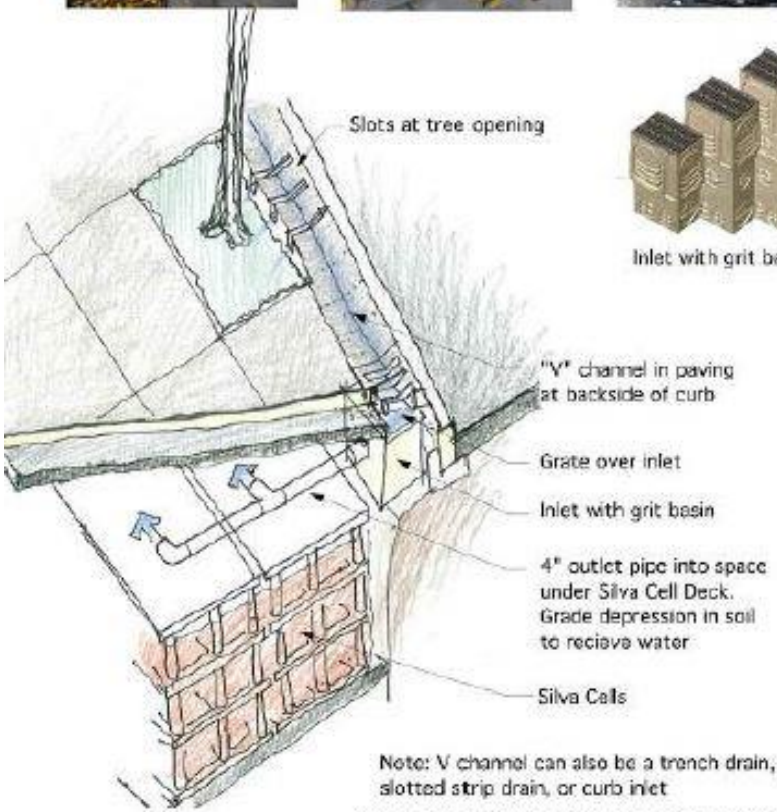
Suspended Pavement Systems for Stormwater Treatment

Rainwater and stormwater runoff enter the suspended pavement system through a permeable surface or alternate drainage systems.

Pervious pavers

Pervious pavers

Pervious pavers
and slot drain through paving



Inlet with grit basin

Trench drain

Trench drain

Slot drain

Silva Cell Water Harvesting Options

Curb inlet

Open jointed paver
water interception
into a planted area

Silva Cell Water Harvesting Options

deeproot


Collection pipe or flow out underdrains to existing drainage network

Solid pipe from catch basin transitions to a perforated distribution pipe to transport water from the catch basin through the Silva Cell system and soil media

