Stormwater and Pavement

Permeable Pavement as Stormwater BMP

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Tom Sweet

Permeable Pavement Workshop

UC Davis, November 14, 2017

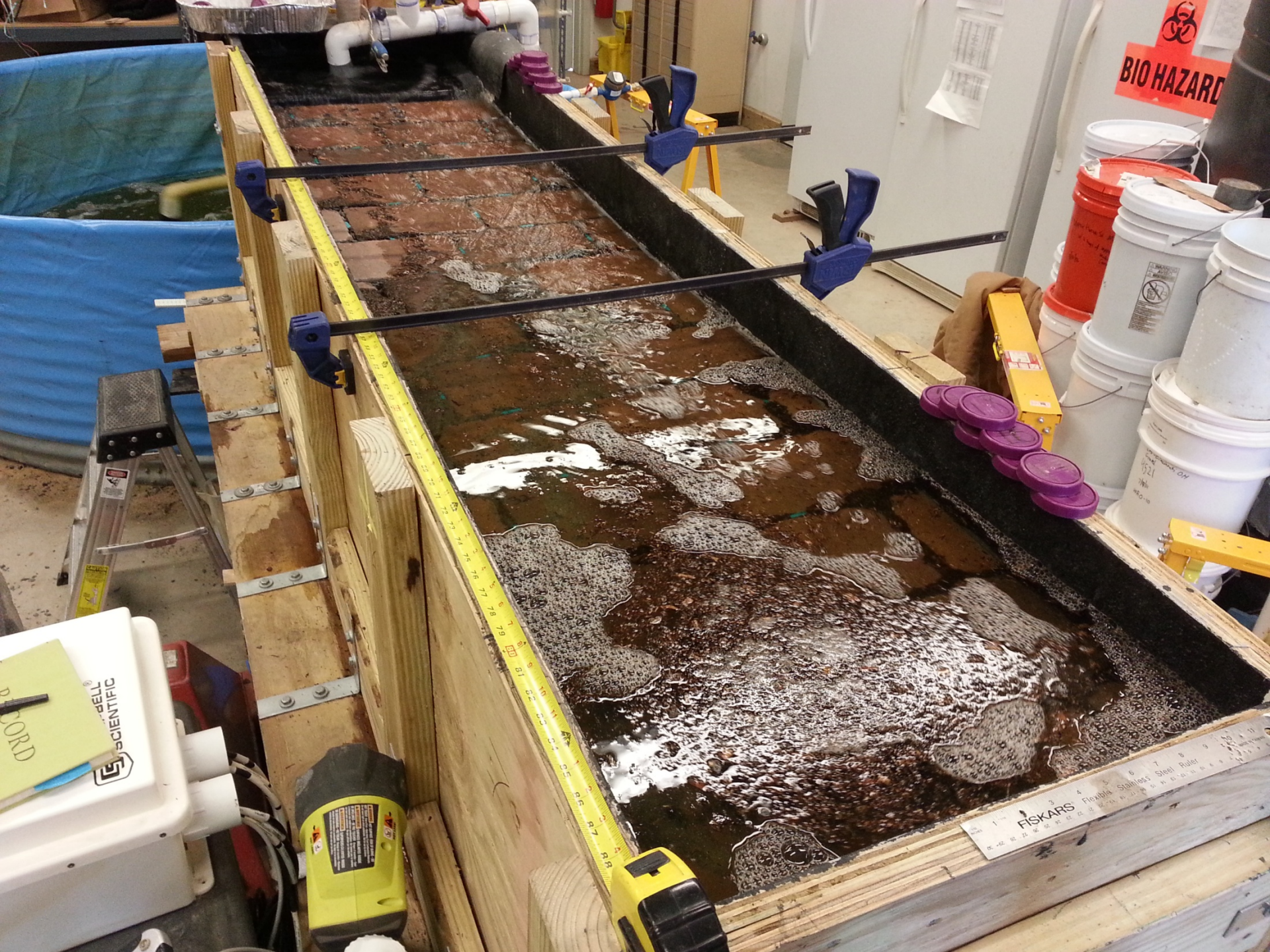
AECOM

why aren't all streets like this?

