a matter of policy the City of Greenfield finds that coordination of parking among mixed or combined uses is desirable to reduce the amount of paved surface on a site. Combinations of any of the uses set forth in Table 21.06.0203 ~~shall~~ may provide the total number of off-street parking stalls and/or queuing space required for each individual use, or may submit for Plan Commission approval a Shared Parking Analysis and Plan in accordance with the following:

1. A Shared Parking Plan shall be submitted with site plan showing a complete and accurate description of the proposed uses, the floor area dedicated to each use, and the distance from each use to the proposed parking area. Uses participating in the shared parking plan must be located with one-quarter (1/4) mile of the parking area.

2. A Shared Parking Analysis shall be presented showing the parking demand for each individual use by time period, in the form of a matrix. The time periods shall include a weekday morning,

E. *Concrete curb required for all off-street parking areas.* Concrete curb meeting City specifications shall be required for all off-street parking areas serving more than five (5) vehicles in all nonresidential zoning districts and in the MFR-1, MFR-2, MFR-3, and PUD Districts. This requirement shall also apply to the expansion of any existing off-street parking lot where the number of off-street parking spaces is increased by ten (10) spaces or more. Breaks, depressions or other inlets for stormwater flows are permitted where a landscaped area has been designed to function as a vegetated stormwater control measure, in conjunction with an approved Stormwater Management Plan.

- Impervious area decrease alone from shared parking:
  Runoff Reduction: 18%
  TSS Reduction: 16%
- Impervious decrease + 0.4 ac bio-retention:
  Runoff Reduction: 55%
  TSS Reduction: 66%

Code Change: Encourage use of bio-retention as required landscaping

i. All yards sodded or seeded on at least 4 inches of topsoil. Rain gardens as defined in this Chapter may be incorporated into lawn areas where planned and designed to receive drainage or runoff.

ii. Trees and shrubbery appropriate for the development, and according to the plan approved under subsection (a) above. The incorporation of amended soil areas, stormwater trees, and other vegetative stormwater control measures into landscaping plans is encouraged.

Parking Lot Landscaping.

1. Landscaping shall be provided on the perimeter and within the interior of all parking areas to provide screening, canopy cover, and stormwater treatment and control. The integration of vegetated stormwater control measures with parking lot landscaping is strongly encouraged. All landscaped areas shall be mulched or seeded in keeping with the overall landscaping plan. The Village may maintain a list of accepted species of trees and landscaping materials, including plants and trees suitable for use in vegetated stormwater control measures.

2. In parking lots, at least 5% of the interior parking area shall be landscaped with plantings, and one tree of a minimum 2-inch caliper, for each 10 spaces, all as shall be submitted and approved as part of the plan provided for herein above. Planting required within the parking lot shall be in addition to, and not in lieu of, other planting requirements, such as for street trees. The planting plan may be varied to accommodate the design of vegetated stormwater control measures, so long as the total number of required trees is met within the overall parking area. The use of deciduous trees (which may function as stormwater trees, as defined in this Chapter) is encouraged to provide canopy shading within parking areas. Each interior landscaped area shall be a minimum of 75 SF in size. [NOTE:

- Treat runoff using filter strips
- Total area 4.12 acres

- **% Runoff Reduction: 41%**
- **% TSS Reduction: 58%**

Project Takeaways:

- Implementing simple code changes can lead to significant TSS, volume benefits when redevelopment occurs
- *Expanding stormwater management requirements to require simple, “low-hanging fruit” approaches such as disconnection or changing turf to deep-rooted vegetation may be worthwhile
- We must expand our repertoire of landscaping techniques for screening: use of green walls, planting screens instead of berms, junipers, “dense evergreen hedges”
- Limited but STRATEGIC use of permeable surfacing is needed
- **CREDITING GI MEASURES FOR VOLUME AND AS REQUIRED LANDSCAPING IS CRUCIAL!

Thank you!

