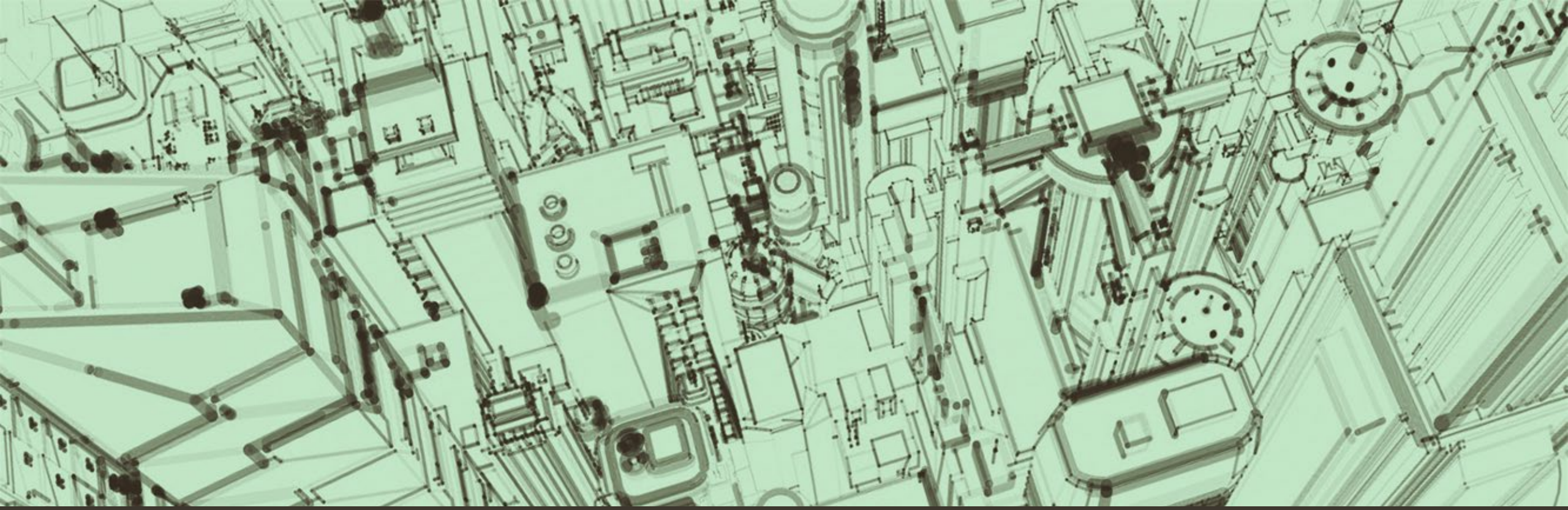
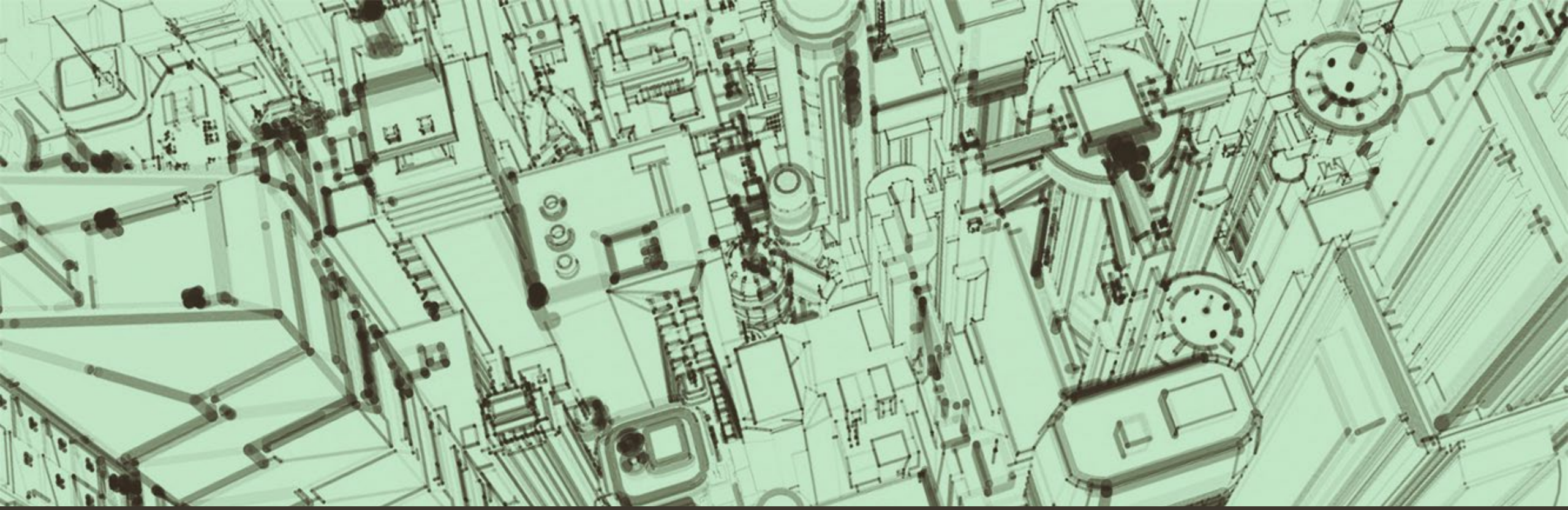


Low Impact Development

Provision C.3 Compliance Workshop – May 24, 2022

CONTRA COSTA CLEAN WATER PROGRAM



Greeting

Karin Graves, Interim Program Manager

CONTRA COSTA CLEAN WATER PROGRAM

Agenda

9:10 – 9:45	Basics of Provision C.3 and Low Impact Development
9:45 – 10:15	Changes to Provision C.3 and the *Stormwater C.3 Guidebook*
10:15 – 10:35	Green Infrastructure Project Identification and Conceptual Design
10:35 – 10:40	Break
10:40 – 11:55	Topics in LID Implementation—Panel/Audience Discussion
11:55 – 12:00	Summary and Wrap-Up

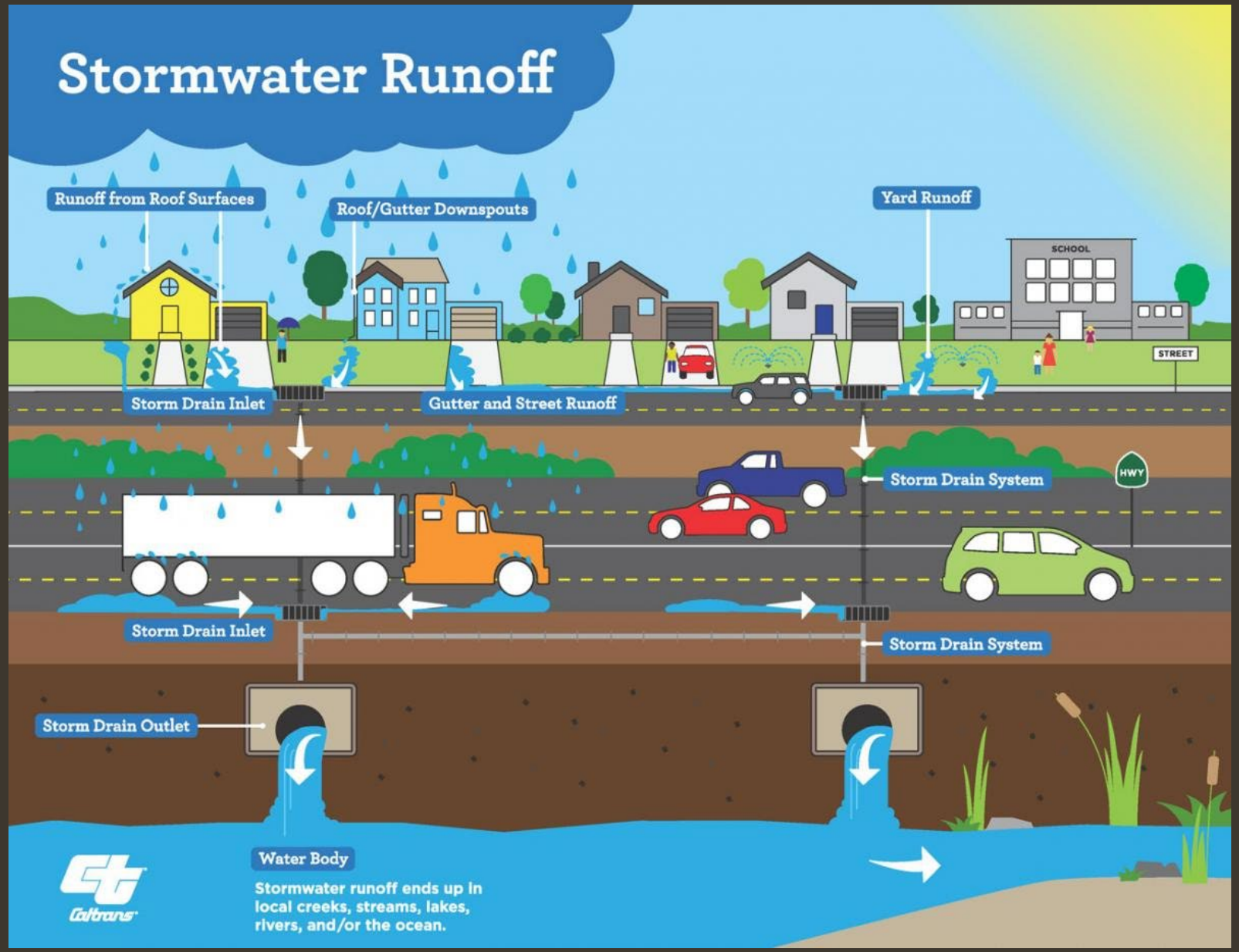
Presenters/Facilitators

- **Yvana Hrovat**, P.E., Haley and Aldrich
  - Haley and Aldrich will assist CCCWP and Permittees with C.3 implementation going forward
  - 18 years of experience in assisting California municipalities and agencies with:
    - planning, design, construction, monitoring and maintenance of Green Infrastructure and LID measures
    - Development of LID guidance and stormwater standards manuals
    - Facilitation of outreach, trainings, and public workshops

- **Dan Cloak**, P.E., Dan Cloak Environmental Consulting
  - Prepared the CCCWP *Stormwater C.3 Guidebook*
  - Has assisted California municipalities with stormwater NPDES compliance since 1992

Logistics

- Meeting is being recorded.
- Participants have been muted by default.
- To comment or ask a question, use the “Raise Hand” function or the Chat.
- We’ll address as many questions as we can at the end of each presentation.
  - After the break, the following topics will be discussed with the panel:
    - Coordinating the Design Team to Implement LID
    - Key Requirements for Construction Drawings
    - Submittals and Approvals for Bioretention Soils
    - Selecting Plants and Mulch for Bioretention Facilities
    - 100% LID in Higher Density Projects

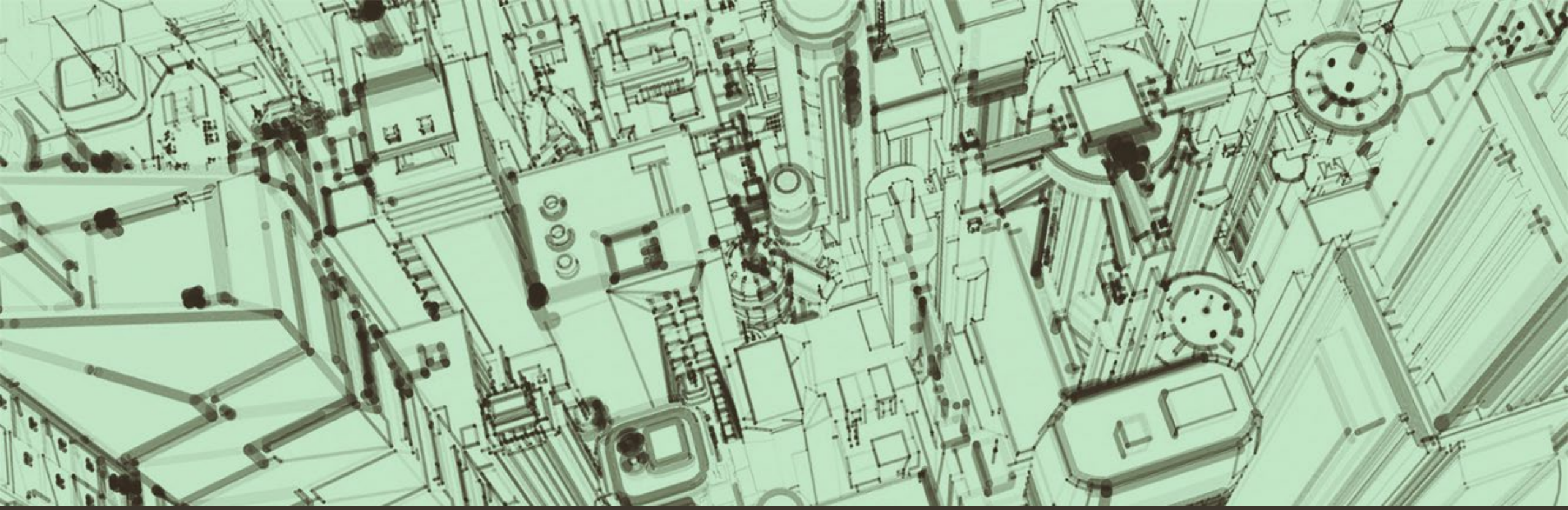

Stormwater Runoff
Runoff from Roof Surfaces
Roof/Gutter Downspouts
Yard Runoff
SCHOOL
STREET
Storm Drain Inlet
Gutter and Street Runoff
HWY
Storm Drain System
Storm Drain Inlet
Storm Drain System
Storm Drain Outlet
Water Body
Stormwater runoff ends up in local creeks, streams, lakes, rivers, and/or the ocean.
Caltrans