Catch Basin

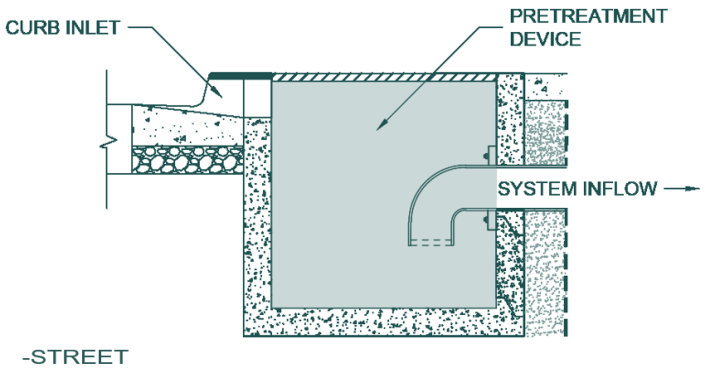
deeproot

Cleanout

Distribution pipe

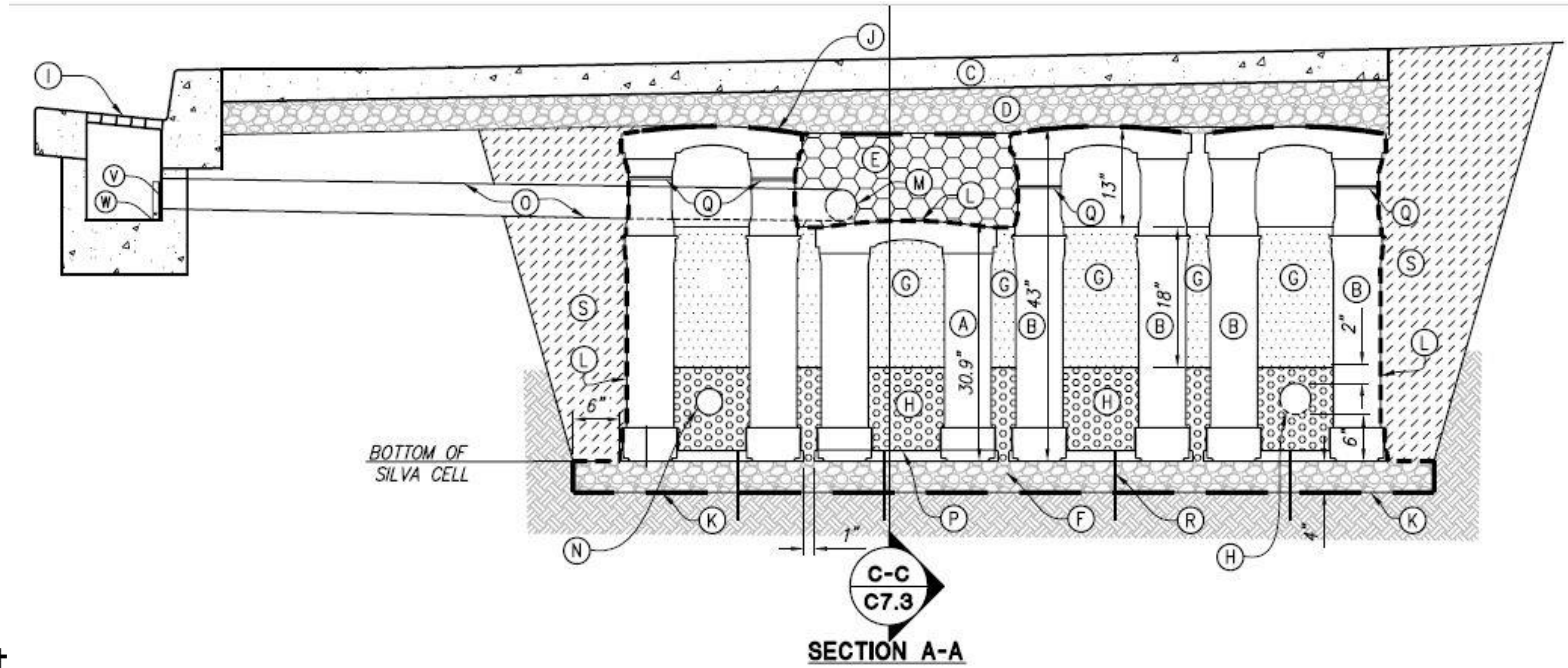
deeproot

PRETREATMENT



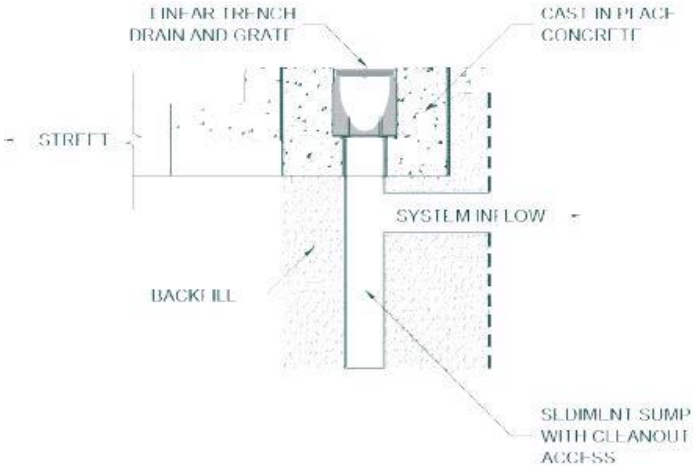
