

The background is a light blue gradient. There are several realistic water droplets of various sizes scattered around the edges. A faint, large circular watermark is visible in the upper center of the page.

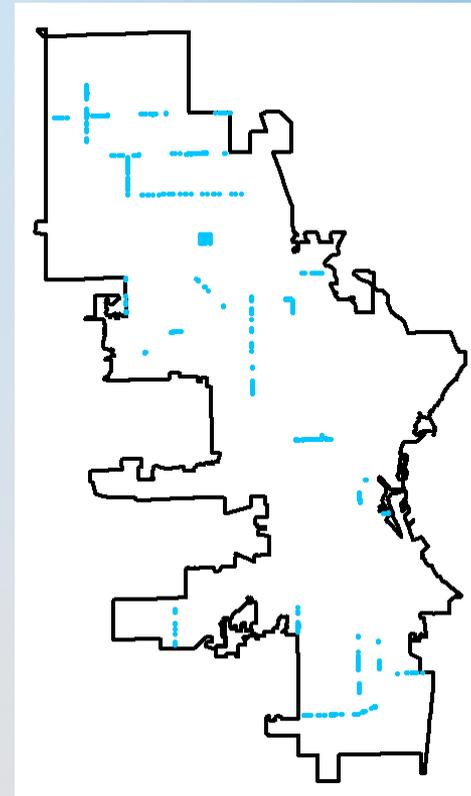
# Green Infrastructure Maintenance

# DISCUSSION TOPICS

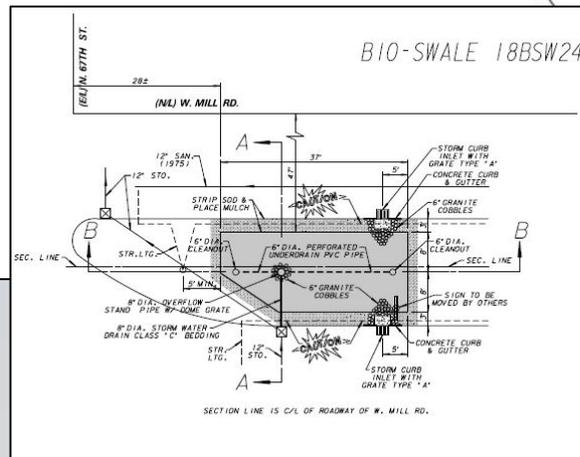
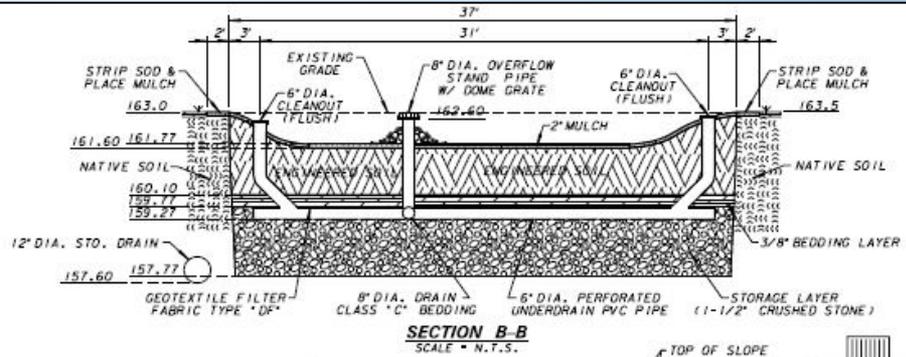
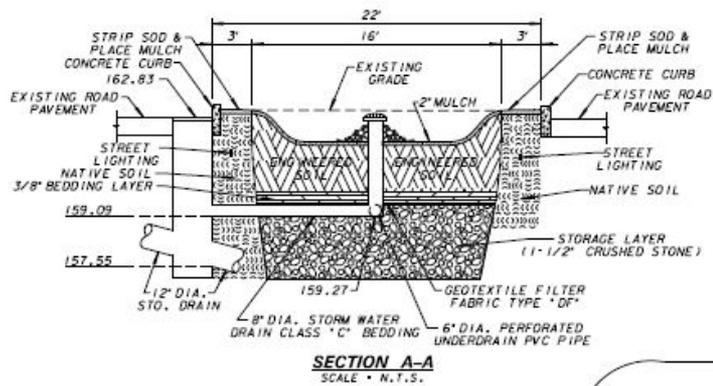
- Inventory of Existing GI
- Maintenance Challenges
- Maintenance Contracts
- Maintenance Costs