Background

- Federal/State laws require local agencies to eliminate/reduce stormwater pollution through a "Municipal Regional Permit" (MRP).
- MRP is a National Pollution Discharge Elimination System (NPDES) permit developed and enforced by the SFRWQCB.
- NPDES permits for construction, industrial, wastewater, and municipal stormwater discharging to water bodies
- Covers "Permittees": Alameda, Contra Costa, San Mateo and Santa Clara Counties, Vallejo, Fairfield-Suisun

Background

- CCCWP formed 1991; includes 19 Cities/towns, County, and Flood Control District as co-permittees
- CCCWP assists and represents 21 permittees with MRP implementation
- Implementation includes:
  - water quality monitoring,
  - clean up of trash and pollutants,
  - **Low Impact Development and Green Infrastructure,**
  - business inspections,
  - response and clean up of illicit discharges and dumping,
  - construction site controls and
  - much more



Basics

Overview of Provision C.3 and Low Impact Development

CONTRA COSTA CLEAN WATER PROGRAM

Basics

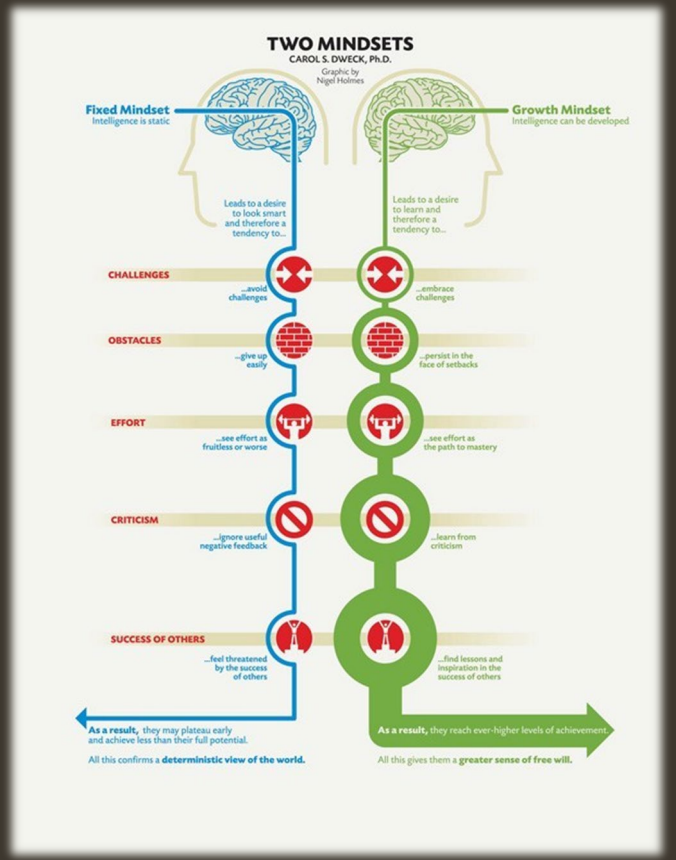
1. Check your mindset.
2. Go for an integrated design.
   - Site plan
   - Landscaping plan
   - Grading and drainage plan
   - Stormwater plan
3. Use the *Guidebook* and ancillary documents.
4. Prepare a complete Stormwater Control Plan submittal.
5. Ask questions.

1. Check Your Mindset

- “I already know how to design site drainage.”
- “Do the minimum.”
- “Maybe this doesn’t apply to my project.”
- “My project is particularly challenging.”

OR

- “This is a chance to learn a new way of doing things.”
- “I can add value to my project by creating elegant solutions.”
- “These tools and guidance have been tested and refined over time.”



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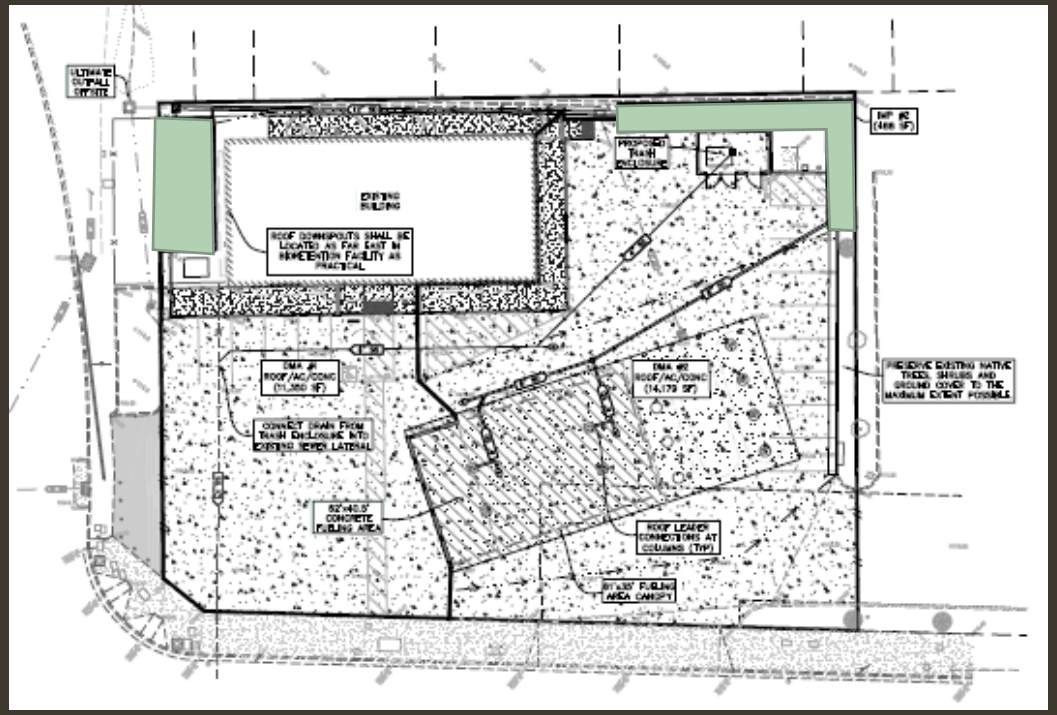
2. Integrated Site Planning

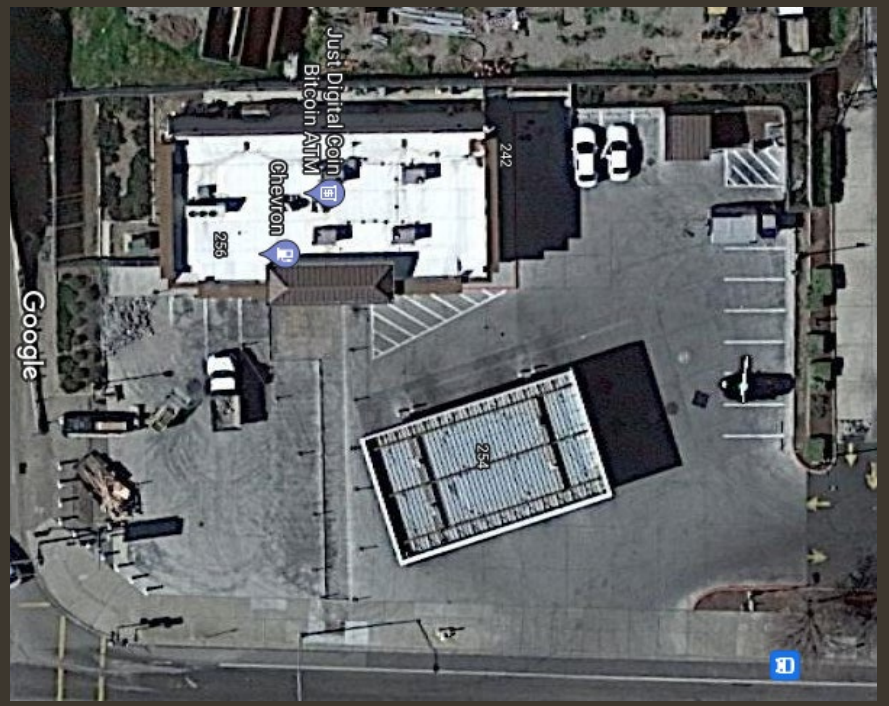
Existing Condition

- How does the site drain now (pre-project)?
- Where is the connection to the municipal storm drain or off-site drainage?
- Where are the low points (or existing inlets)?

Thinking about the Site Plan

- What spaces can or should be vegetated?
- Where can the bioretention facilities go?
- How can I route drainage across the surface?


EXISTING BUILDING
PROPOSED TRASH ENCLOSURE
INFILTRATION FACILITY
DMA #1 ROOF/AC/CONC (11,350 SF)
DMA #2 ROOF/AC/CONC (14,179 SF)
PRESERVE EXISTING NATIVE TREES, SHRUBS AND GROUND COVER TO THE MAXIMUM EXTENT POSSIBLE
CONCRETE PAVING AREA
ROOF LEADER CONNECTIONS AT COLUMNS (TYP.)
CANOPY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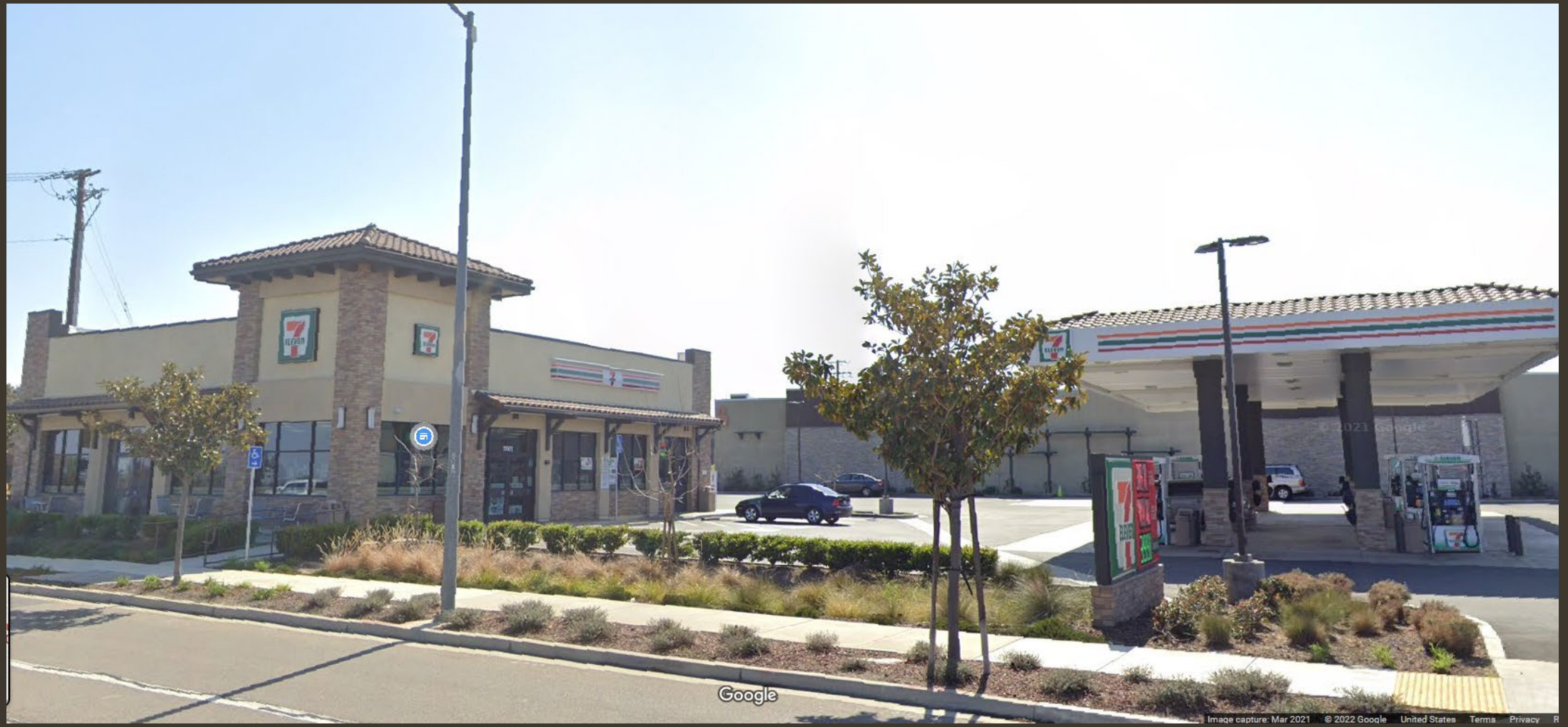
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Image capture: Mar 2021 © 2022 Google United States Terms Privacy


Analisa Ln


Tice Valley Blvd
Chives Way
PRIVATE PROPERTY
KEEP OUT
FIRE LANE NO PARKING


AHEAD
NO PARKING
FIRE LANE
NO PARKING
Google


Google


DD
DUNKIN'