NOTE: PRETREATMENT DEVICE INSTALLED PER MANUFACTURER RECOMMENDATIONS

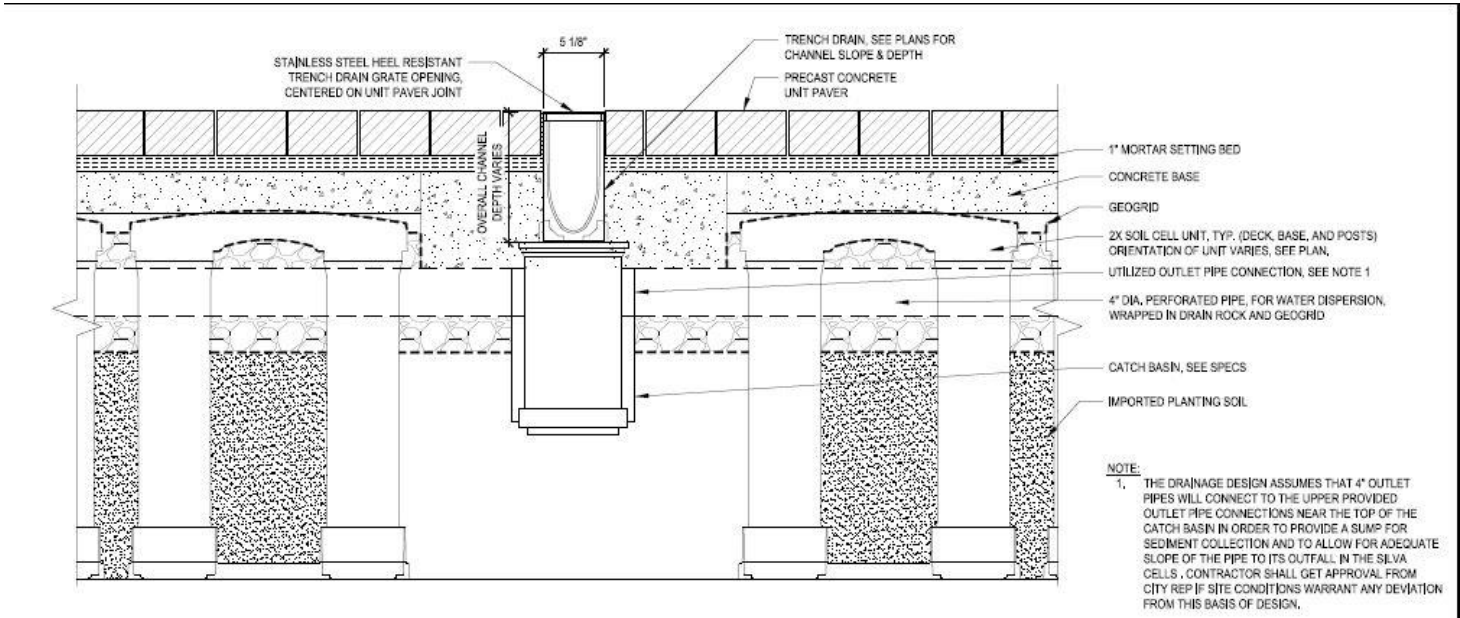
OPTIONS INCLUDE HYDRODYNAMIC SEPARATORS, FILTRATION DEVICES, AND FLOW REGULATORS.