# INVENTORY OF EXISTING GI

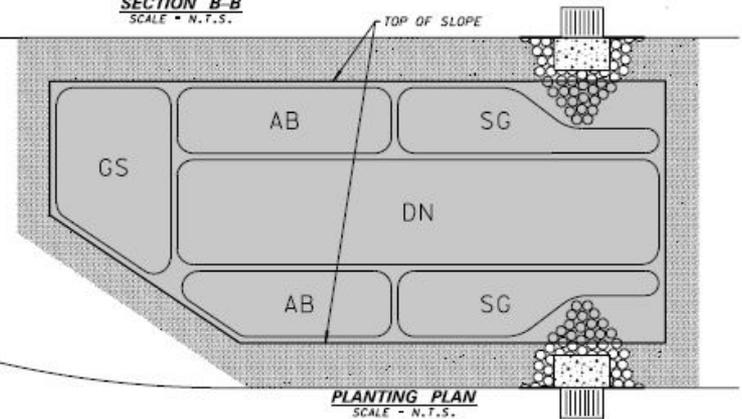
- 175 Bioswales
  - Over 240,000 square feet
  - 37 locations
  - 2.2M gallons stored
  - First constructed in 2009
  - Oldest still in place is 2010
  - Locations focus primarily on medians



# BIOSWALE PLANS AND DETAILS



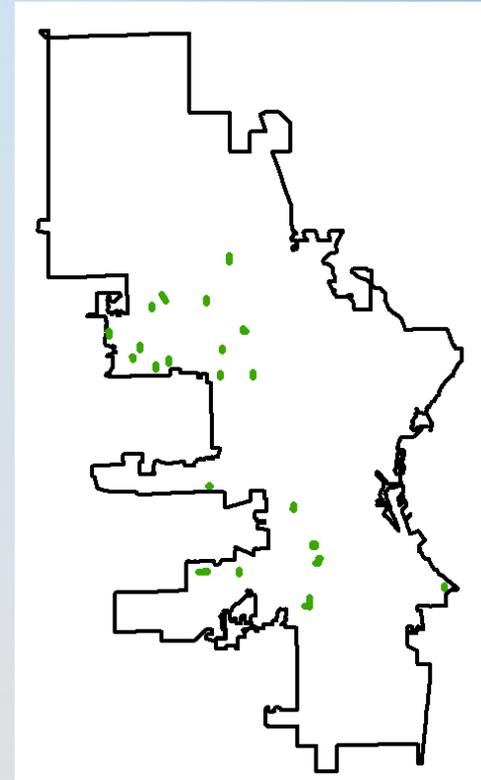
- (12) GS GROW LOW SUMAC
- (16) DN DIABLO NINEBARK - "SUMMER WINE"
- (60) SG INDIAN STEEL GRASS
- (67) AB AGASTACHE BLUE FORTUNE



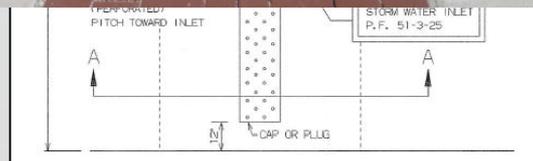
# INVENTORY OF EXISTING GI

## ○ 26 Green Alleys

- Over 51,000 square feet
  - Permeable Paver Section
- 1.6M gallons stored
- First constructed in 2011
- Typically installed as part of existing alley paving program
- 3 parking lots this year



# GREEN ALLEY PLANS AND DETAILS



# INVENTORY OF EXISTING GI

## ○ 3 Permeable Pavements

- Pavers in parking lanes
  - East Greenfield Ave
  - West Dakota Ave
  - Josey Heights