2006

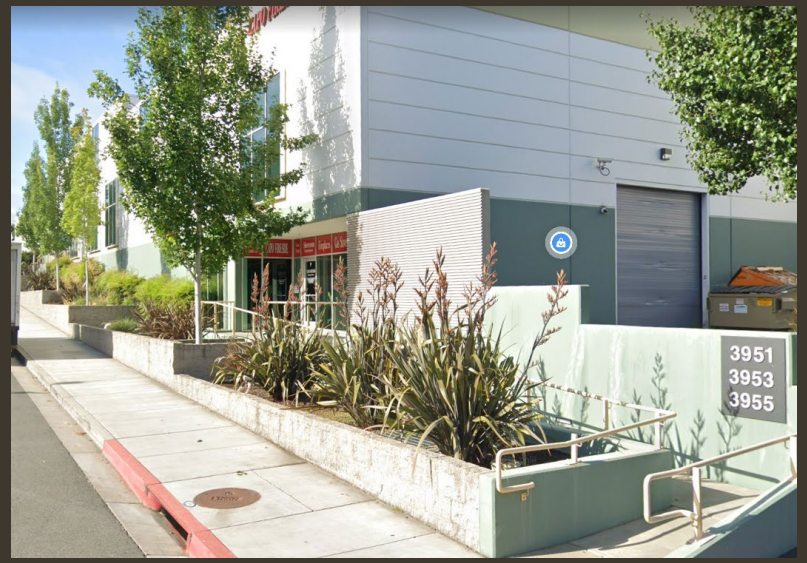
AREA C-4
10,675 SF
AREA C-5
11,000 SF
AREA C-9
30,300 SF
TRASH AREA
BUILDING 1
AREA C7
17,150 SF
AREA N-1
5,925 SF
AREA N-2
13,124 SF
RECREATIONAL AREA
98,450 SF
TRASH ENCLOSURE
AREA C-1
44,000 SF
AREA C-8
36,000 SF
AREA C-9
2 30 SF
AREA N-3
8,148 SF
TRASH AREA
AREA C-3
22,185 SF
AREA 2
25,875 SF
AREA C-11
15,200 SF
TRASH AREA TO BE COVERED AND ENCLOSED
AREA C10
28,430 SF
REFUSE AREA

2007

2020

2011

2020

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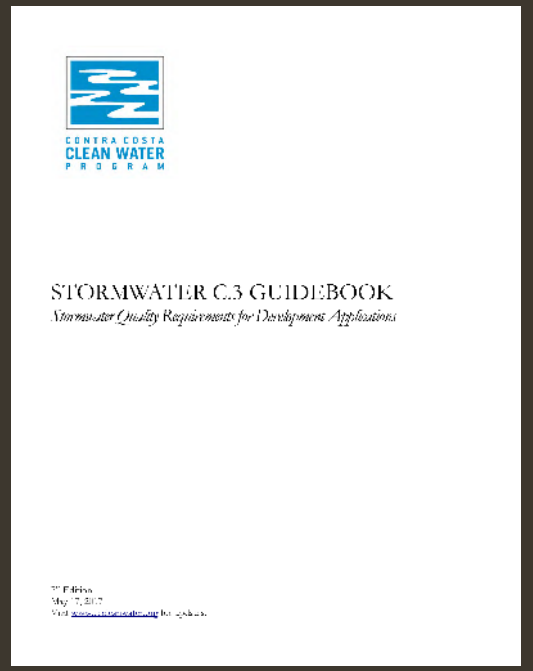
E-1

3. *Stormwater C.3 Guidebook*

- First Edition, Feb. 2005
- Seventh Edition, May 2017.
- Most recent update: May 2020.
- Eighth Edition in progress.
- Adopted by ordinance by the County and its 19 cities and towns
- Uniformity of compliance and design approach
- Updates and revisions
  - Based on experience with development projects countywide over 15 years
  - Input from and review by municipal Stormwater Control Plan reviewers



Stormwater C.3 Guidebook

CHAPTER 1: Policies and Procedures

- Applicability, review process, subdivisions, phased projects, HM compliance, offsite compliance

CHAPTER 2: Preparing a Stormwater Control Plan

- Checklist, step-by-step, sample outline, template, examples.

CHAPTER 3: Low Impact Development Site Design Guide

- Site analysis and “first cut” drainage design
- Documentation procedure. Preparing an exhibit and using the IMP Sizing Calculator.
- Check to integrate stormwater plan with site, landscaping, and grading plans (p. 43)

Stormwater C.3 Guidebook

CHAPTER 4: Design and Construction of Bioretention Facilities

- What to show on construction plans
- Detailed design criteria for facilities
- Ideas and guidance for applications
- Items to be inspected during construction (with checklist)

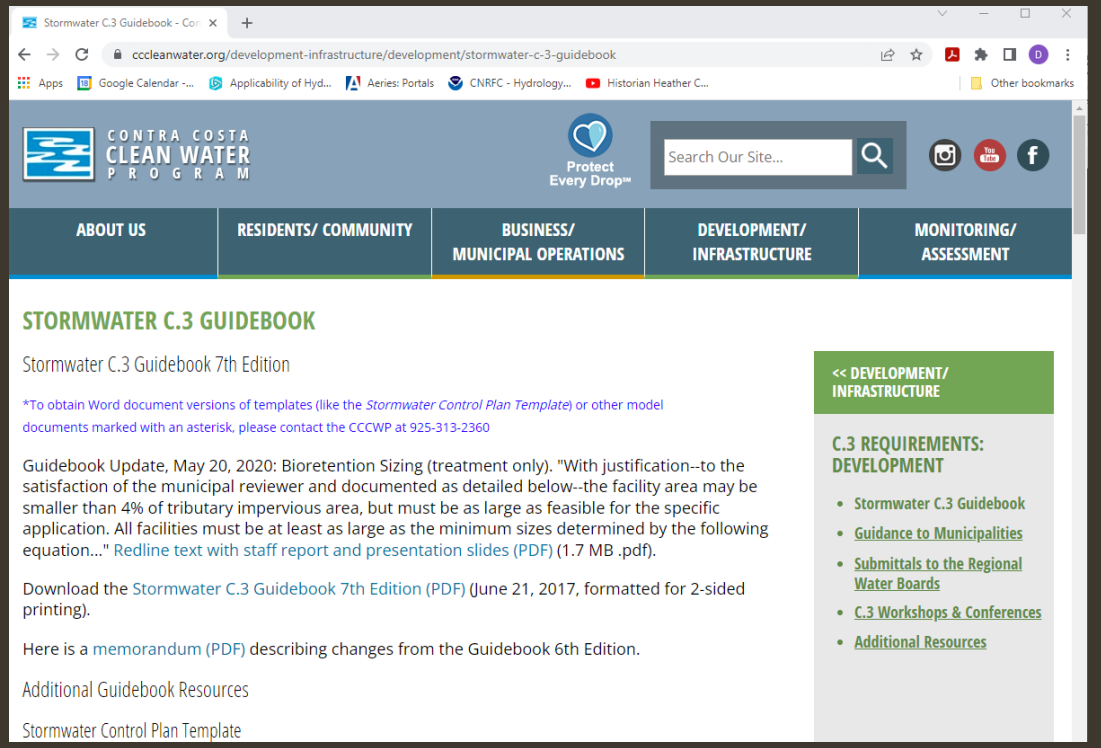
CHAPTER 5: Preparing a Stormwater Facilities Operation and Maintenance Plan

APPENDICES

- B: Soils, Plants, and Irrigation
- C: Preparing a Stormwater Control Plan for a Small Land Development Project

Other Resources at cccleanwater.org

- Stormwater Control Plan Template
- Example Stormwater Control Plans
- Sizing Calculator
- Isohyetal Map
- Green Infrastructure Planning and Design Resources



4. Preparing a Complete Submittal: Key Parts

EXHIBIT

- Entire site divided into separate Drainage Management Areas
- For each DMA: unique identifier, type, and square footage
- Proposed locations and sizes of treatment and HM facilities

REPORT

- Calculator output
- Project Data form

DEPENDING ON THE COMPLEXITY OF THE SITE

- Cross-sections and/or details showing how drainage and facilities will be integrated into the site

I. PROJECT DATA

Table 1. Project Data

Project Name/Number	Example for a Commercial Project
Application Submittal Date	December 1, 2017
Project Location	123 Main Street, Anytown
Name of Developer	XYZ Corporation
Project Phase No.	Not applicable
Project Type and Description	4,680 SF Retail Building with drive-through lane and parking
Project Watershed	Pristine Creek
Total Project Site Area (acres)	0.6 acres
Total Area of Land Disturbed (acres)	0.6 acres
Total New Impervious Surface Area (sq. ft.)	0 SF
Total Replaced Impervious Surface Area	21,050 SF
Total Pre-Project Impervious Surface Area	24,000 SF±
Total Post-Project Impervious Surface Area	21,050 SF
50% Rule	Applies
Project Density	FAR = 0.2
Applicable Special Project Categories	None
Percent LID and non-LID treatment	100% LID
HMP Compliance	Exempt (less than one acre of impervious area created or replaced)

Project Name: Example for a Commercial Project
Project Type: Treatment Only
APN: 00-123-4567
Drainage Area: 27,810
Mean Annual Precipitation: 20.0

II. Self-Retaining Areas

Self-Retaining DMA	
DMA Name	**Area (sq ft)**
DMA4	1,770
DMA5	155
DMA6	550
DMA7	4,285

IV. Areas Draining to IMPs

IMP Name: IMP1
IMP Type: Bioretention Facility
Soil Group: IMP1

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor	IMP Sizing
DMA1	2,805	Concrete or Asphalt	1.00	2,805	
			Total	2,805	
				Area	0.040

IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
	1.000	112	270

IMP Name: IMP2
IMP Type: Bioretention Facility
Soil Group: IMP2

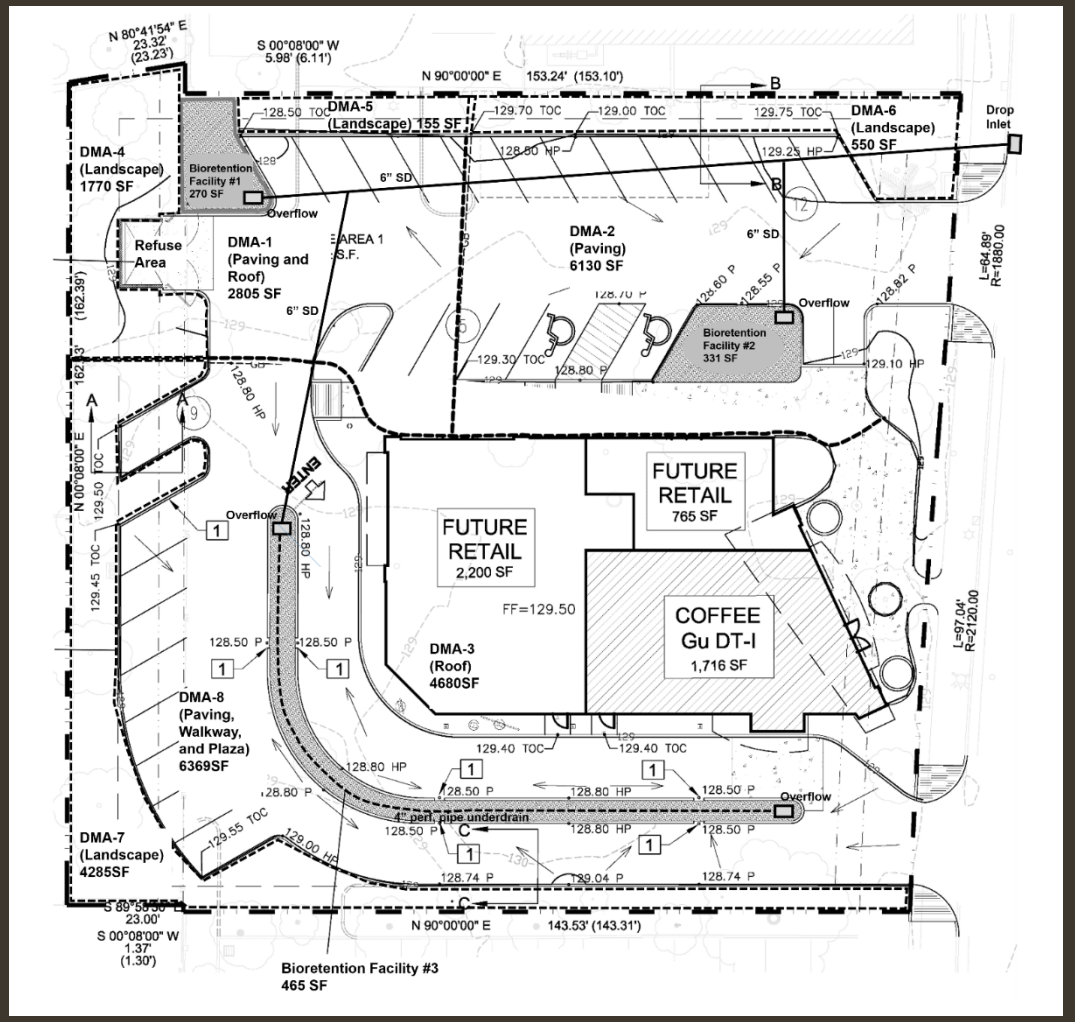
DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor	IMP Sizing
DMA2	6,130	Concrete or Asphalt	1.00	6,130	
			Total	6,130	
				Area	0.040

IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
	1.000	245	331

IMP Name: IMP3
IMP Type: Bioretention Facility
Soil Group: IMP3

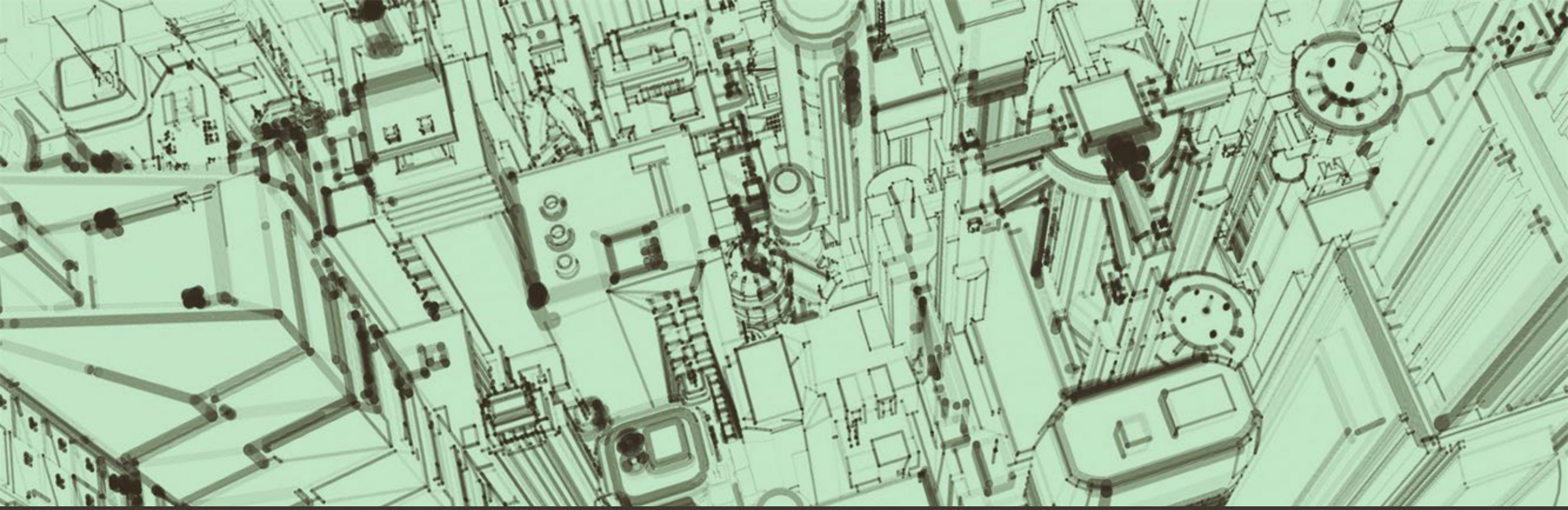
DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor	IMP Sizing
DMA3	4,680	Conventional	1.00	4,680	

IMP Sizing	Rain	Minimum	Proposed



5. Ask Questions

- Use the *Guidebook*.
- Contact CCCWP at 925-313-2360 or Michael.Burger@pw.cccounty.us (*Guidebook* and LID design questions)
- Contact your local reviewer (project-specific questions)



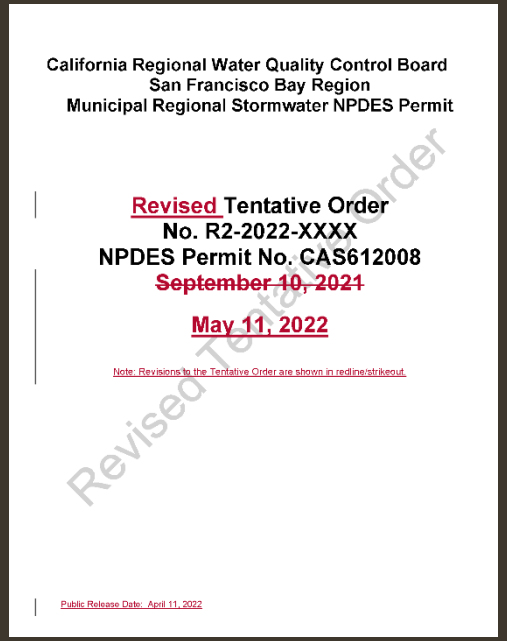
Changes to Provision C.3

and coming changes to the *Stormwater C.3 Guidebook*

CONTRA COSTA CLEAN WATER PROGRAM

Changes to Provision C.3 - Topics

- Effective Dates
- Regulated Project Thresholds
- Hydromodification Management
- Green Infrastructure Retrofits


California Regional Water Quality Control Board
San Francisco Bay Region
Municipal Regional Stormwater NPDES Permit

Revised Tentative Order
No. R2-2022-XXXX
NPDES Permit No. CAS612008
~~September 10, 2021~~

May 11, 2022

Note: Revisions to the Tentative Order are shown in redline/strikeout.

Revised Tentative Order

Public Release Date: April 11, 2022

Also, a preview of updates
to the *Stormwater C.3 Guidebook*
(in progress)

Changes are Effective July 1, 2023

- Until then, MRP 2.0 thresholds and requirements will apply to:
  - Projects with approved or conditionally approved Tentative Maps
  - Projects with applications deemed complete
  - Housing projects for which a preliminary application has been submitted (per SB 330 and SB 8)

Regulated Project Thresholds

Parcel Based Projects

Project Type	Threshold Area	Now	MRP 3.0
• Parking lots • Auto service facilities • Retail gasoline outlets • Restaurants	Cumulative	5,000 SF	5,000 SF
Other Development or Redevelopment	Cumulative	10,000 SF	5,000 SF
Parking Lot Renovation	Cumulative	Exempt*	5,000 SF
Detached Single-Family (not part of larger plan)	Cumulative	Exempt	10,000 SF

*Application of C.3 requirements to parking lot renovations has varied by jurisdiction and by project

Regulated Project Thresholds

Roads, Sidewalks, and Trails

Project Type	Threshold Area	Now	MRP 3.0
New roads, including sidewalks and bike lanes • Includes widening with additional lanes	Contiguous	10,000 SF	5,000 SF
New stand-alone trail projects ≥ 10 feet wide • Unless are pervious pavement per *Guidebook* criteria • Or direct runoff to a vegetated area @ 2:1 ratio	Contiguous	10,000 SF	5,000 SF
Stand-alone Public Works ROW projects • Sidewalk gap closures • Sidewalk replacement • ADA curb ramps	Contiguous	10,000 SF	5,000 SF

Regulated Project Thresholds

Roads, Sidewalks, and Trails

Project Type	Threshold Area	Now	MRP 3.0
Reconstructing* existing roads • Includes sidewalks and bicycle lanes	Contiguous	Exempt	1 acre
Extending pavement surface without adding lanes (e.g. safety improvements or paving shoulders)	Contiguous	Exempt	1 acre
Utility trenching projects ≥ 8 feet wide on average	Contiguous	Exempt	1 acre

*Removing and replacing an asphalt or concrete pavement to the top of the base course or lower, or repairing the pavement base in preparation for surface treatment

Special Projects

- For certain higher-density projects, “Special Projects” allows treatment of a portion of runoff by facilities other than bioretention:
  - Tree-box-type high-flowrate filters
  - Vault-based high-flowrate media filters
- Applicant is required to demonstrate infeasibility of 100% LID treatment

Special Projects in MRP 3.0

- **Category A** (unchanged):
  - Project size up to ½ acre, 85% lot coverage
  - Non-auto, pedestrian-oriented, zero surface parking
- **Category B** (unchanged):
  - Project size up to 2 acres
  - 25-100% non-LID, scales with FAR or DU/acre
- Category C (changed):
  - MRP 2.0: Applies to certain Transit Oriented Developments
  - MRP 3.0: Will apply to certain affordable housing projects only
    - Amount of non-LID is by proportion of extremely low, very low, low, and moderate-income housing
    - Additional credits for proximity to transit, more dwelling units per acre, and minimized surface parking

Hydromodification Management (HM)

- Applies to:
  - Projects that create or replace ≥ 1 acre impervious surface, unless:
    - Post-project impervious surface is less than or same as pre-project
    - Project drains to Bay/Delta or tidal zones
    - Project is in exempt/highly developed watershed
- Compliance
  - Infiltration of runoff, and/or
  - Detention with very slow release via weir or orifice

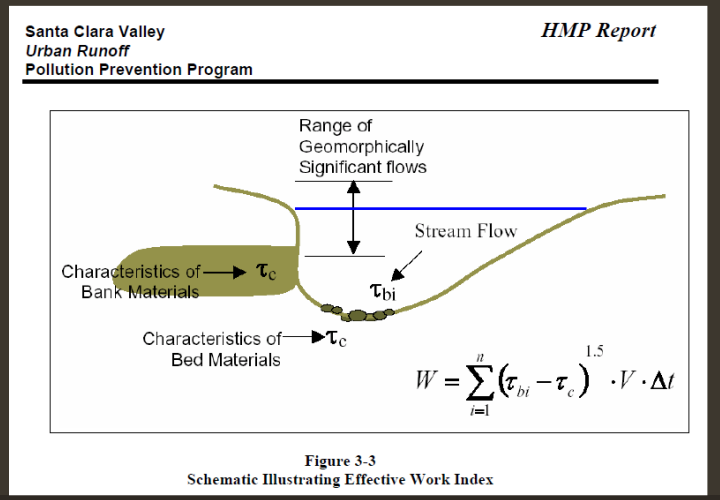
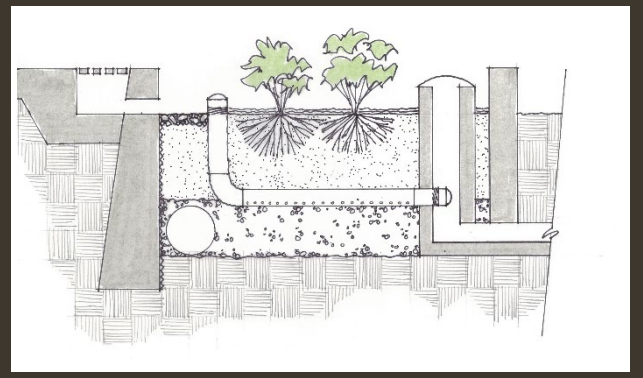


Figure 3-3
Schematic Illustrating Effective Work Index

Hydromodification Management During MRP 3.0

- **Applicability Maps**
  - Maps CCCWP submitted in 2019 have not been approved by Water Board staff
  - Review of maps and resubmittal were delayed during permit negotiations
  - In interim, evaluate each proposed project
- **HM Facility Sizing**
  - Continue to use methods and criteria (sizing factors) in *Guidebook* 7th Ed.
  - Methods and criteria will change during MRP 3.0
  - CCCWP is examining options for ongoing compliance



Green Infrastructure Retrofits since 2009

- **MRP 1.0:** Ten Green Streets Pilot Projects
- **MRP 2.0** (2015):
  - Green Infrastructure Plans submitted in 2019
  - Review all capital projects for "no missed opportunities"
- **MRP 3.0** (2022)
  - Implement retrofit projects during permit term to treat runoff from a minimum acreage of existing impervious surface

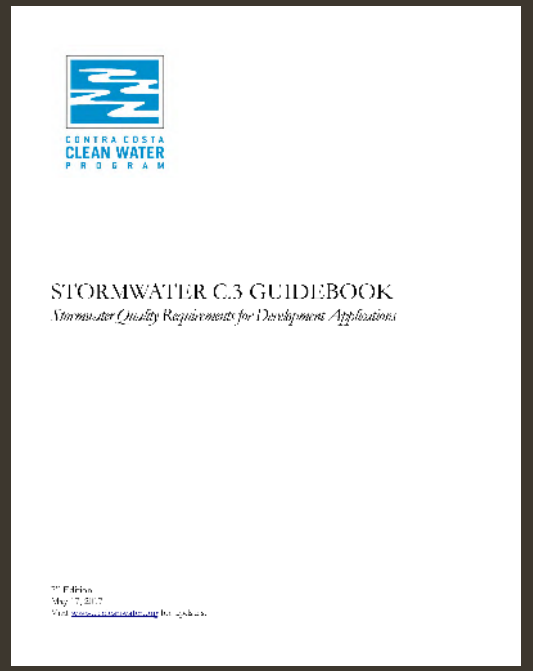
MRP 3.0 Minimum Green Infrastructure Retrofits

- By June 30, 2027
  - 3 acres per 50,000 population
  - May be met by each municipality or countywide
  - Minimum of 0.20 acres in each municipality
  - Maximum/cap of 5 acres for larger municipalities

- May count toward minimum:
  - Excess existing impervious area retrofit in connection with a Regulated Project
  - Regulated Projects that are Roads Projects
  - Projects completed after January 1, 2021
  - Projects that are approved and funded by June 30, 2027

Updates to the Stormwater C.3 Guidebook

- Unchanged from 7th Edition:
  - Stormwater Control Plan and Exhibit required
  - Approach to documenting your LID design
    - Four types of Drainage Management Areas
    - Five types of Integrated Management Practices (IMPs)
  - Design criteria for IMPs
- More emphasis on integration of LID drainage design into site and landscape design
- Some updates to:
  - What to show on construction plans—details and notes
  - Bioretention soil submittal and inspection requirements