deeproot

TRENCH DRAIN

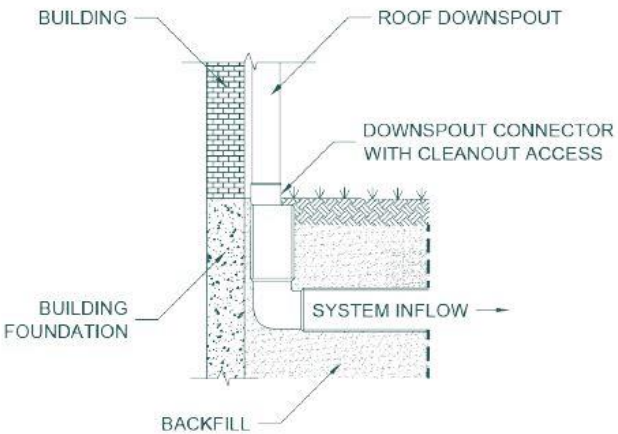


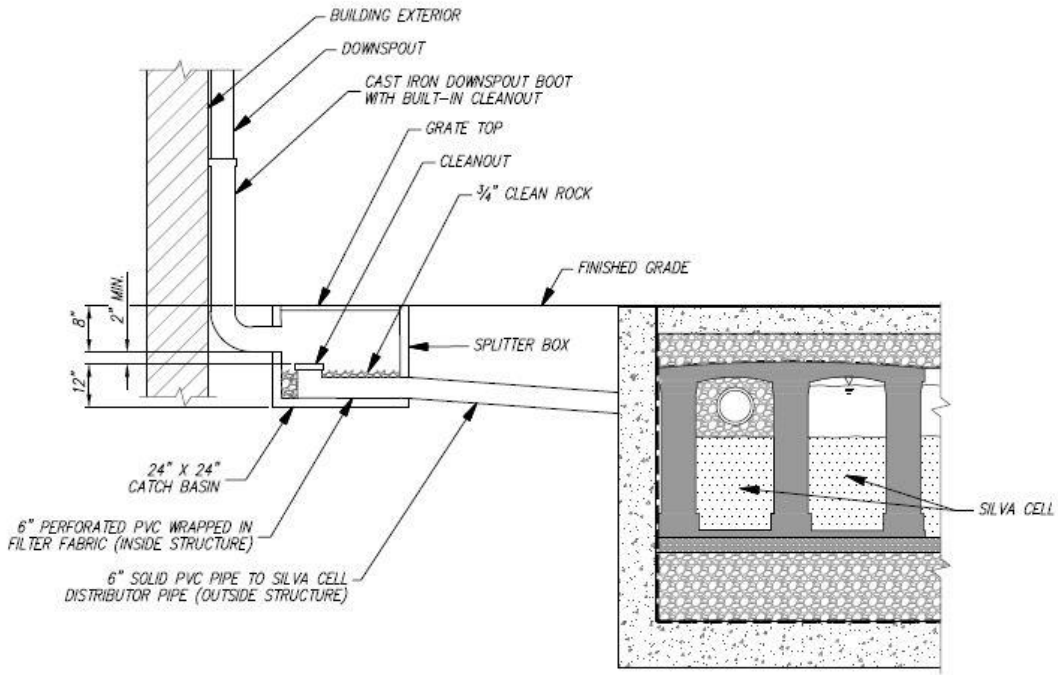


1 SOIL CELL & UNDERDRAIN SYSTEM SECTION
SCALE: 2" = 1'-0"

deeproot

ROOF LEADER





SIZING METHOD:
COMBO
FLOW-VOLUME

4	SILVA CELL SPLITTER BOX	N.T.S.

deeproot

A couple of notes on maintenance……

- Sediment, trash, leaf litter and other woody debris can be removed from catch basins, pre-treatment devices and overflow/distribution pipes with a vac-truck

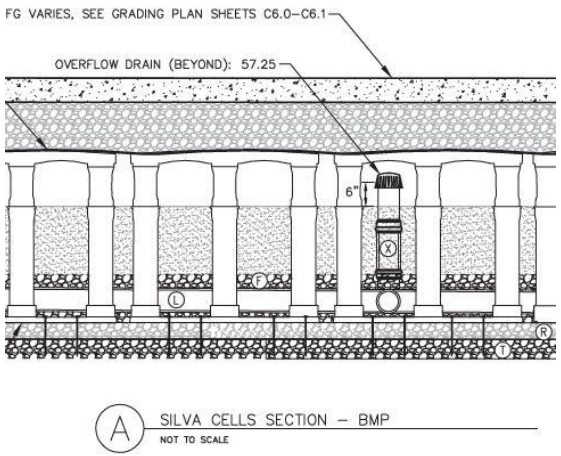
- Soil profile and drainage rates can be monitored and assessed via inspection ports and/or pressure transducers

- Assuming proper pre-treatment is used and the contributing drainage area is and remains stable, soil media in the soil cell system should not require maintenance.