By Brad Causey

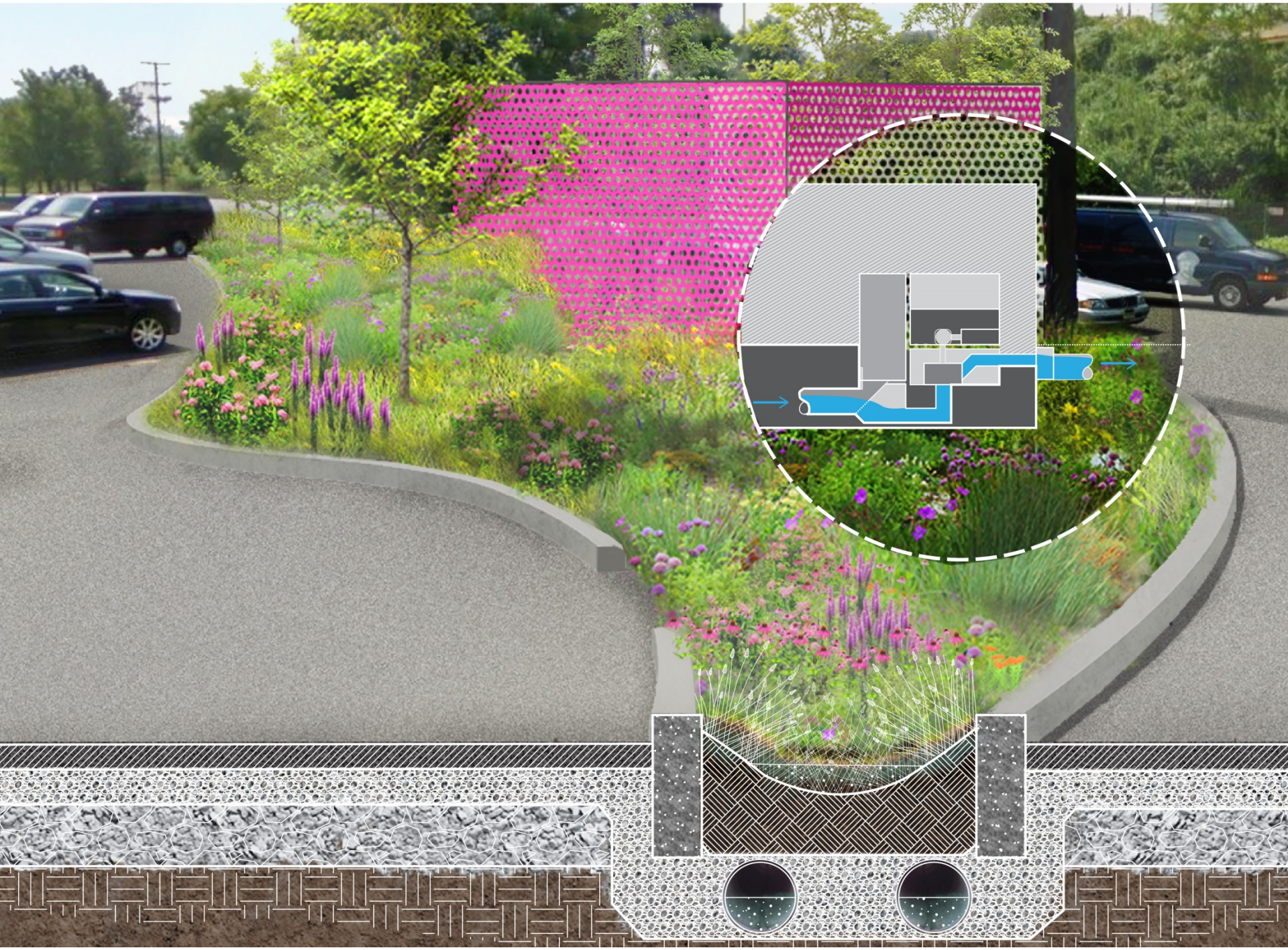
FIRST CURB-TO-CURB PERMEABLE STREET IN BAY AREA OUTPERFORMS EXPECTATIONS

The morning after an overnight rainstorm, Tom Sweet, AECOM senior engineer, walks two blocks from the Downtown Berkeley BART


BIO HAZARD
FISKARS
Flexible Stainless Steel Ruler

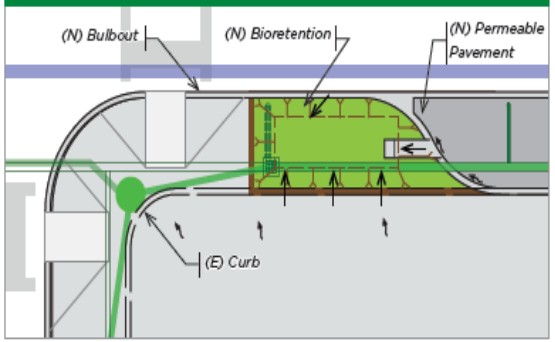

Bank of America


70500087
San Francisco Chronicle

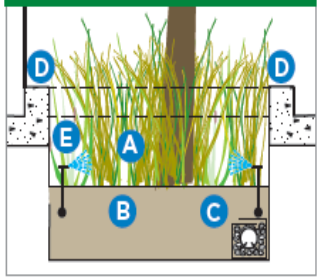


DETAIL – MANAGING RISK

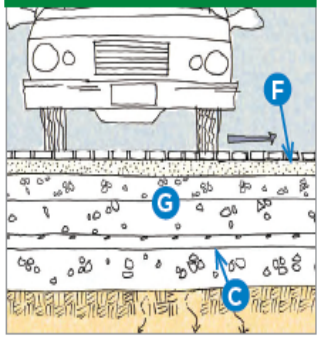
BULBOUT PLAN



BIORETENTION



PERMEABLE PAVEMENT



BIORETENTION

- **A** Plant selection – Hardy California drought tolerant natives and adapted species
- **B** Soil mix and placement – Robust amended organic soil mix to ease O&M
- **C** Underdrain placement – Allows assured drawdown during wet weather to provide storage
- **D** Curb – Provides safe separation from vehicle, bicycle and pedestrian use areas
- **E** Irrigation –Simple system for grow-in

PERMEABLE PAVEMENT

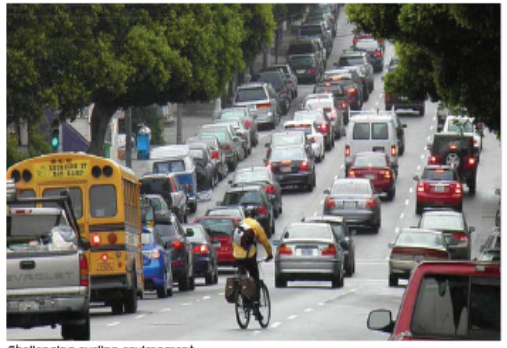
- **F** Pavement type – Range of permeable pavement types allows tailoring to specific location (pavers, asphalt or concrete)
- **G** Deeper permeable base