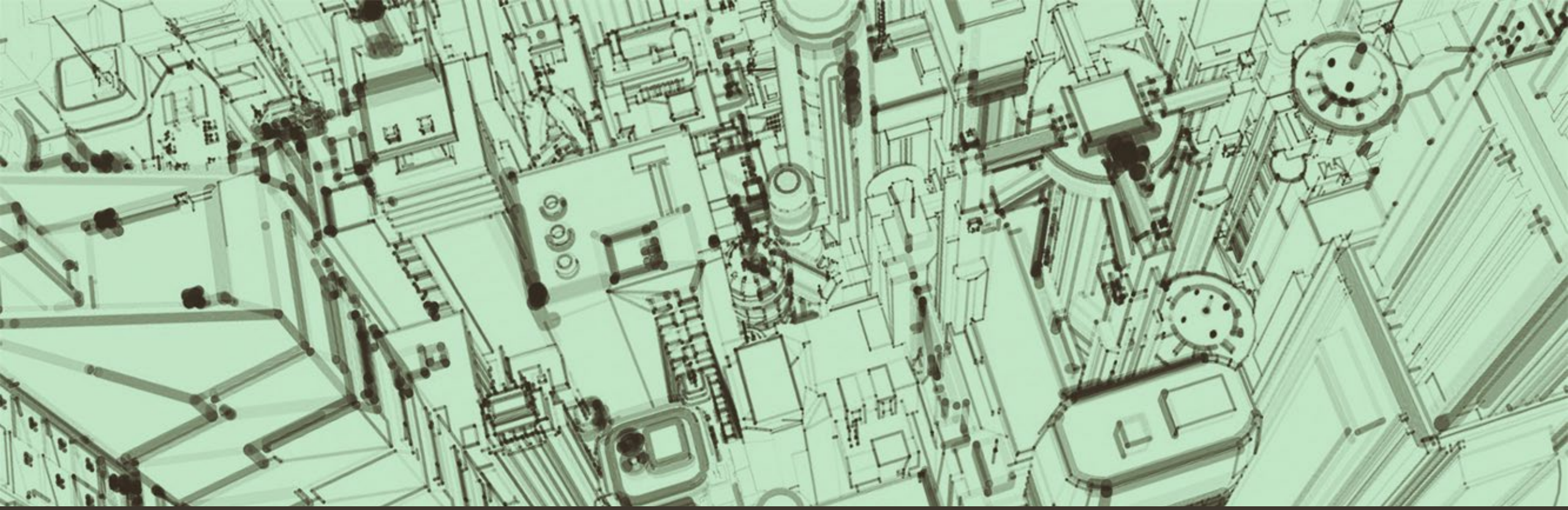


Updates to the Stormwater C.3 Guidebook

- Incorporate MRP 3.0 changes to Provision C.3
  - Regulated Projects Thresholds
  - Special Projects
- Retrofitting with Green Infrastructure
  - New Chapter 6 covers Green Infrastructure Project Identification and Conceptual Design

Updates to the Stormwater C.3 Guidebook

- Hydromodification Management
  - Options are under review
- Appendices and Supporting Documents
  - More detailed background on C.3 issues in an expanded Appendix E
  - Frequently Asked Questions
    - Applicability of C.3 to specific types of development
    - Design and construction of IMPs
    - Other issues



Green Infrastructure Retrofits

Project Identification and Conceptual Design

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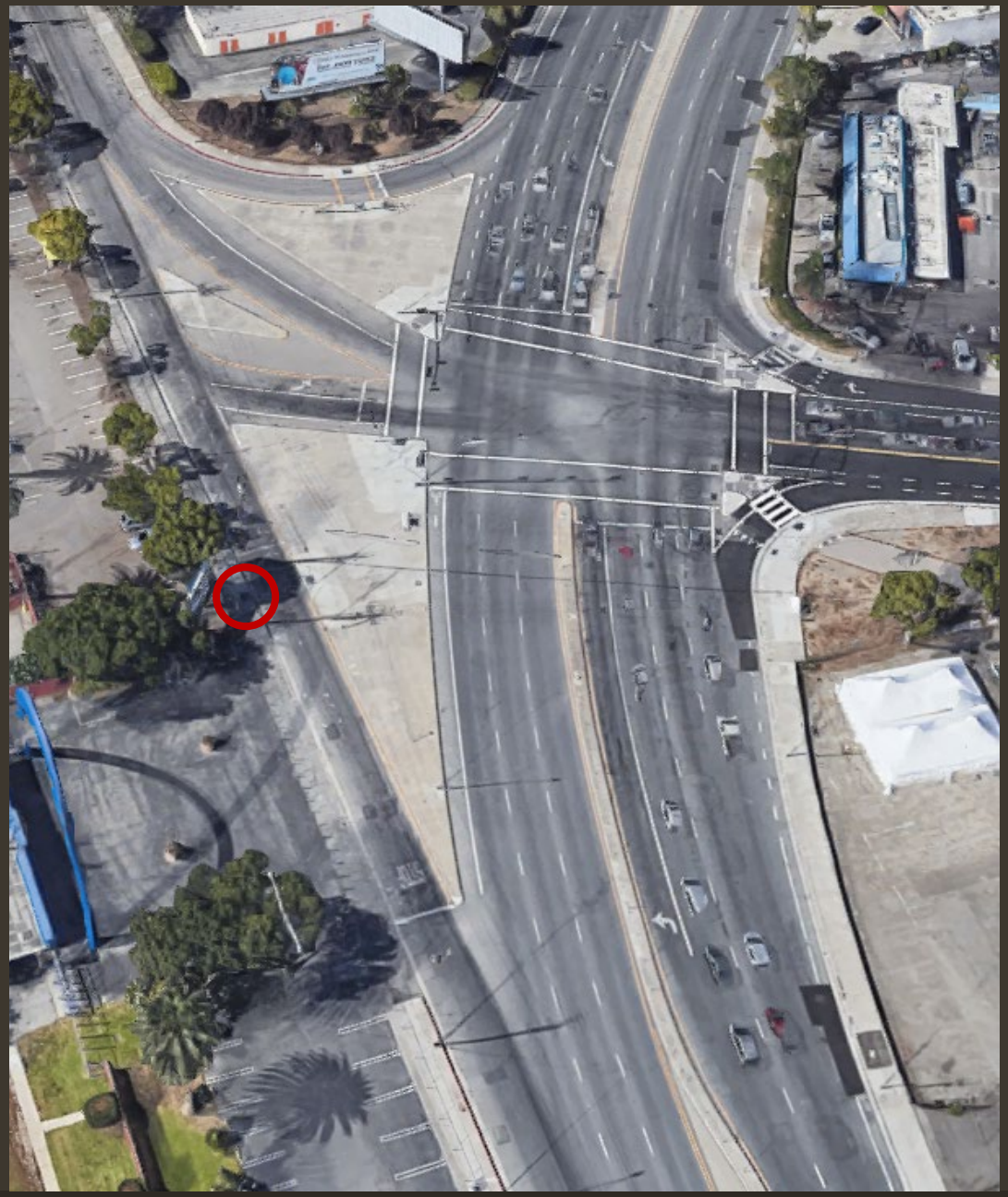
MRP 3.0 Green Infrastructure Retrofit Minimums

Municipality	Acres
Antioch	5.00
Brentwood	4.45
Clayton	0.74
Concord	5.00
County	5.00
Danville	2.67
El Cerrito	1.53
Hercules	1.58
Lafayette	1.60
Martinez	2.30

Municipality	Acres
Moraga	1.07
Oakley	2.55
Orinda	1.20
Pinole	1.16
Pittsburg	4.36
Pleasant Hill	2.09
Richmond	5.00
San Pablo	1.86
San Ramon	4.56
Walnut Creek	4.21

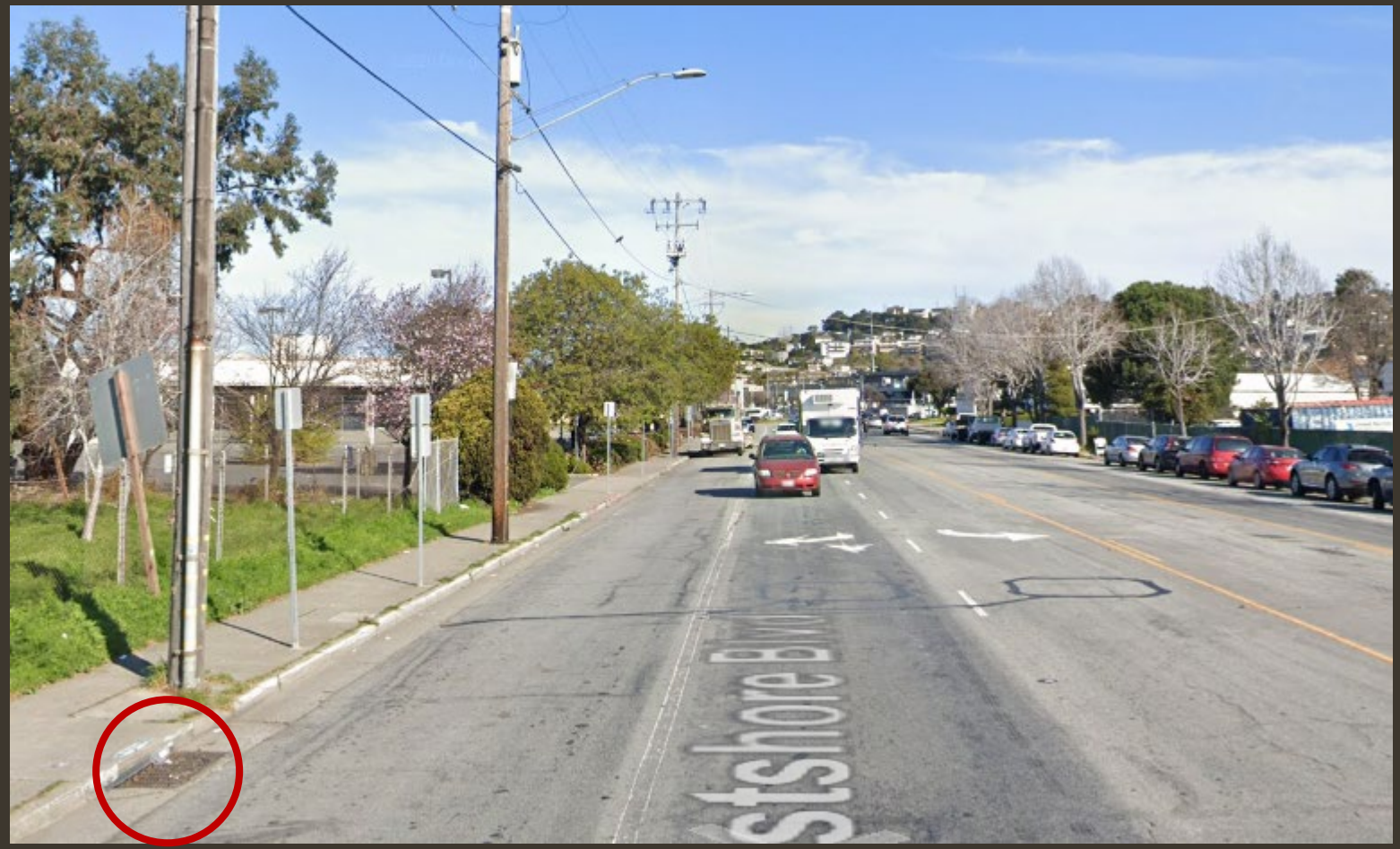
57.32 acres countywide




Old Tully Rd

Investigating Green Infrastructure Opportunities

- First, understand the existing surface drainage.
  - Find the low points first
  - Generally, these are the existing catch basin locations.
- Next, take a quick look at whether a bioretention facility could be located there.
  - Look for existing flat unpaved or vegetated area adjacent to the catch basin.
  - Or, flat pavement that could be converted.
    - Unused lanes / road diet
    - Lose some parking spaces
    - Reconfigure traffic lanes
- Mostly, this can be done using Google Maps.
  - Use a combination of satellite view and street view.
  - It helps to spend a few hours at the site.

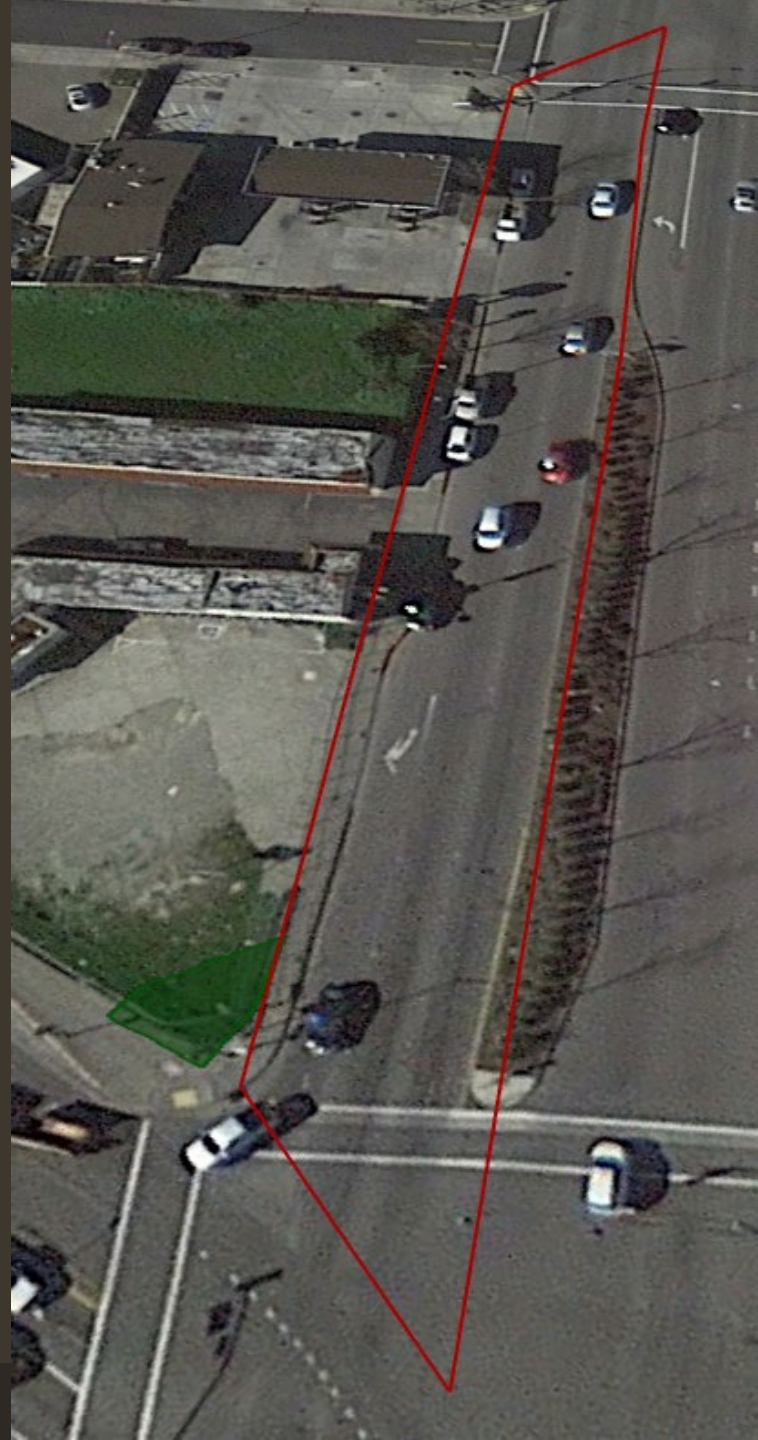

stshore Blvd

Investigating Green Infrastructure Opportunities

- Then, examine the tributary areas.
  - On streets, this is generally from crown to back of sidewalk.
  - Typically, but not always, each block is a separate catchment.
- Particularly in older areas:
  - An entire block may drain to a catchbasin on the lowest corner.
  - Valley gutters may connect drainage from upgradient blocks.
  - Parcels may drain to the gutter rather than being collected internally and piped to storm drains.
- In flat areas, it may be necessary to find a high point
  - Marks the line between catchments
  - Use a construction laser level and rod (one person)