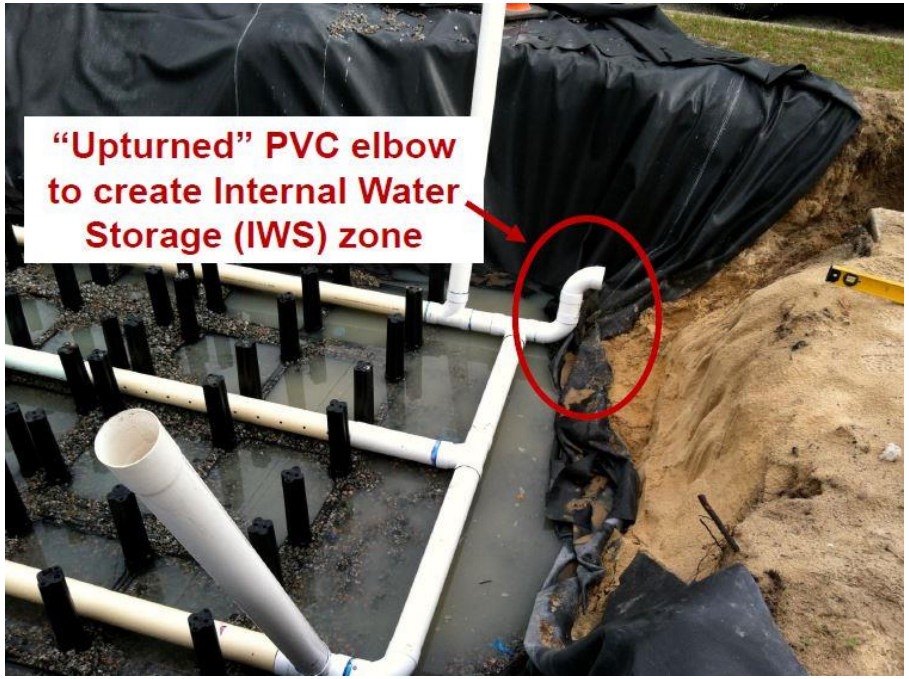
A couple of notes on design considerations…

- Be sure to account for bypass / overflow as part of the inlet system

- Provide horizontal separation between the distribution pipe and the underdrain / collection pipe (do not vertically stack)



- Upturned elbow attached to the underdrain where it discharges from the system (effectively holding back a portion of the storage volume to infiltrate over time)