## ○ 94 Porous Sidewalks

- At end of residential driveways

## ○ 7 Retention Ponds

- Not exactly GI, but close enough



# MAINTENANCE CHALLENGES



# MAINTENANCE CHALLENGES

- Bioswale Damage

- Traffic



# MAINTENANCE CHALLENGES

- Bioswale Damage

- Humans



# MAINTENANCE CHALLENGES

- Bioswale Damage

- Contractor



# MAINTENANCE CHALLENGES

- Bioswale Damage
  - Contractor



# MAINTENANCE CHALLENGES

- Bioswale Damage

- Trash



# MAINTENANCE CHALLENGES

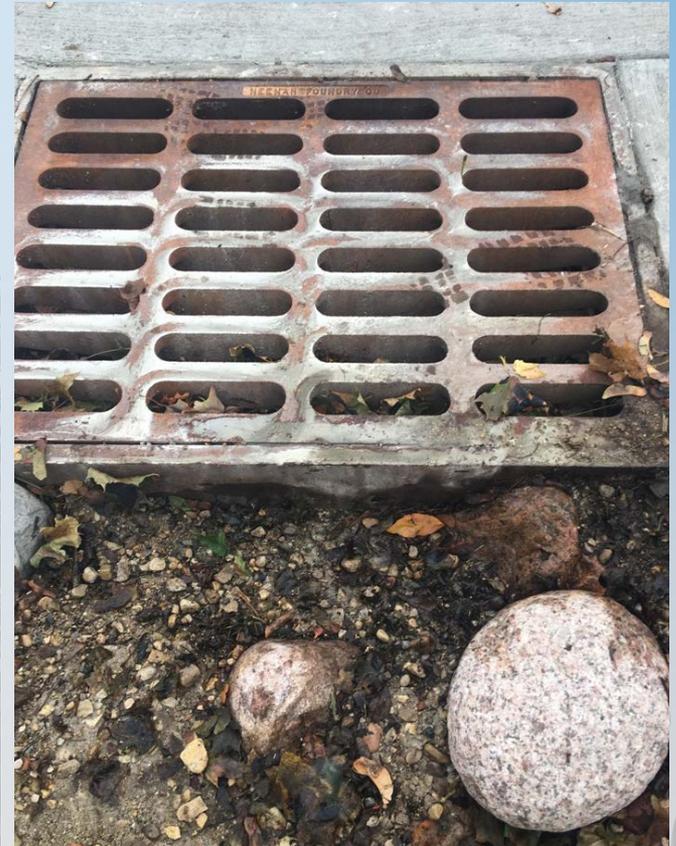
- Bioswale Damage
  - Environment



# MAINTENANCE CHALLENGES

- Bioswale Damage

- Environment



# MAINTENANCE CHALLENGES

- Bioswale Damage
  - Ourselves



# MAINTENANCE OPTIONS

- Train and use existing staff
  - New, dedicated staff was never an option
- Look to outside contracting

# MAINTENANCE OPTIONS

## ○ Neighborhood Groups

- Worked with a local BID to perform basic maintenance
- Not a success, did not come through