RISKS AND UNCERTAINTIES	MITIGATION	STATUS
Meeting SSIP performance[1]	Supplement with permeable pavement to meet anticipated SSIP performance metric requirements	✓
Sufficient funding[2]	Design by CBSIP, construction and O&M by EIP budget. Detailed agreements in place between agencies.	✓
Schedule	Coordinated approach between SFMTA, SFDPW and SFPUC	✓
Contracting mechanism[2] – Maintenance	Subcontracted to a third party for the first 2 years – in the construction contract	✓
Soils – Permeability	Belt and suspenders approach – underdrain system to assure storage	✓
Design Basis	Leveraging the updated stormwater design guidelines and ongoing work by SSIP to coordinate design details including O&M responsibilities	✓

Notes:
1. 4,320 SF of GI captures run-off from the first 3/4" of rainfall and provides 104,000 gallons of annual CSD reduction (at $3.2 per gallon).
2. Estimated first costs approximately $350,000 and annual O&M costs estimated at $13,500.

WIGGLE NEIGHBORHOOD GREENWAY EIP
PHASE 1 – OAK AND FELL BULBOUTS GREEN INFRASTRUCTURE (GI)


Existing conditions


Challenging cycling environment

INTRODUCTION TO OPPORTUNITY

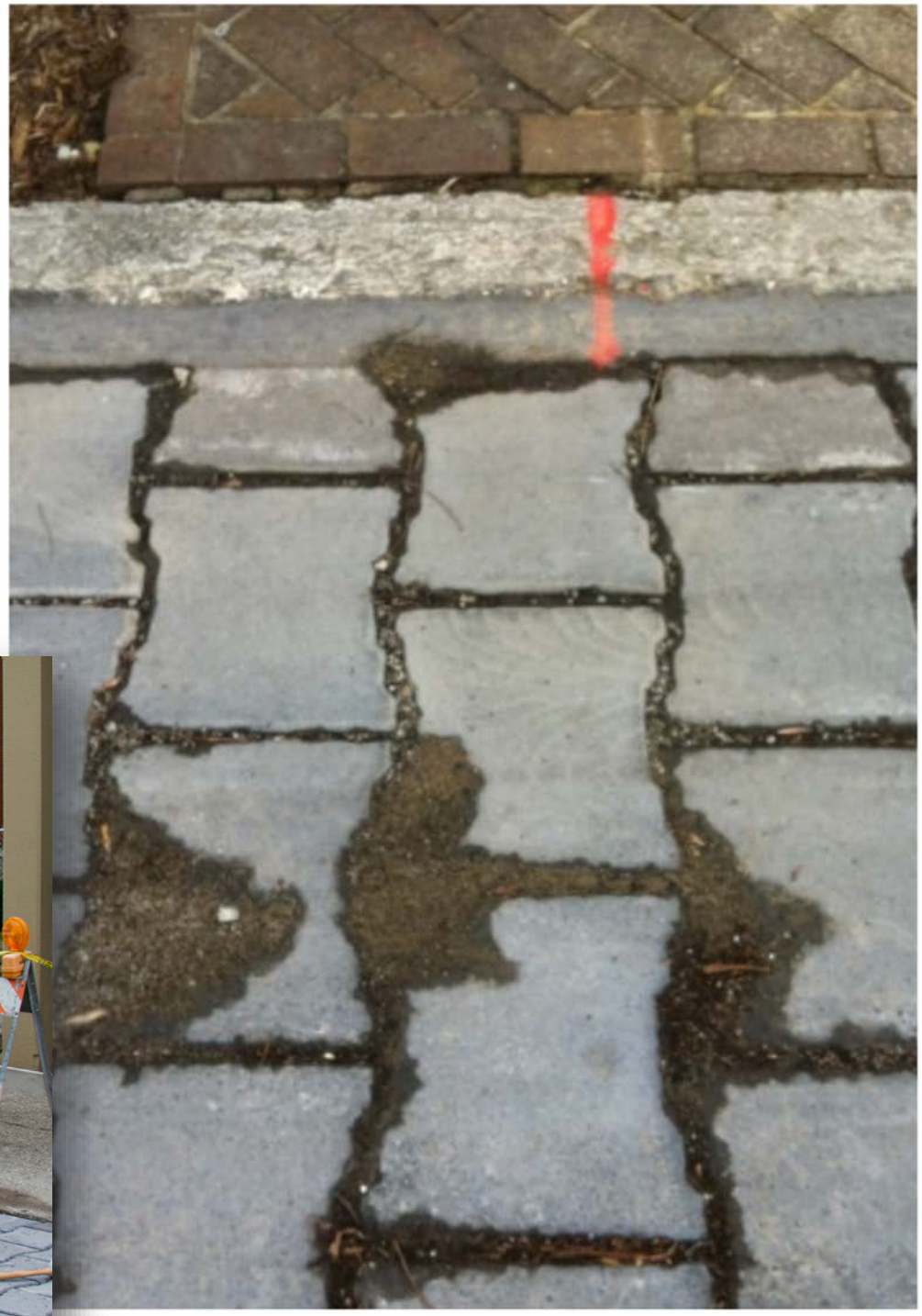
SFMTA FELL & OAK BIKEWAY PROJECT

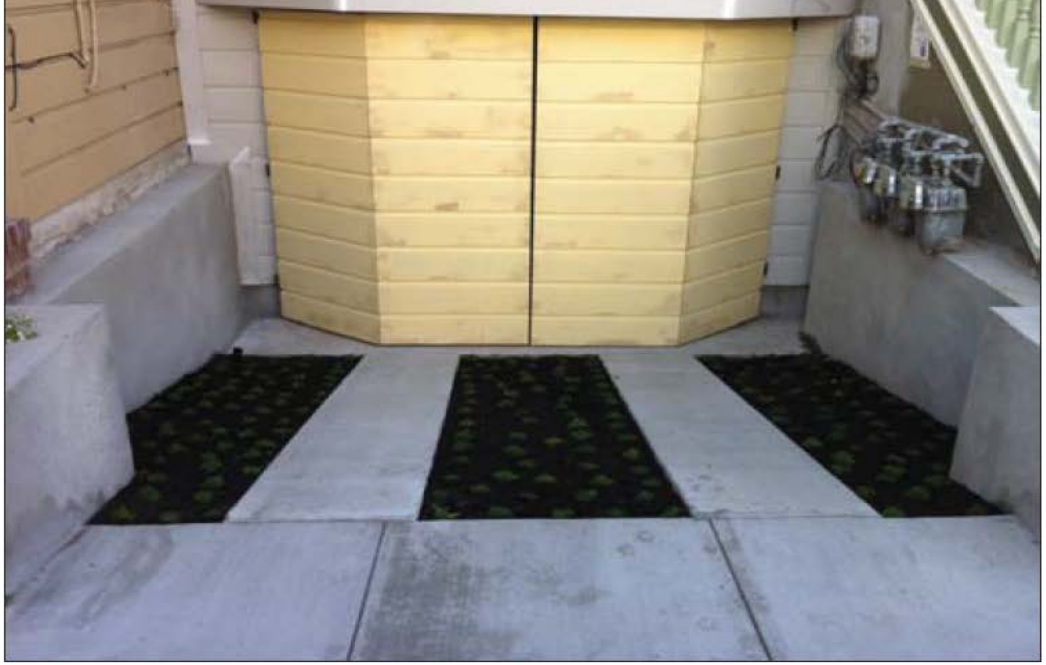
+ Primary goal – create separated safe bikeways
+ Additional goals – pedestrian safety, functionality of Fell and Oak access to residents and businesses
  - SFMTA currently legislating curb modifications
  - SFDPW design substantially complete
+ SFMTA outreach – dedicated website, public meetings, public wants more green (landscaping)
  - Significant media coverage to date
+ SFMTA asking SFPUC to integrate GI
+ SFPUC evaluation of bulbout locations aligns with SFMTA preferences


Example of planned bike lane


Existing Wiggle cyclists


Value to local businesses



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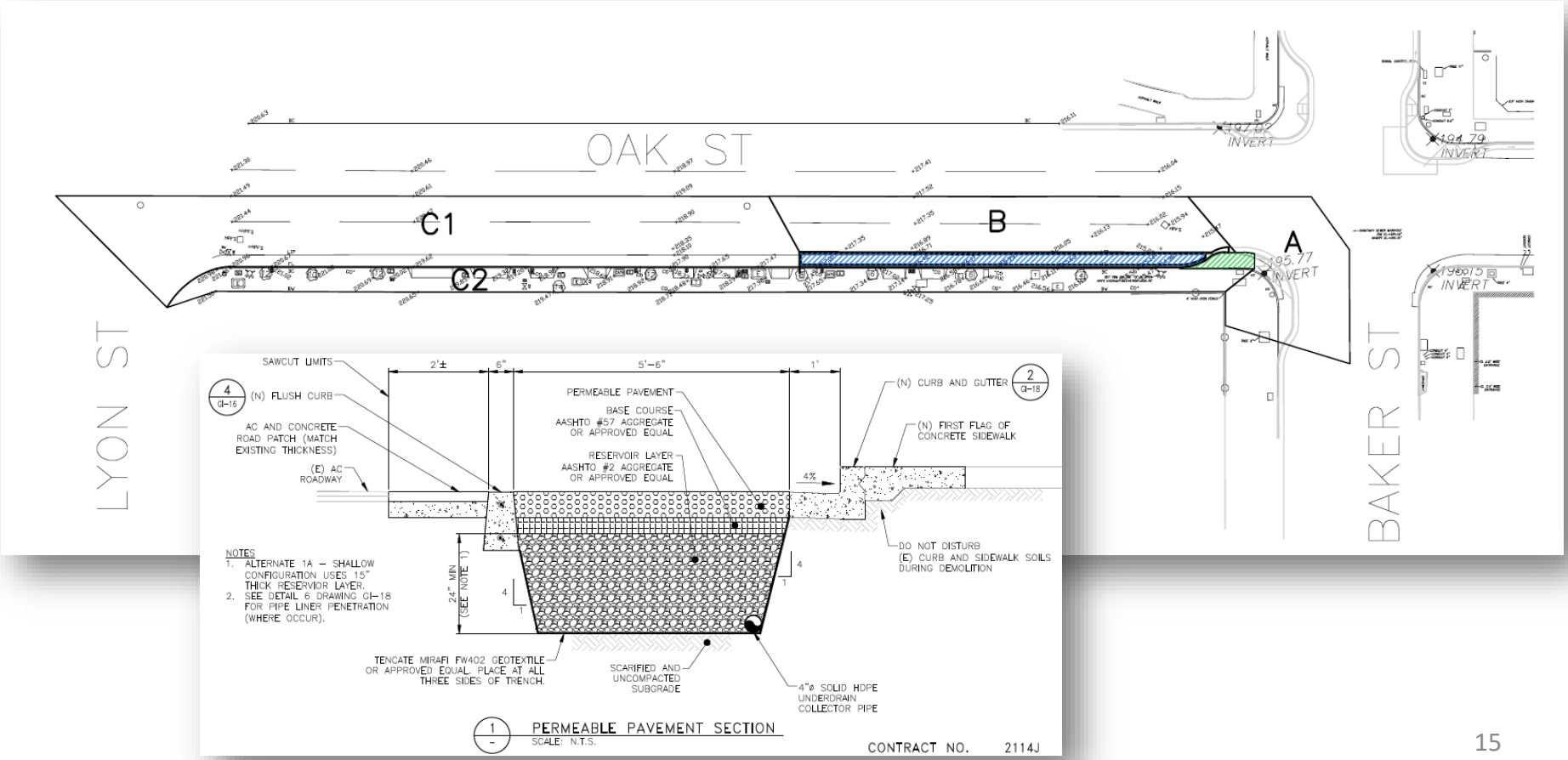
HERTZ 003-7043
Hertz