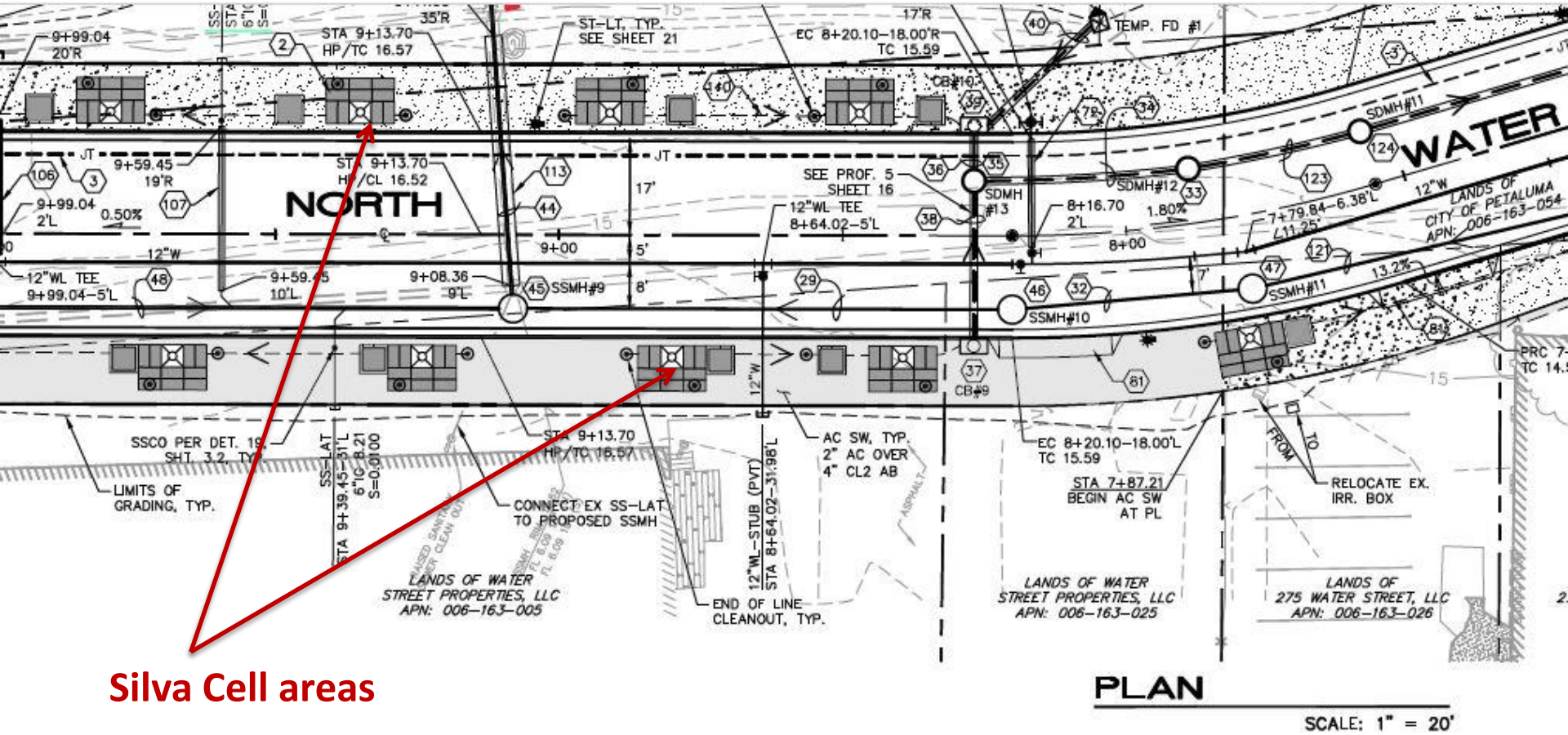


deeproot

North River Apartments – Public Improvements

Petaluma, CA

2020



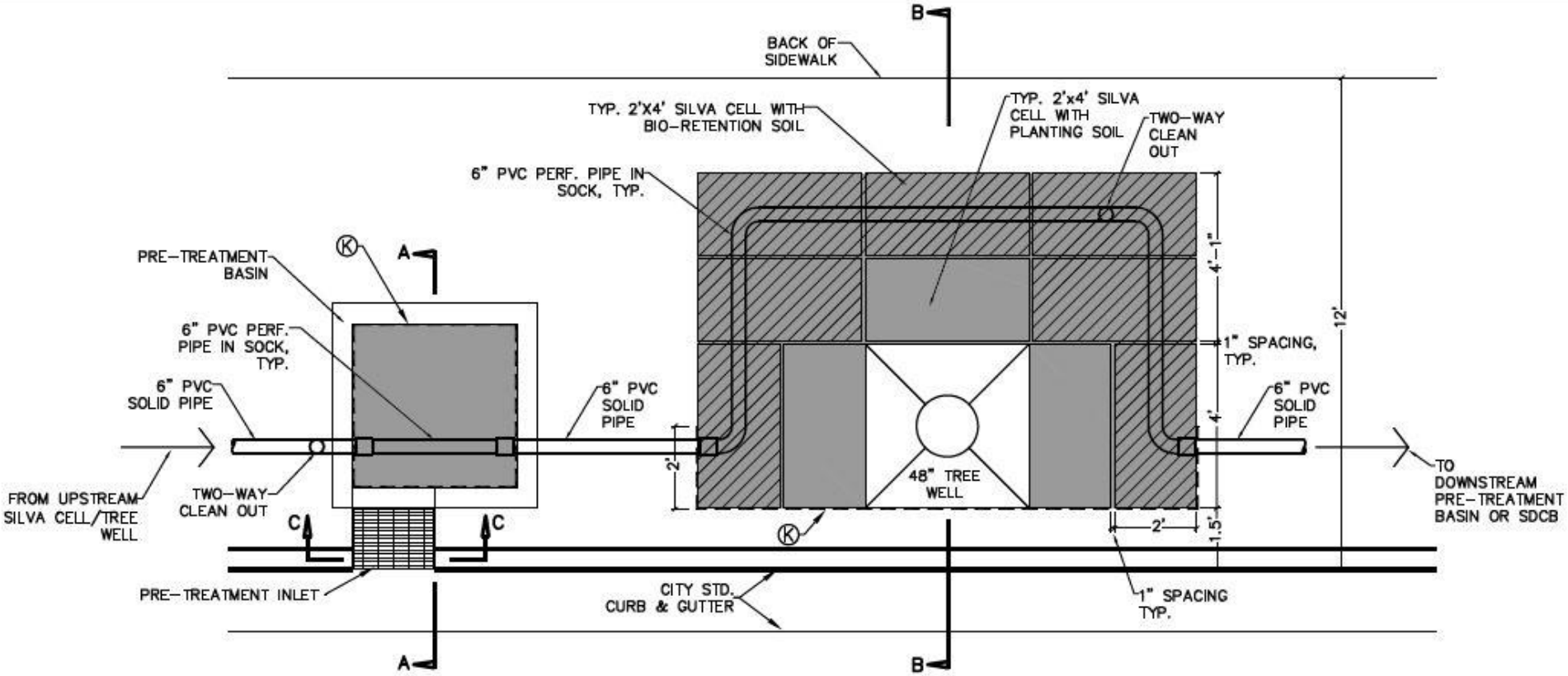
Silva Cell areas

deeproot