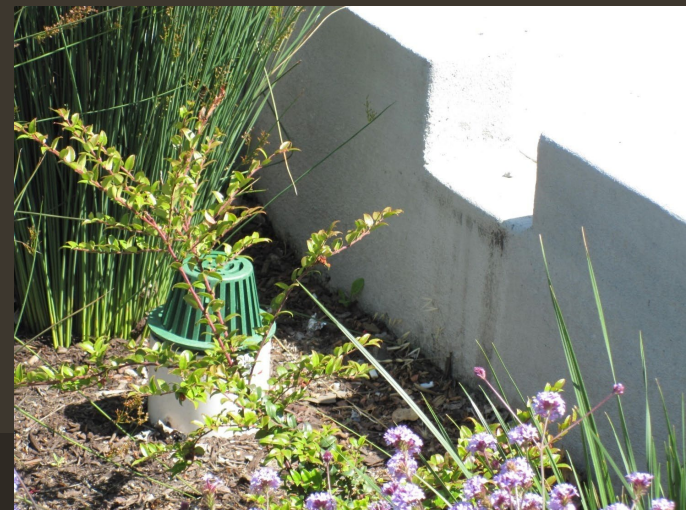
Evaluating Opportunities

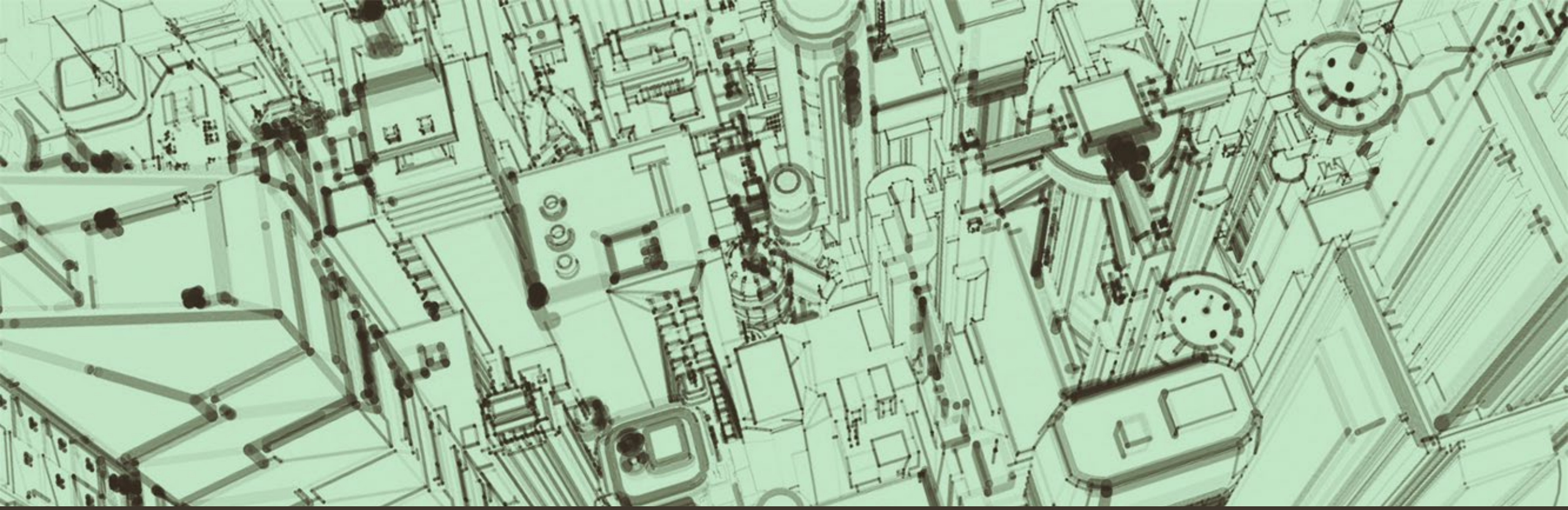
- Draw the tributary areas as polygons on Google Earth.
  - Crown to back of sidewalk, typically.
  - But take note of high points and other field observations.
  - Get an estimate of the square footage.
- Draw the potential bioretention facility as a polygon.
  - Lanes closed, parking spaces lost, etc. Consider parkway strip.
  - Get an estimate of the square footage.
- Calculate the ratio.
  - 4% or more: great!
  - 2% - 4%: More typical.
  - Less than 2%: May not be feasible.



Refining the Conceptual Design

- Visit the site again.
- Do a quick design of elevations for your bioretention facility.
  - Existing catch basin grate elevation ≈ bioretention overflow grate elevation.
  - Bioretention top of soil elevation = six inches lower.
  - What is the height of the curb or wall at each point around the perimeter?
- Look closely and expect to be surprised at what you didn't see the first time.
  - Catch basins hidden by vehicles or vegetation.
  - On private parcels, drainage features visible from the street.
  - Oddly configured crowns and curbs.
  - Utilities!





BREAK

Panel Discussion Begins at 10:45

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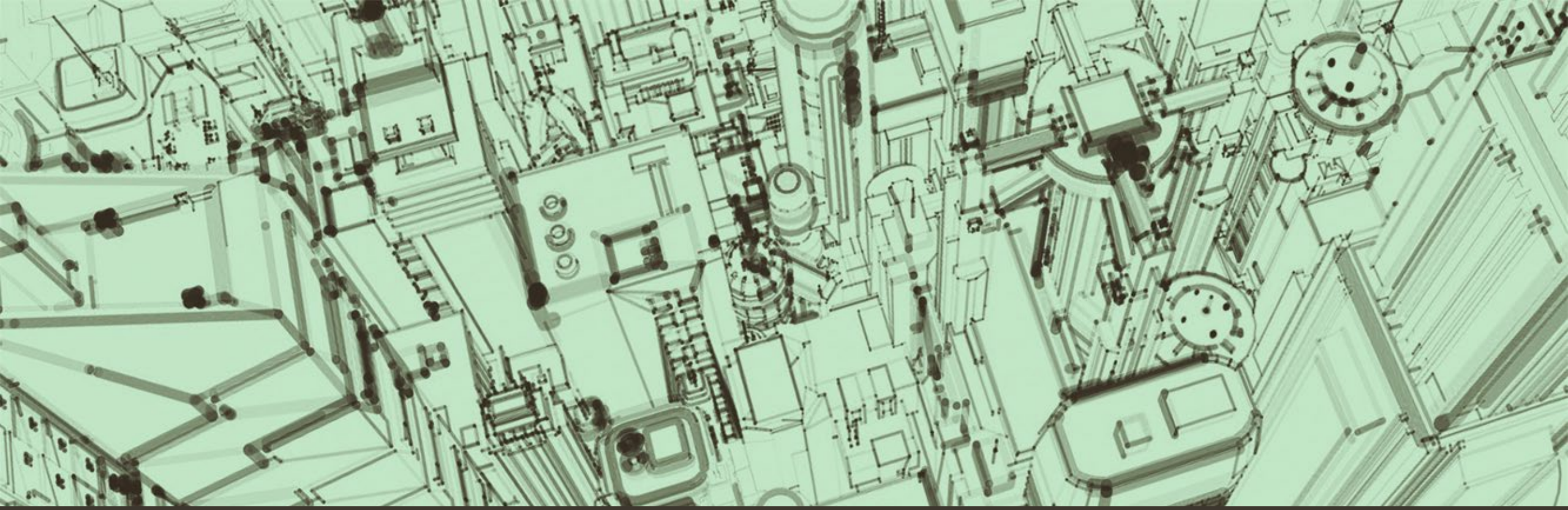

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Panel Discussion

Planning, Design, Construction, & Maintenance of LID Facilities

Panelists

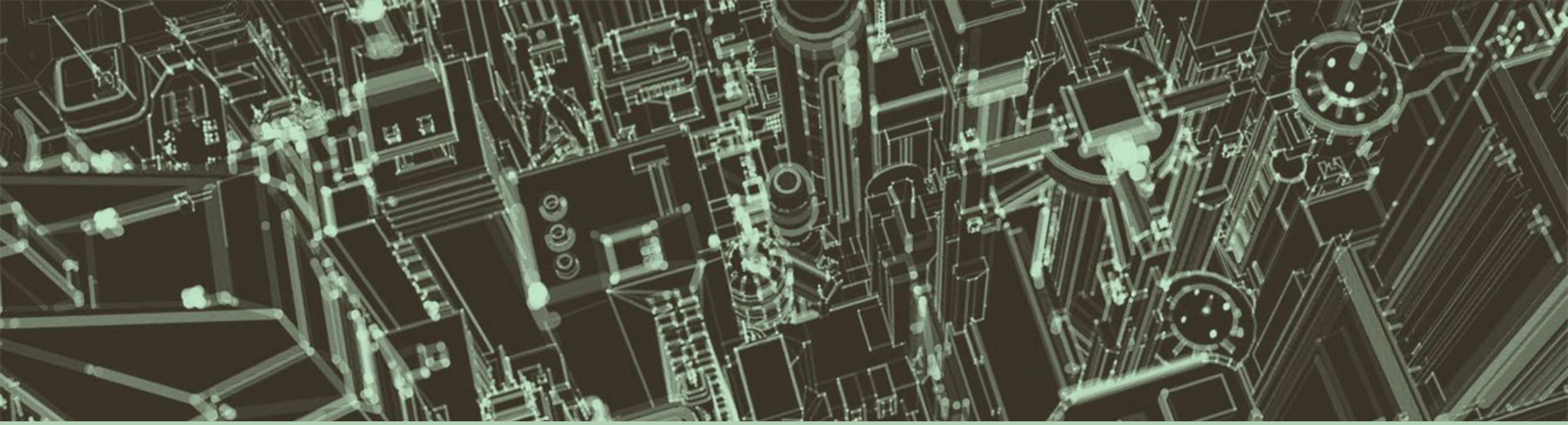
- **Mitra Abkenari,** City of Concord
- **Ryan Cook,** City of Walnut Creek
- **Phil Hoffmeister,** City of Antioch
- **Frank Kennedy,** Kennedy and Associates

Topics for Discussion

1. Coordinating the Design Team to Implement LID
2. Key Requirements for Construction Drawings
3. Submittals and Approvals for Bioretention Soils
4. Plants, Mulch, and Irrigation for Bioretention Facilities
5. 100% LID in Higher-Density Projects

Format (each of five topics)

Introduction to Topic • Background and Issues	3 minutes	Dan
Barriers and Bridges • What is holding us back on our path to better LID design? • How can this barrier be overcome?	6 minutes	Panel
Questions and Answers • Input on Barriers • Suggestions for Bridges • Other Comments	6 minutes	All



Coordinating the Design Team

Architects, Landscape Architects, and Drainage Engineers

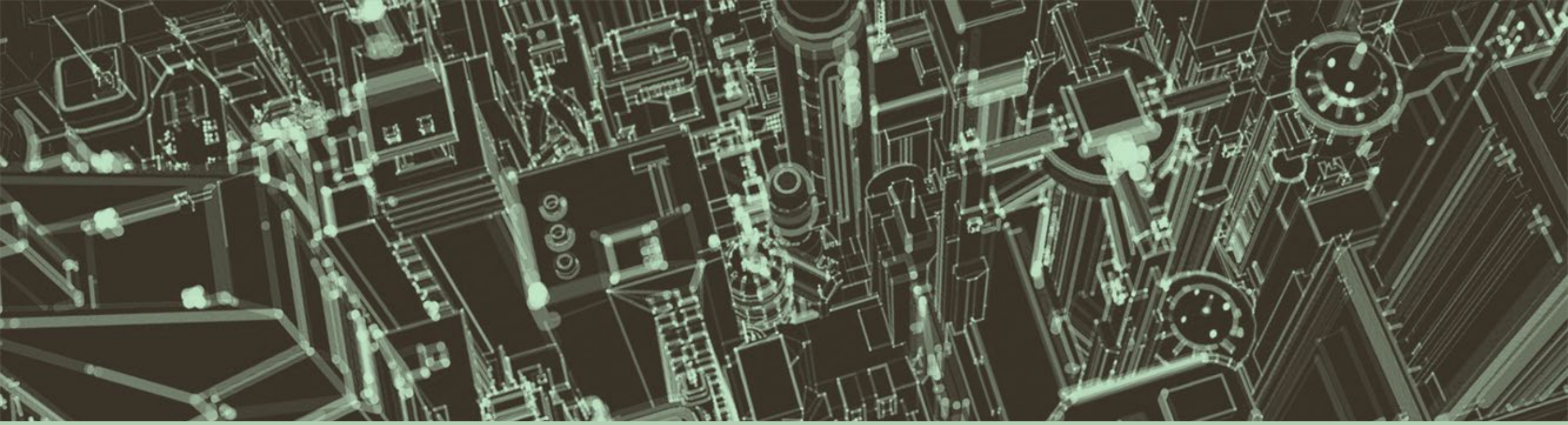
Good* LID Site Design

- Site plan, landscaping plan, and stormwater plan are congruent.
- Put bioretention facilities in high visibility, well-trafficked areas and make them a focal point in the landscape.
- Design site drainage so only impervious roof and pavement drain to IMPs.
- Keep drainage runs short and use surface drainage (sheet flow, swales, trench drains)
- Ensure bioretention facilities are level or nearly level.
- In subdivisions, bioretention facilities should be in a common, accessible area.