Oak and Fell – Technical Issues

Meeting BMP sizing ratio

- Limited areas available for GI due to project scope
- Drainage areas broken into 4 separate areas – upstream roadway, adjacent roadway, sidewalk and side inlet flows
- Curb and gutter included to convey flows directly to bioretention cell

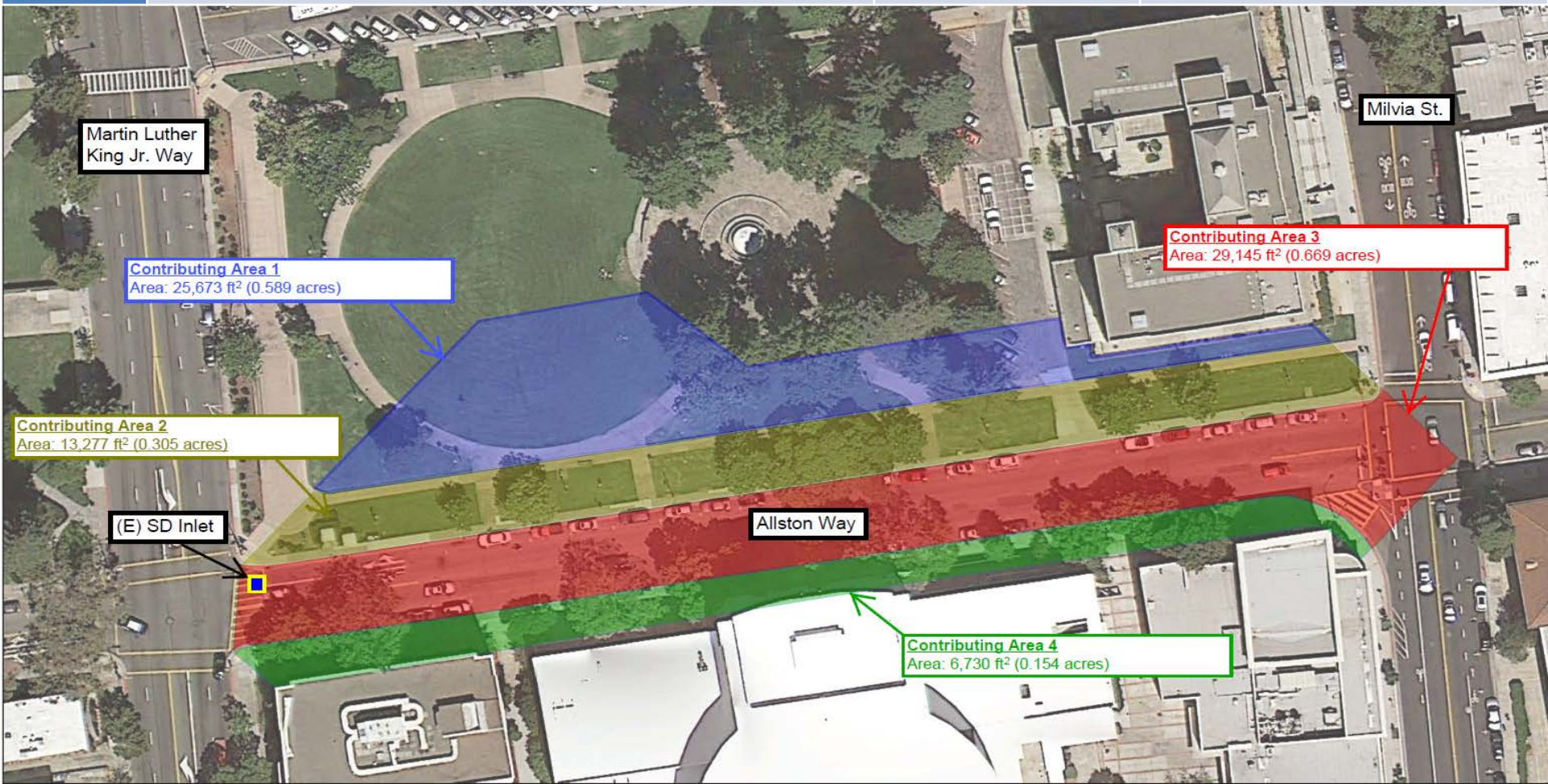