Questions & Discussion

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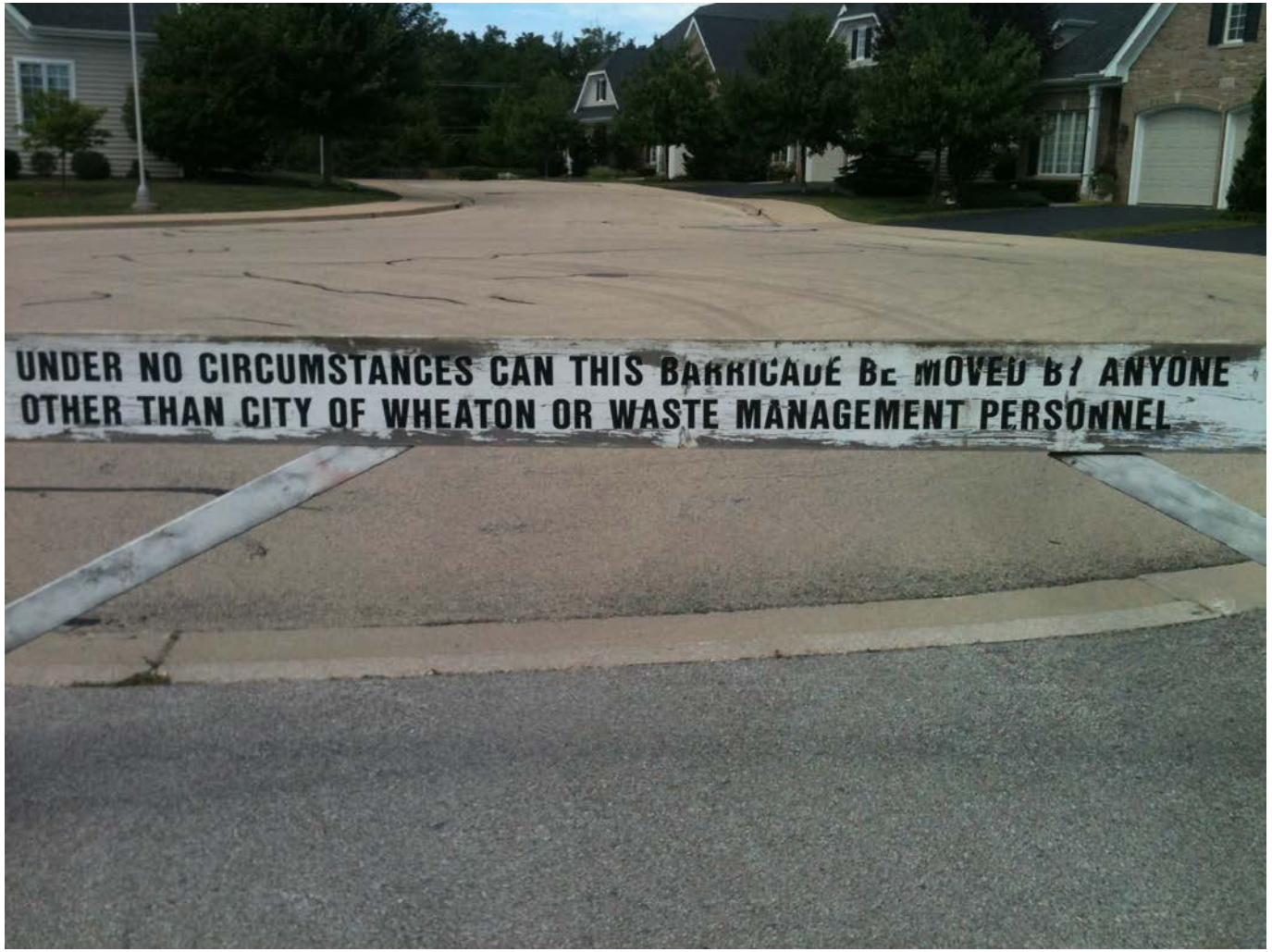

We are dedicated to removing barriers to green infrastructure