*Effective, Affordable, Multi-Benefit, Sustainable, Resilient

Coordinating Design Teams: Barriers and Bridges

Issues	Possible Actions
How to communicate to developers the need to engage the whole team in LID design at project start?	Use the pre-application meeting and/or presentation to committees or DRBs/DRCs.
	At initial meeting, staff encourage applicant to get a civil engineer and engage in consideration of elevations and LID layout, and designate areas for LID facilities.
	Suggest architect provide initial layout.
	Staff request additional info as the project progresses.
	Emphasize C3 needs to be thought of way ahead of time.
	Preliminary Stormwater Control Plan needs to be part of initial submittal
	Geotech needs to be involved at start re: how to handle bioretention facilities adjacent to buildings and structures
	Align design and project details with the constraints that apply in each situation– e.g. when to use planters instead of bioretention facilities.
	Engage with planning departments and DRBs/DRCs and explain importance of integrated design so they are commenting on well—get through to architects
	Work with architects and engineers to nail down bioretention facility locations early.
	Think ahead how utilities will be routed to avoid conflicts with bioretention facilities.
	Highlight specific notes on details, not on general notes.
	LAs struggle to find enough landscaping in restricted sites. Looking for ways to hybrid.

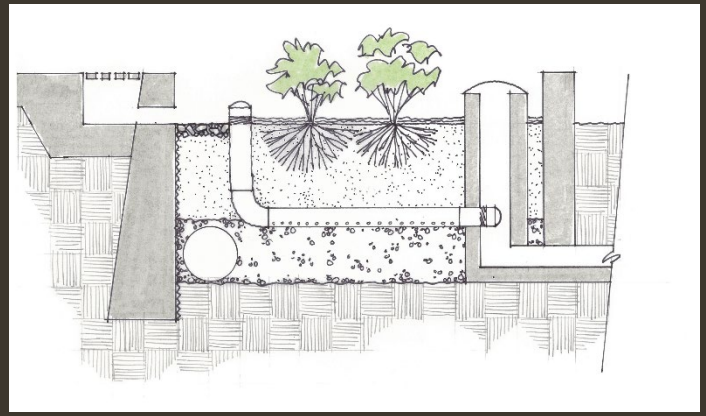


Construction Drawings

What needs to be shown to build bioretention facilities right?

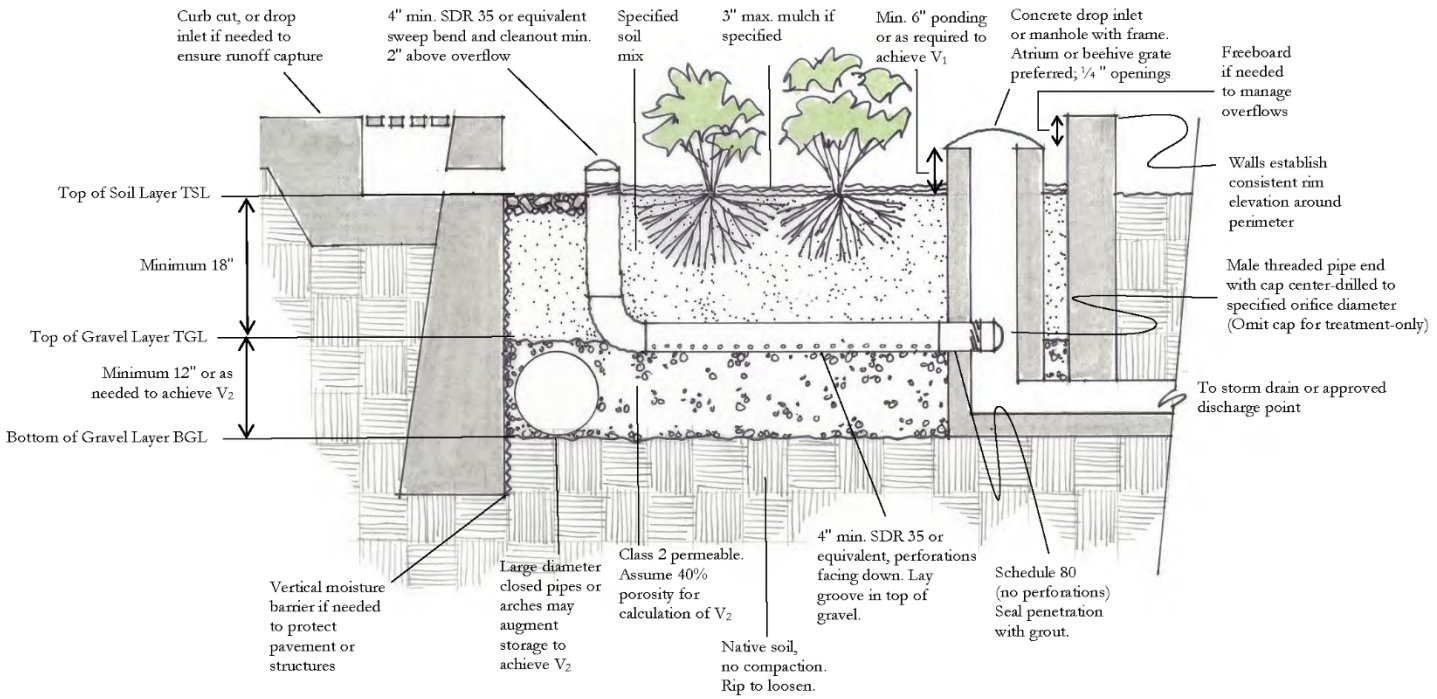
Design and Construction of LID Facilities

- Why do we need consistency in design and construction?
  - Municipalities share responsibility for ensuring operation in perpetuity
  - Visible features are part of the community aesthetic
  - Operational effectiveness and maintenance requirements depend on quality construction
- Flexibility in shape and appearance vs. consistency in engineering
  - Facilities must be designed
    - No cut-and-paste
    - No figuring it out in the field
  - Construction documents must show key engineering criteria are met



Bioretention Facility

Cross-section
Not to Scale

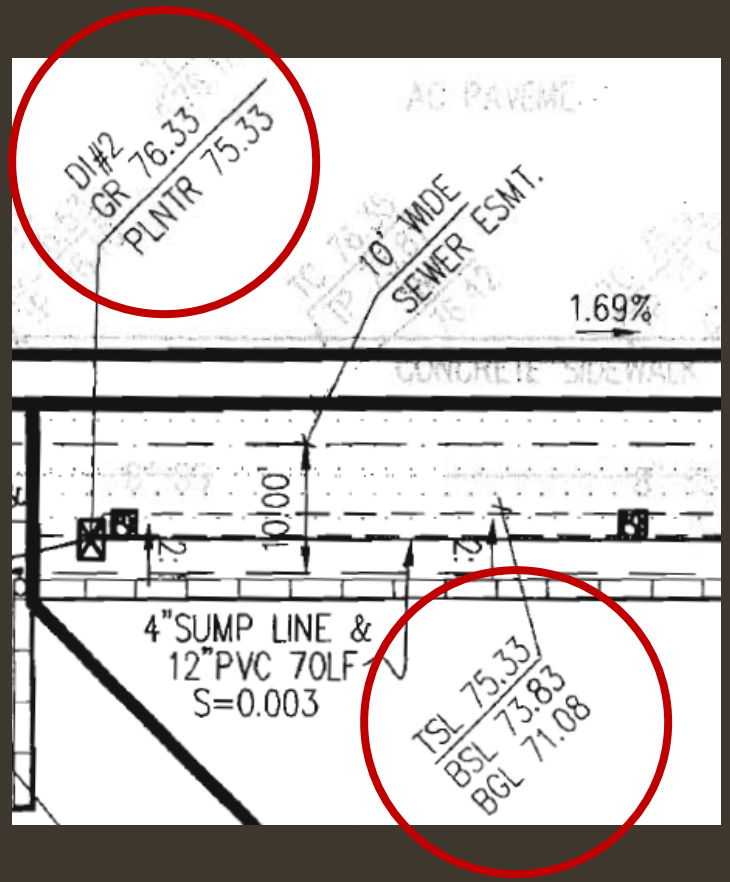


Notes:

- No liner, no filter fabric, no landscape cloth.
- Maintain BGL, TGL, TSL throughout facility area at elevations to be specified on drawing.
- Class 2 perm layer may extend below and underneath drop inlet.
- Elevation of perforated pipe underdrain is atop gravel layer.
- See Appendix B for soil mix specification, planting and irrigation guidance.
- See Chapter 3 for factors and equations used to calculate V_1 V_2 and orifice diameter.

What to Show on Construction Plans

- On grading and drainage plan, show:
  - Bottom of gravel layer, BGL
  - Top of gravel layer, TGL
  - Top of soil layer, TSL
- Top of curbs or walls, spot elevations of adjacent pavement
- At curb cut inlets show top of paving, top of curb, and TSL
- At overflow grates, show the grate elevation and the adjacent TSL
- Call out elevations of piped inlets

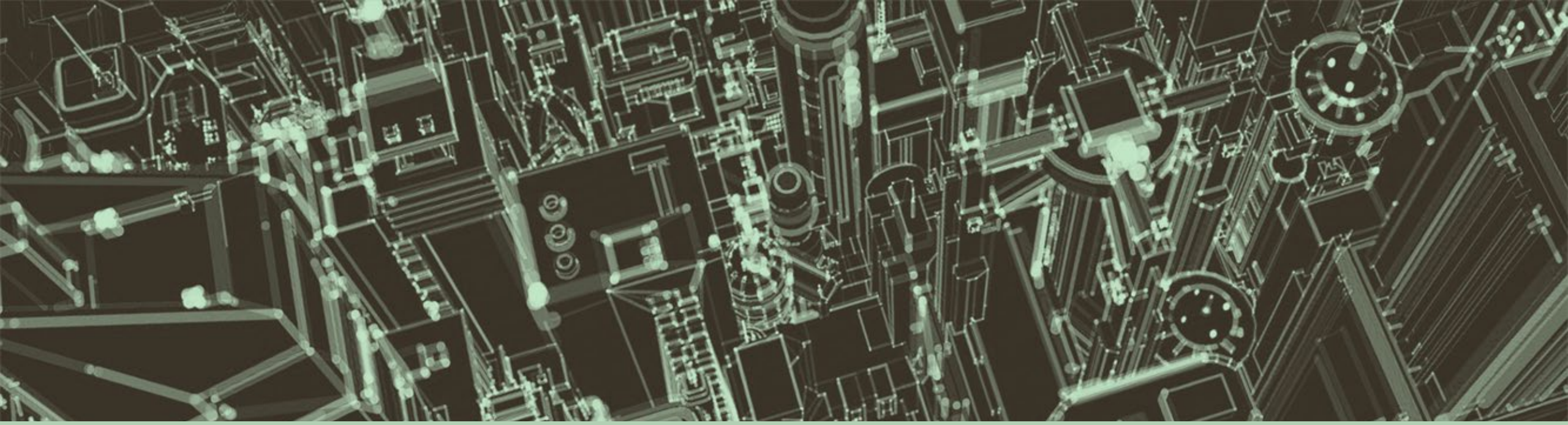


8th Edition: Additional Requirements and Guidance

- Include notes on IMP details (typically cross-sections)
  - Gravel drainage layer shall be “Class 2 permeable” Caltrans specification 68-2.02(F)(3)
  - Soil mix shall meet “Specification of Soils for Bioretention Facilities” dated 04/18/2016
  - Underdrain shall be 4” min SDR 35 or equivalent, perforations facing down. Lay in groove at top of gravel layer.
  - Underlying soil is to be uncompacted. Rip to loosen.
- Include a planting plan and irrigation plan consistent with conditions.
- Include notes on Landscaping Plan sheets:
  - No soil amendments, fertilizers, or synthetic pesticides are to be used within bioretention facilities. Use only approved bioretention soil mix and aged compost mulch.
  - Maintain specified top of soil elevation following planting.

