# GREEN INFRASTRUCTURE IMPLEMENTATION IN THE MUNICIPALITY OF ANCHORAGE

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For: DOT&PF Quarterly Design Meeting

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# INTRODUCTION AND PURPOSE

- Training Purpose: To discuss barriers to implementation of Green Infrastructure in Anchorage and ways to overcome them.

Some portions of this presentation may also be applicable to the Mat-Su Borough soon.
MS4 permit is expected later this year.

Stormwater pond in south Anchorage.

# REVIEW: WHAT IS GREEN INFRASTRUCTURE?

- What is Green Infrastructure?

From the US EPA: *The **range** of measures that use plant or soil systems, permeable pavement or other permeable surfaces or substrates, stormwater harvest and reuse, or landscaping to store, infiltrate, or evapotranspirate stormwater and reduce flows to sewer systems or to surface waters.*

Simpler Definition: *Measures that use natural processes to clean stormwater.*

- What does Green Infrastructure do?

*Slows runoff and allows it to filter through soil or plant media allowing removal of sediment and attached pollutants.*

**Green Infrastructure ≠ Infiltration**

# REVIEW: WHAT IS GREEN INFRASTRUCTURE?

- Why is it needed?

Practically: Stormwater picks up pollutants as it runs across (primarily) impervious surfaces. Most of these pollutants bind to sediment. Removing sediment and particulates removes pollutants.

From Regulatory Standpoint: Stormwater treatment is required per the joint MOA/ADOT&PF MS4 (stormwater) permit.

Taku Lake Rain Garden

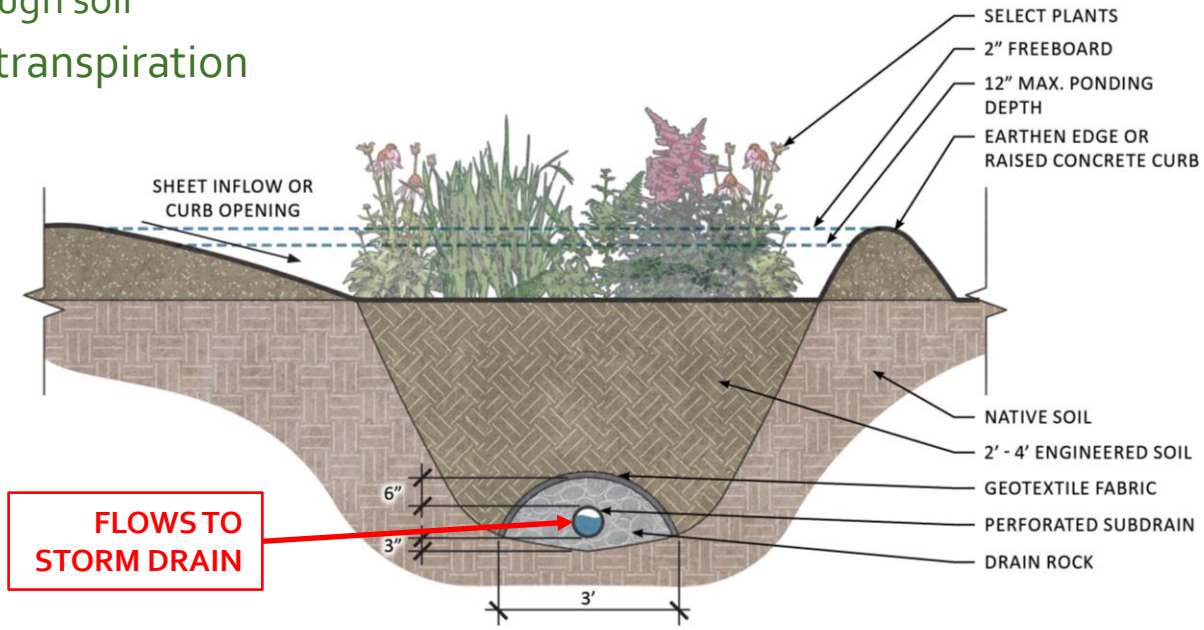
# REVIEW: WHAT IS GREEN INFRASTRUCTURE?