FELL

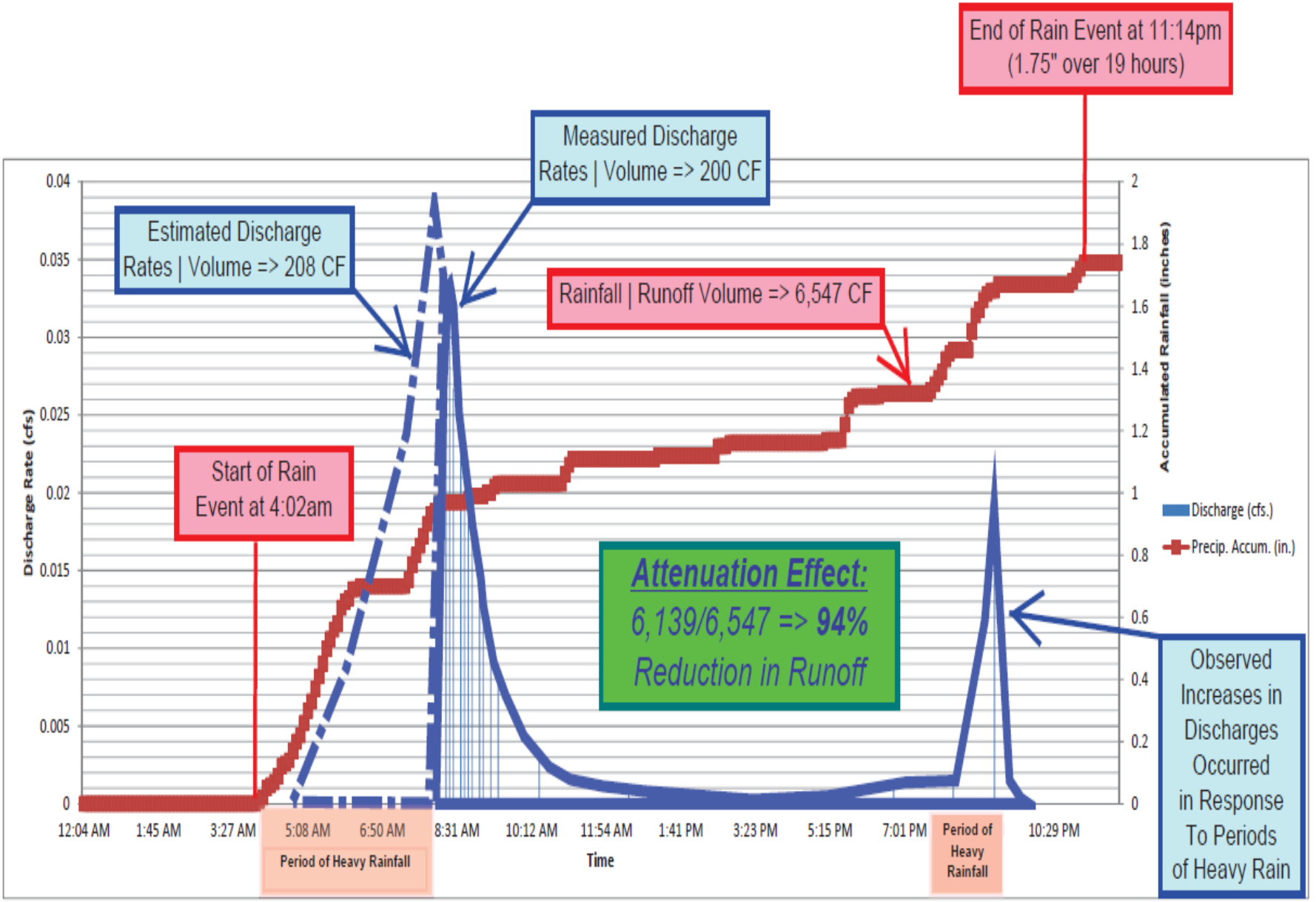
Water Quantity Monitoring – Contributing Areas

Table 1: Allston Way Contributing Areas

Area	Location	Area (square feet)	Cw (runoff coefficient)
1	MLK Civic Center Park	25,673	0.25
2	North Sidewalk Frontage	13,277	0.6
3	Allston Way Roadway	29,145	0.9
4	Berkeley HS South Sidewalk Frontage	6,730	0.6