Quality in Construction: Barriers and Bridges

Issues	Possible Actions
Are these requirements/guidance sufficient to ensure quality in the design of facilities?	Changing mindset. Project is CEQA definition—includes adjacent ROW when impacted. Figure out alternative areas for treatment.
How else can we ensure that construction documents are adequate?	Keep the stormwater control plan in the mix as project moves forward to final design and construction.
Lack of spot elevations around bioretention facilities; result is that ponding is inadequate.	Change mindset—accept input from municipal reviewer on things that won't work. They are trying to make sure that construction goes smoothly. Also, aesthetic quality, community benefit and long-term maintenance.
Locate utility easements, including water and PGE. Often have surprises when utility crossings are found within the site.	
Problem coordinating subcontractors on the site to achieve the site.	Make sure C.3 fine grading is called out as a line item in the bid so it is clear which subcontractor is implementing each step.



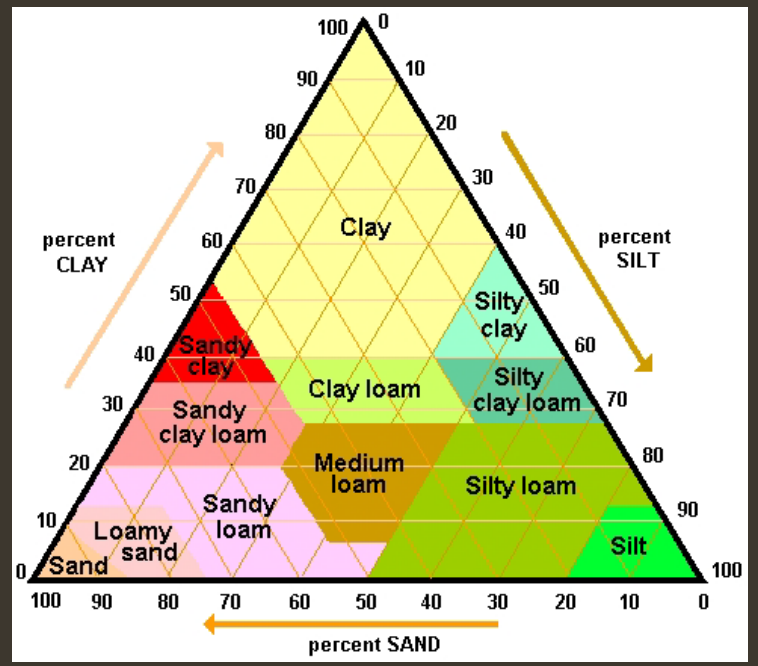
Bioretention Soils

Submittals and Construction Inspection

Bioretention Soil April 2016 Specification

B-2

- Submittals must include:
  - A sample of mixed bioretention soil
  - Certification that the mix meets the specification
  - Grain size analysis of the sand component
  - Description of the equipment and methods used to mix the sand and compost
  - Qualifications of the testing laboratory
- A “brand name” mix may be used (up to 100 cubic yards)
- No infiltration rate testing is required if the “specified” mix is used.

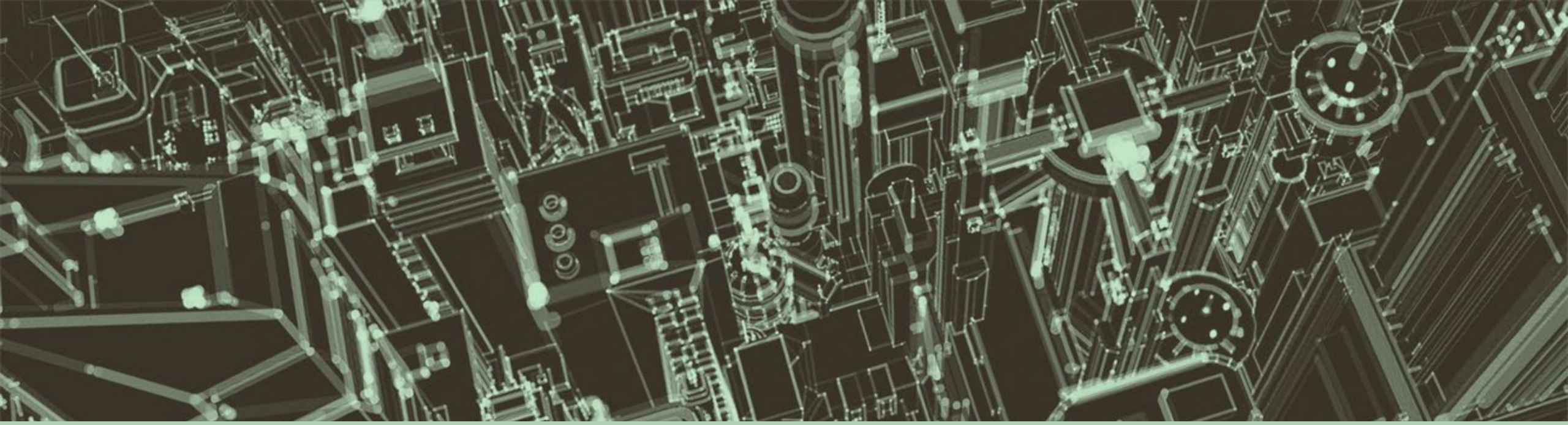


Guidebook 8th Edition – Soil Submittals

- Needs:
  - To verify that material delivered matches submittal
  - An alternative to infiltration rate testing
    - Not repeatable
    - Takes a long time
- Changes/Updates
  - Soil Mix Specification Submittal Verification Checklist developed by BASMAA
  - Compare submitted sample to delivery (look and feel)
    - Grainy, gritty texture
    - May be slightly spongy, but breaks apart easily
    - After manipulating the mix, there is no discoloration on the hand

Soil Submittals: Barriers and Bridges

Issues	Possible Actions
Will the "look and feel" field comparison serve to ensure the soil mix is the right product?	Walnut Creek will still use infiltration testing. Falling head test. Tube test. Repeatability OK.
	Antioch uses look and feel test as well as infiltration test.
Soils too sandy. Irrigation can be excessive (can be mitigated by subsurface irrigation system)	
	Infiltration rates tend to decline following repeated wettings.
	Try to correlate manual look and feel test with tube test results.
	Do manual test first. Using the infiltration test good learning tool for correlation in field. Different loads on different days will produce different results.
	How do we provide some guidance on how to adjust mix? To make infiltration faster or slower. To resolve more economically.



Plants, Mulch, and Irrigation

for Bioretention Facilities

Guidebook 7th Edition, Appendix B

- Performance requirements (ongoing) – basis of O&M inspections
  - Runoff percolates through the soil mix at a *minimum* rate of 5 inches per hour
  - Plants are in healthy condition
  - Irrigation systems minimize water use and prevent overwatering
- Plantings
  - Plant selection for a particular site should be by experienced professionals
  - Table B-1 lists ≈ 120 species that may be suitable
    - Grasses, small shrubs, large shrubs, small trees, vines
    - Lawn alternatives, non-irrigated sites

Guidebook 7th Edition, Appendix B

B-1

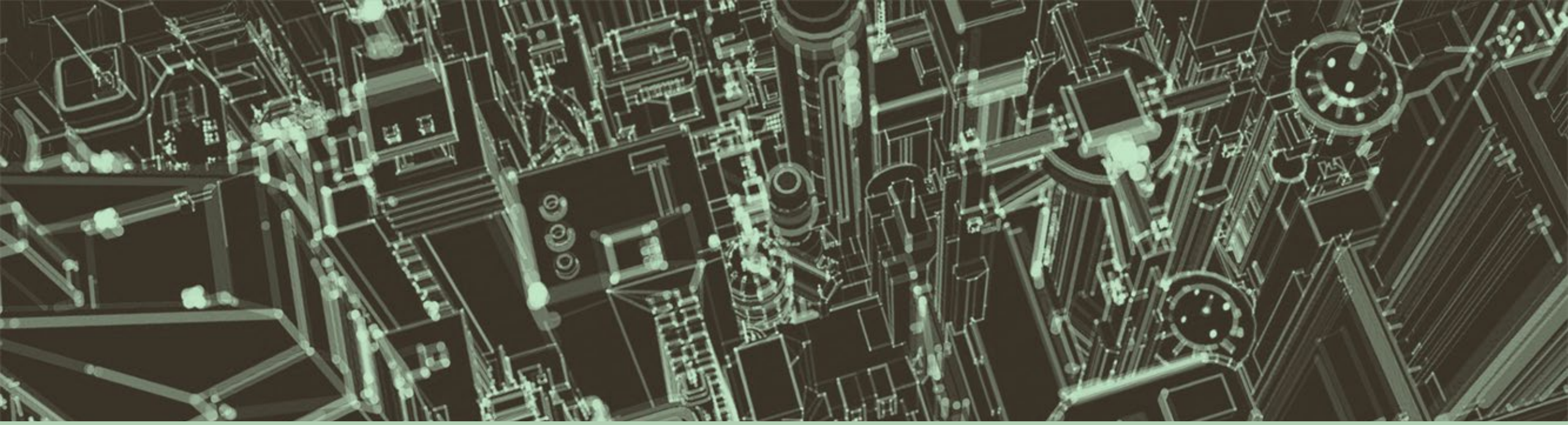
- Mulch
  - Aged compost mulch is recommended
  - Same product as used in soil mix
- Irrigation
  - Separate control (zone) for watering
  - Smart irrigation controllers strongly recommended
  - Drip emitters strongly recommended

Guidebook 8th Edition

- Dismantling Appendix B
  - Soils requirements/guidance goes to a separate section in Chapter 4
  - Mulch and planting design guidance goes to Chapter 4, Bioretention Design Sheet
  - Operation and maintenance guidance goes to Chapter 5
  - Plant list is retained in Appendix B

Mulch and Irrigation: Barriers and Bridges

Issues	Possible Actions
How can we ensure project landscape architects access the guidance in the Guidebook?	
Is the guidance on mulch adequate? What alternatives are acceptable or unacceptable?	Noting rock mulch can heat up and kill plants. No ground up rubber, dyed bark, etc. Look for mulch specification in plans and at construction stage.
Are we still having issues with perceived excessive water use?	Drip irrigation needs to be eaceh plant, not general.
	Chip bark discouraged. In Guidebook, maybe be more specific.
Walnut Creek -- Leaning toward not allowing trees, particularly in smaller facilities.	
Issues with mulch--Overfilling with mulch can lead to washout of mulch.	

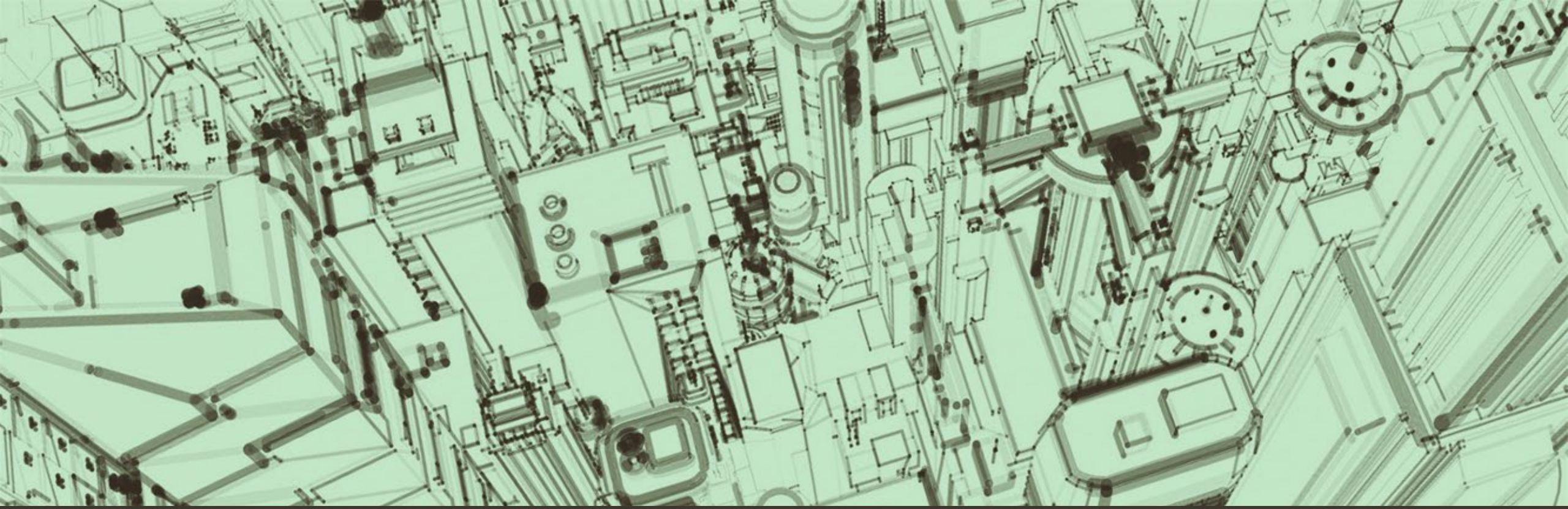


100% LID in Higher-Density

Making Low Impact Development Feasible on Nearly Every Site

100% LID on Higher-Density Sites

- What is a higher-density site?
  - Typically, a previously developed site, or infill
  - Minimal or no surface parking
  - Minimal landscaping
- What issues arise designing LID on higher-density sites?
  - Lack of suitably sized flat areas that can be landscaped
  - Barriers to moving runoff around or under buildings
  - Surface drainage across paved areas
  - Additional costs for walls and other structures
  - Drop-offs and depth of facilities
  - Matching street grades and drainage/municipal storm drain connections



Wrap up

Final Comments

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