- Which seems cleaner?

Above: Water flowing into traditional curb inlet.
Right: Water outflow from the Taku Lake rain garden.

# FACILITIES AND PROCESSES

- Countless types of Green Infrastructure *facilities*
- Most of them rely on one or more of the following *processes* to achieve pollutant removal:
  - Infiltration
  - Filtration
    - Through vegetation
    - Through soil
  - Evapotranspiration



# REVIEW MOA REQUIREMENT

- MOA Green Infrastructure Requirements
  - DCM Chapter 2, *Section 3.3.2.1 Water Quality Treatment*
  - Stormwater ***treatment*** through Green Infrastructure for the first 0.52 inches of rain in a 24-hour period.
    - 20% Area Allowance
    - Roadway with rights of way 60 feet or less
    - Infeasibility determination

**Green Infrastructure ≠ Infiltration**

- Anchorage has a lot of challenging sites
  - Inability to infiltrate into the subgrade
  - Many conflicted demands for limited surface space
  - Constricted ROW

**WHAT TO DO?**

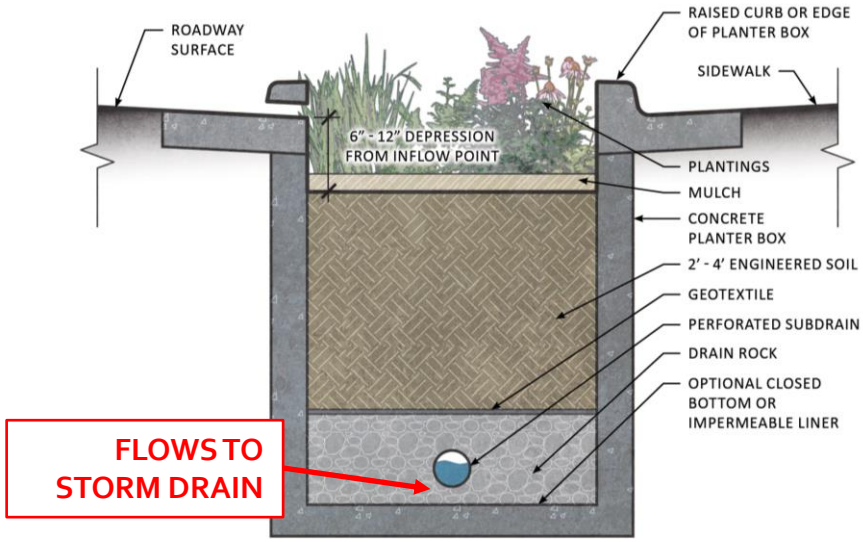
# BARRIERS TO IMPLEMENTATION

- **Barrier # 1: Infiltration or Nothing:** If your site cannot infiltrate water into the subgrade, you think Green Infrastructure is not feasible.

- **Overcoming it:**
  - *Infiltration* is NOT a requirement.
  - Infiltration is only ONE of several processes available to achieve Green Infrastructure Treatment.
  - *Filtration* will often work when Infiltration does not.

# BARRIERS TO IMPLEMENTATION

No-infiltration Stormwater Planter




*Left: Stormwater planter from National Precast Concrete Association https://precast.org/2014/12/rain-go/*
*Above Right: Photo from Wilkes East Neighborhood in Gresham, Oregon. http://www.wilkeseastna.org/node/628*

# BARRIERS TO IMPLEMENTATION

- **Barrier # 2: All or Nothing Mentality:** When you have a challenging site, and you cannot fully meet the GI requirements, you do nothing.

- **Overcoming it:**
  - All or SOMETHING
  - Treating only part of the site
  - Treating a lesser volume
  - Modifying specific design parameters
  - What CAN you do?
  - How can your runoff contact vegetation or soil?
  - WMS will work with you on design variances, but SOMETHING is always preferred over nothing.