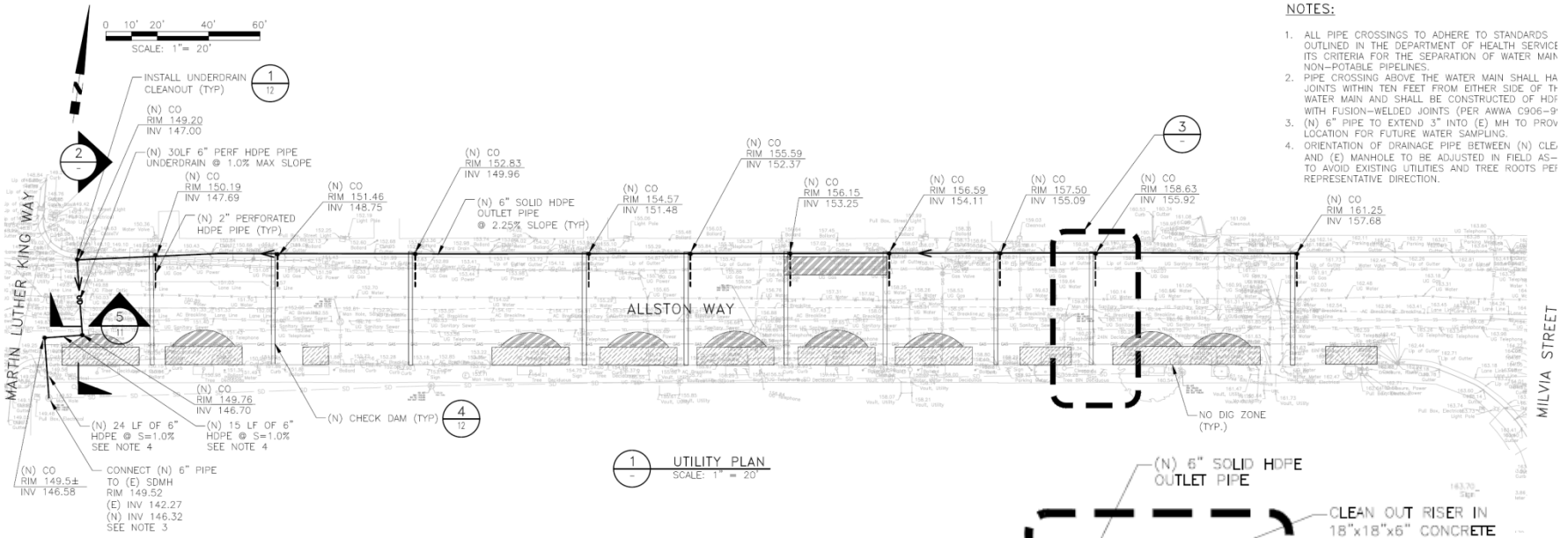


Water Quantity Monitoring Event – January 6, 2016




12 UNTIL OAKLAND
VIA GRAND AVE
5005
AC TRANSIT
specialists across the hall, not across town

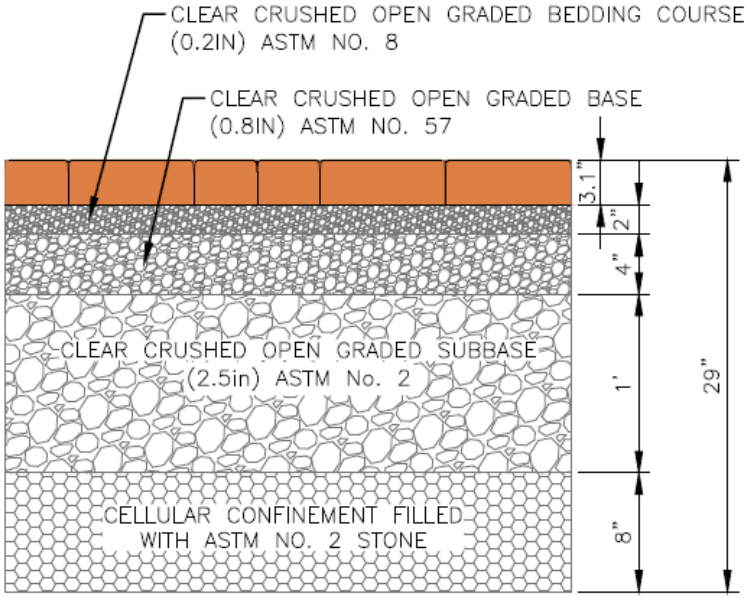
Subsurface Detailing – 11 Infiltration Cells with Underdrains



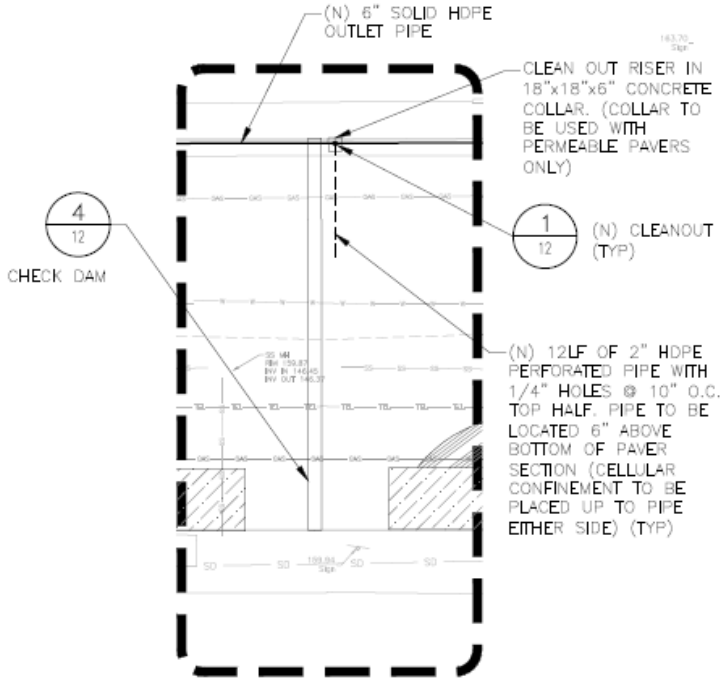
NOTES:

1. ALL PIPE CROSSINGS TO ADHERE TO STANDARDS OUTLINED IN THE DEPARTMENT OF HEALTH SERVICE ITS CRITERIA FOR THE SEPARATION OF WATER MAIN NON-POTABLE PIPELINES.
2. PIPE CROSSING ABOVE THE WATER MAIN SHALL HA JOINTS WITHIN TEN FEET FROM EITHER SIDE OF TH WATER MAIN AND SHALL BE CONSTRUCTED OF HDF WITH FUSION-WELDED JOINTS (PER AWWA C906-9
3. (N) 6" PIPE TO EXTEND 3" INTO (E) MH TO PROV LOCATION FOR FUTURE WATER SAMPLING.
4. ORIENTATION OF DRAINAGE PIPE BETWEEN (N) CLE AND (E) MANHOLE TO BE ADJUSTED IN FIELD AS- TO AVOID EXISTING UTILITIES AND TREE ROOTS PEF REPRESENTATIVE DIRECTION.

1 / - UTILITY PLAN
SCALE: 1" = 20'

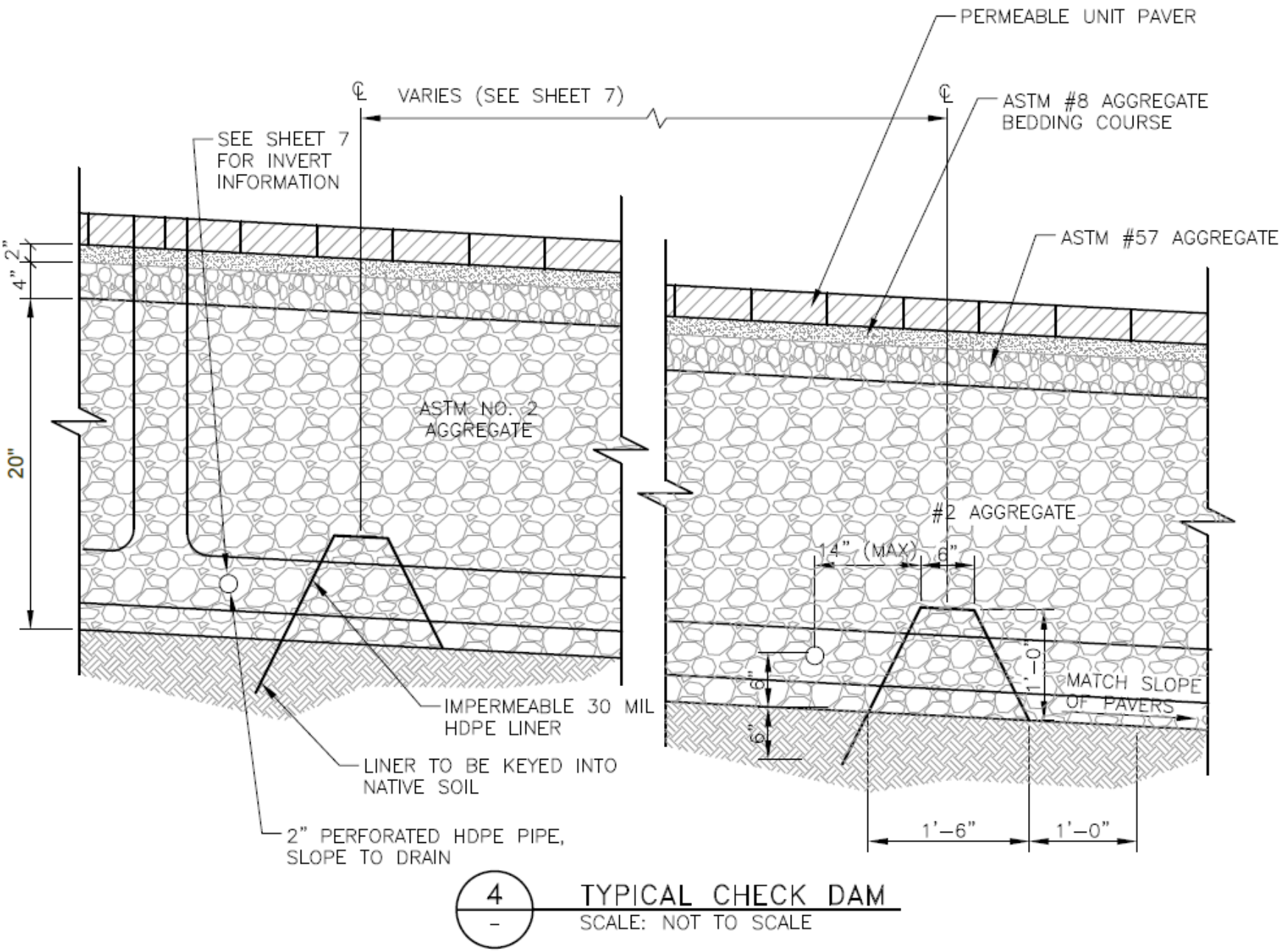


2 / - PAVER ROADWAY SECTION
SCALE: N.T.S.



3 / - UNDERDRAIN AND CHECK DAM ENLARGEMENT
SCALE: 1" = 10'

Subsurface Detailing – Check Dam Configuration



4 – TYPICAL CHECK DAM

SCALE: NOT TO SCALE

Thank You!

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