## ○ Outsourcing - Low Bid

- Started with one City-wide contract
- Evolved in to multiple contracts

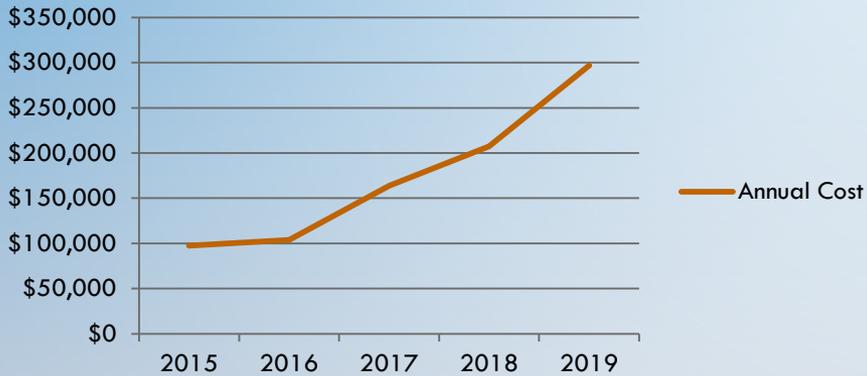
# MAINTENANCE COSTS

## o Contracted Maintenance Costs

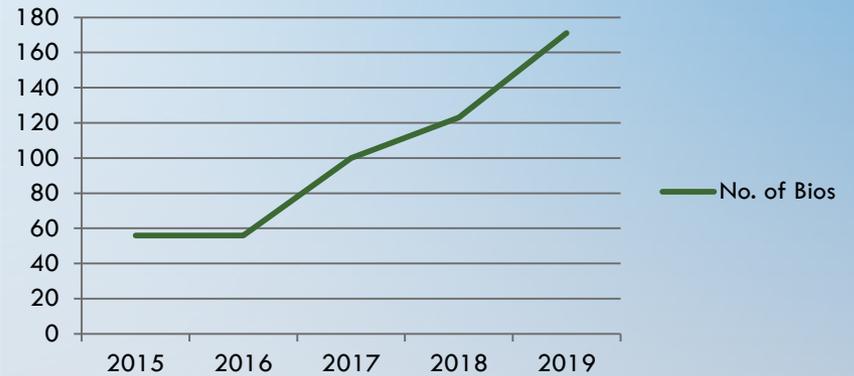
	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>
<b>Annual Cost</b>	\$97,511	\$103,682	\$163,947	\$207,459	\$296,905
<b>No. of Bios</b>	56	56	100	123	171
<b>Total Bio Area</b>	39,856	39,856	56,412	75,165	100,654
<b>Cost per Sq. Ft.</b>	\$2.45	\$2.60	\$2.91	\$2.76	\$2.95
<b>Cost per Bio</b>	\$1,741	\$1,851	\$1,639	\$1,687	\$1,736

# MAINTENANCE COSTS

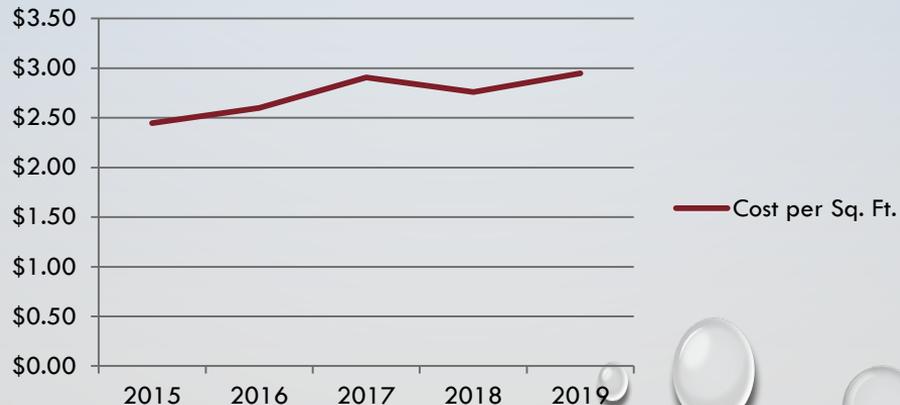
## Annual Cost



## No. of Bios



## Cost per Sq. Ft.



# MAINTENANCE COSTS

- Costs continue to increase as amount of GI grows
  - Maintenance costs increasing on unit basis and with greater quantity
  - Additional activities in near future
    - Paver vacuuming
    - Floating island plant replacement
    - Trash removal

# MAINTENANCE COSTS

## ○ Debris Cleanup

- December before snow cover
- March before spring clean-ups

## ○ Select Locations, In house

- 19 bioswales
- 2-man crew when available
- Roughly every other week
- \$7,200 Total

## ○ City Wide, Contracted

- 172 bioswales
- \$45 per bioswale
- \$7,740 Total

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# QUESTIONS

# MAINTENANCE CONTRACTS

- One primary contract, up to three smaller contracts
- Non-Profits and Job Training
  - Split off groupings of 8-16 bioswales
  - Solicit bids from interested non-profits
  - Have seen level of service increase

# MAINTENANCE CONTRACTS

- Outsourcing - Low Bid
  - Initial Inspection
  - Spring Clean-up
  - Engineered Soil
  - Shredded Hardwood Mulch
  - Plant Inspection
  - Monthly maintenance
  - Perennials / Shrubs
  - Fall Clean-up

# MAINTENANCE CONTRACTS

## ○ What Works Well

- Typical work is done efficiently and on schedule
- Planting timing is key
- Contractors have an interest making sites look good

## ○ Struggles

- Work that varies from typical, specified work
- Tracking and invoicing