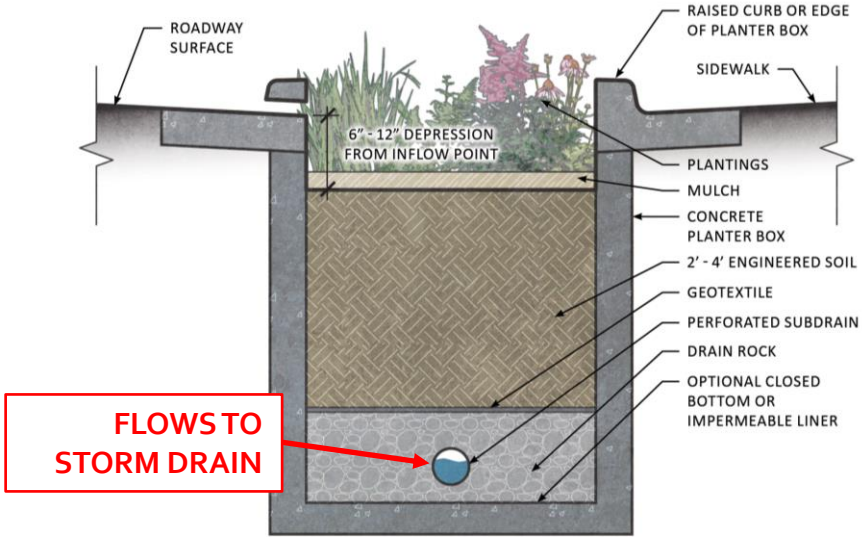
# BARRIERS TO IMPLEMENTATION

- **Barrier # 3: Limiting Your Toolbox:** You think the facilities presented in the DCM are the only available/allowable options.
- **Overcoming it:**
  - See Section 6.6 Paragraph 1: *There are a variety of stormwater controls and Green Infrastructure/LID elements that are not discussed here that may be applicable to specific situations. The designer is encouraged to explore additional stormwater controls and LID elements*.
  - Tools in the DCM are the early basics.
  - These tools may not always work for your site.
  - Countless additional tools and configurations available. The entire US is doing this.
  - Understand the intent and the processes and then eliminate "cookie cutter" mentality.

# BARRIERS TO IMPLEMENTATION:

## Examples of Additional/Modified/Under-utilized Tools

No-infiltration Stormwater Planter

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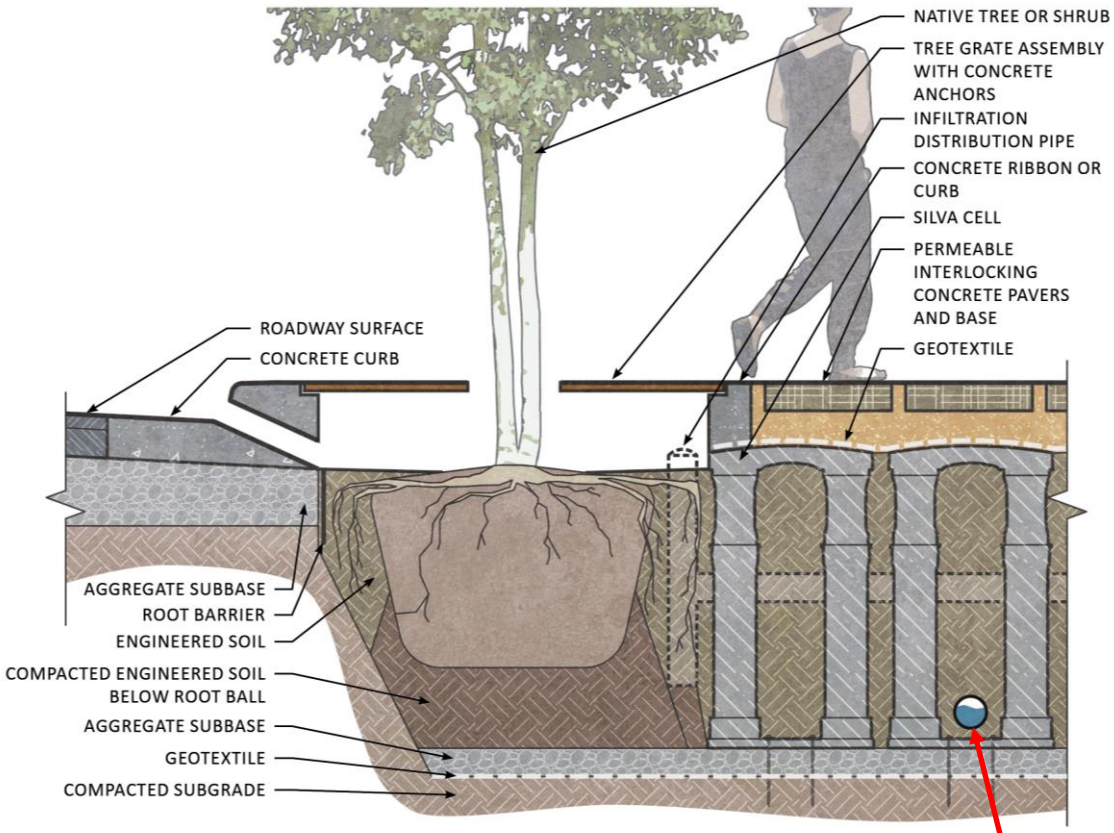
# BARRIERS TO IMPLEMENTATION:

## Examples of Additional/Modified/Under-utilized Tools

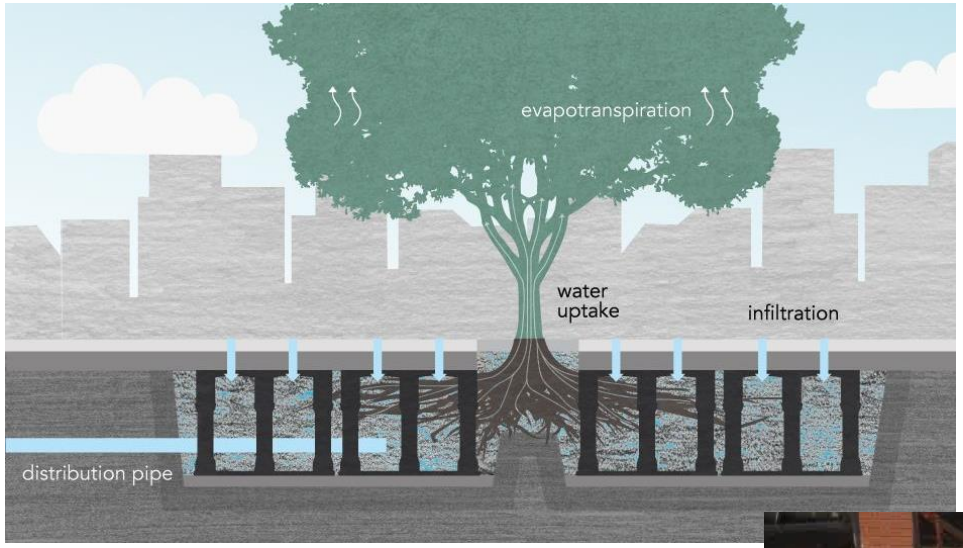
### Silva Cells




Typical Silva Cell Section

Silva Cell in Downtown Fairbanks

# BARRIERS TO IMPLEMENTATION:
## Examples of Additional/Modified/Under-utilized Tools




**Above: Silva Cell Section Schematic**

**Right: Silva Cell Construction**

Photos from Deeproot.com

# BARRIERS TO IMPLEMENTATION:

## Examples of Additional/Modified/Under-utilized Tools

### Filter Strips

Clockwise from top left: Taco bell parking lot in south Anchorage; Taco Bell/McDonald's area in South Anchorage; Filter strip in Minnesota from the MN Stormwater Manual https://stormwater.pca.state.mn.us/index.php?title=File:Filter_strip_for_bioswale.jpg; Natural Water Retention Measures http://nwrm.eu/measure/filter-strips

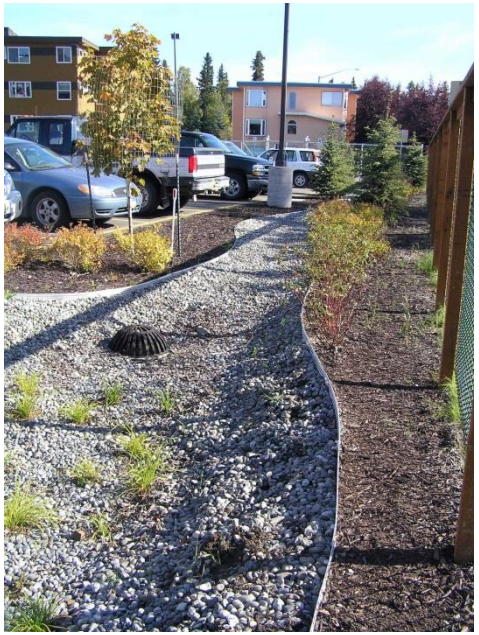
# BARRIERS TO IMPLEMENTATION

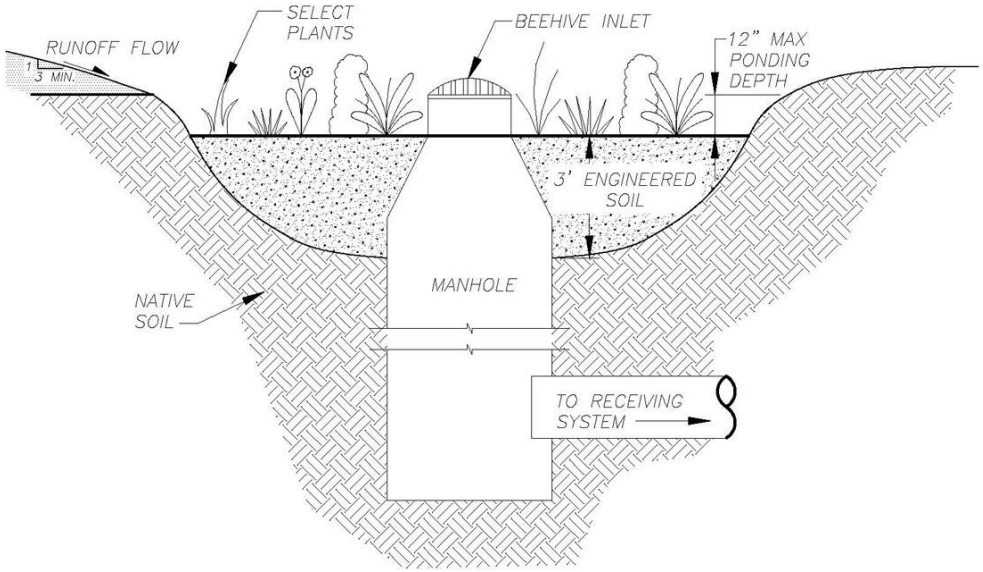
- **Barrier # 4: Believing Myths:** You are concerned about many of the existing stormwater management myths.
- **Overcoming it:**
  - Most Green Infrastructure myths started with a misconception or a poor design that failed. Good design practices can overcome these.
  - Before discounting an idea, find out if the myth is true and if it can be overcome.

# GREEN INFRASTRUCTURE MYTHS

- **Myth:** Green Infrastructure doesn't work in cold climates.
- **Truth:** It does if it's well designed.

Remember: 1) You're designing for rainfall. 2) You need a safe bypass for flood flows and frozen conditions.





# GREEN INFRASTRUCTURE MYTHS

- **Myth:** All Green Infrastructure fill with sediment and fail.
- **Truth**
  - They need to be properly sized
  - They need an overflow for flood flows
  - If they rely on infiltration, they need a field-measured infiltration rate and an appropriate factor of safety.

- **Myth:** All Green Infrastructure are maintenance-intensive
- **Truth**

  You can design them to help minimize maintenance

  Landscaping requires maintenance as well – try to combine them.

NSH/Alpenhorn infiltration facility. Accepting stormwater from nearly 7 acres of impervious surface.

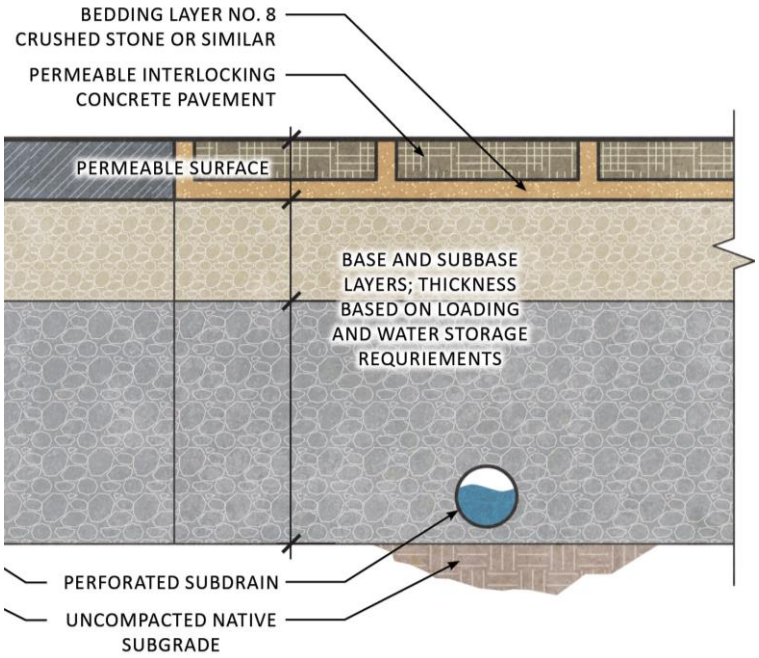
# GREEN INFRASTRUCTURE MYTHS

- **Myth:** Curb cuts don't work because they fill with sand and block inflow
- **Truth:**
  - The drop behind the curb cut needs to prevent that from happening.
  - You can usually use an inlet-style opening instead.

Above: Curb cut not functioning in Anchorage
Upper Right: Stormwater Planter from the City of Salina, CA www.cityofsalinas.org/
Lower Right: Bioretention example from Chesapeake Bay Stormwater Network https://chesapeakestormwater.net/

# GREEN INFRASTRUCTURE MYTHS

## Permeable Interlocking Concrete Pavers (PICP)




Top left: Typical PICP Section
Top Right: PICP Installation in Anchorage. Photo source: Cold Climate Evaluation of PICP and Porous Concrete Pavement Systems, 2010
Lower Right: PICP example from US Green Building Council. www.usgbc.org

# GREEN INFRASTRUCTURE MYTHS

- **Myth:** Permeable interlocking concrete pavers (PICP) will not work in Anchorage because they will heave during freeze/thaw and they cannot be plowed.
- **Truth**
  - This is only true if they are poorly designed and/or poorly installed.
  - ASCE studied the performance of PICP in Chicago, Minneapolis, and Toronto. Study shows it does not heave when it is frozen.
  - When it is property installed so that the blocks form a uniform surface, it can be plowed with a blade like other asphalt surfaces.
    - AWR spoke with seven snowplow operators that regularly plow PICP in parking lots and streets in colder climates such as Minnesota and Illinois. All said they do not plow any differently than other areas.

# GREEN INFRASTRUCTURE MYTHS

- **Myth:** I have to infiltrate stormwater.
- **Truth:** No, you don't. You can filter it instead

Can't emphasize this too much

West Dowling Bioswale

# FINAL TIPS FOR IMPLEMENTATION CHALLENGES

- **Use your site's landscaping**
  - Nearly all sites and most roadways have landscaping of some kind. Let it double as stormwater treatment.
  - Specifically allowed by Municipal code
- **Start Early**
  - You have to think about stormwater treatment WITH your grading plan or general site/roadway drainage.
  - Much fewer options if you try to add in treatment as an afterthought.
- **Get Creative**
  - Look for options that can work with your site
  - Mix and match
  - Consider design variances where needed

# HELPFUL RESOURCES

- **FAST Planning Green Streets Plan**
  - https://fastplanning.us/wp-content/uploads/2019/07/fast_planning_greenstreetsplan_6-18-19.pdf

- **Minnesota Stormwater Website**
  - https://stormwater.pca.state.mn.us/index.php/Main_Page

- **EPA Green Infrastructure Design and Implementation**
  - https://www.epa.gov/green-infrastructure/green-infrastructure-design-and-implementation

# QUESTIONS?

Thank you for attending.