North River Apartments – Public Improvements

Petaluma, CA

2020



15 TYPICAL SILVA CELL INSTALLATION DETAIL

deeproot

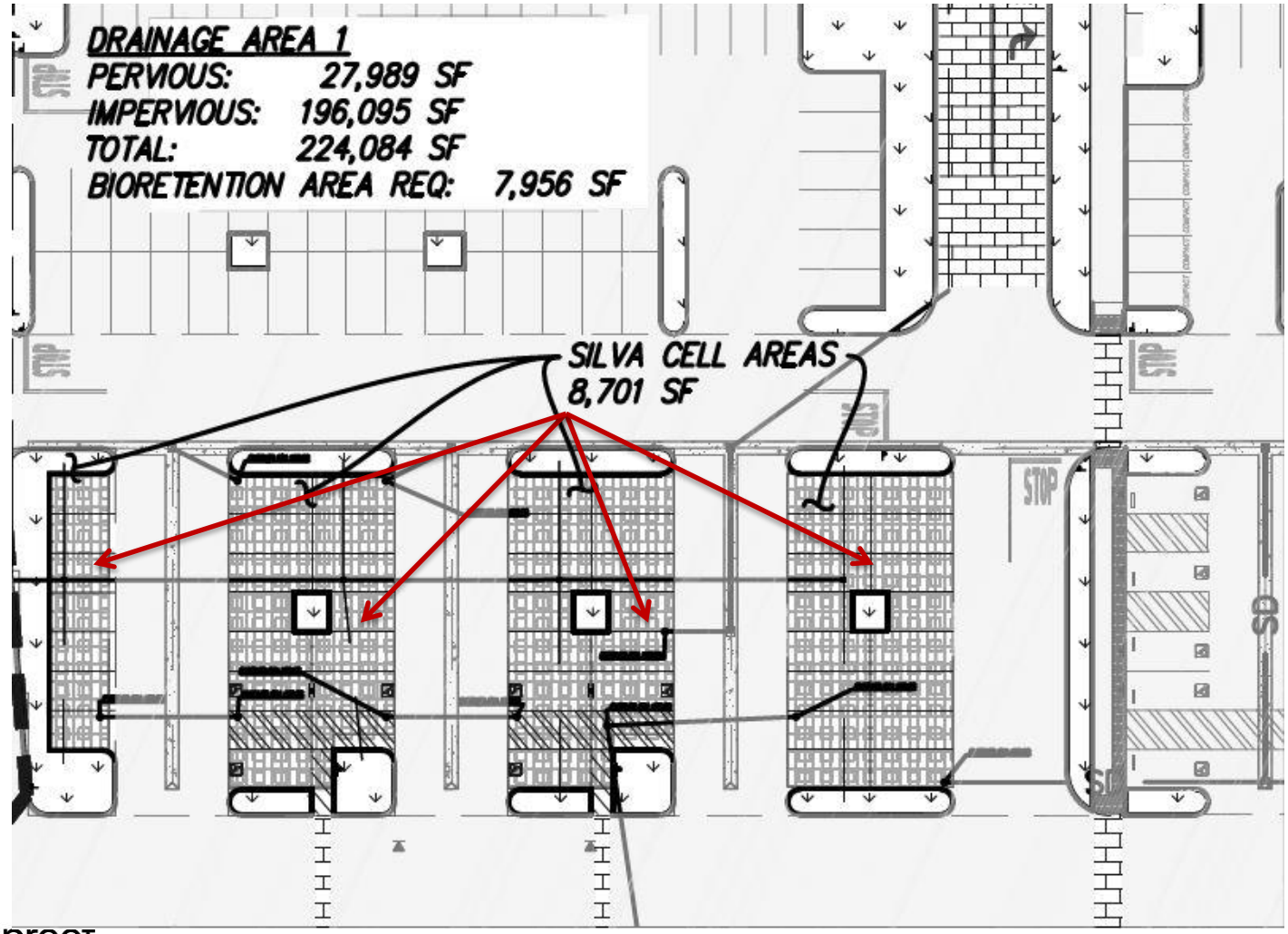
North River Apartments – Public Improvements

deeproot

Lincoln Landing

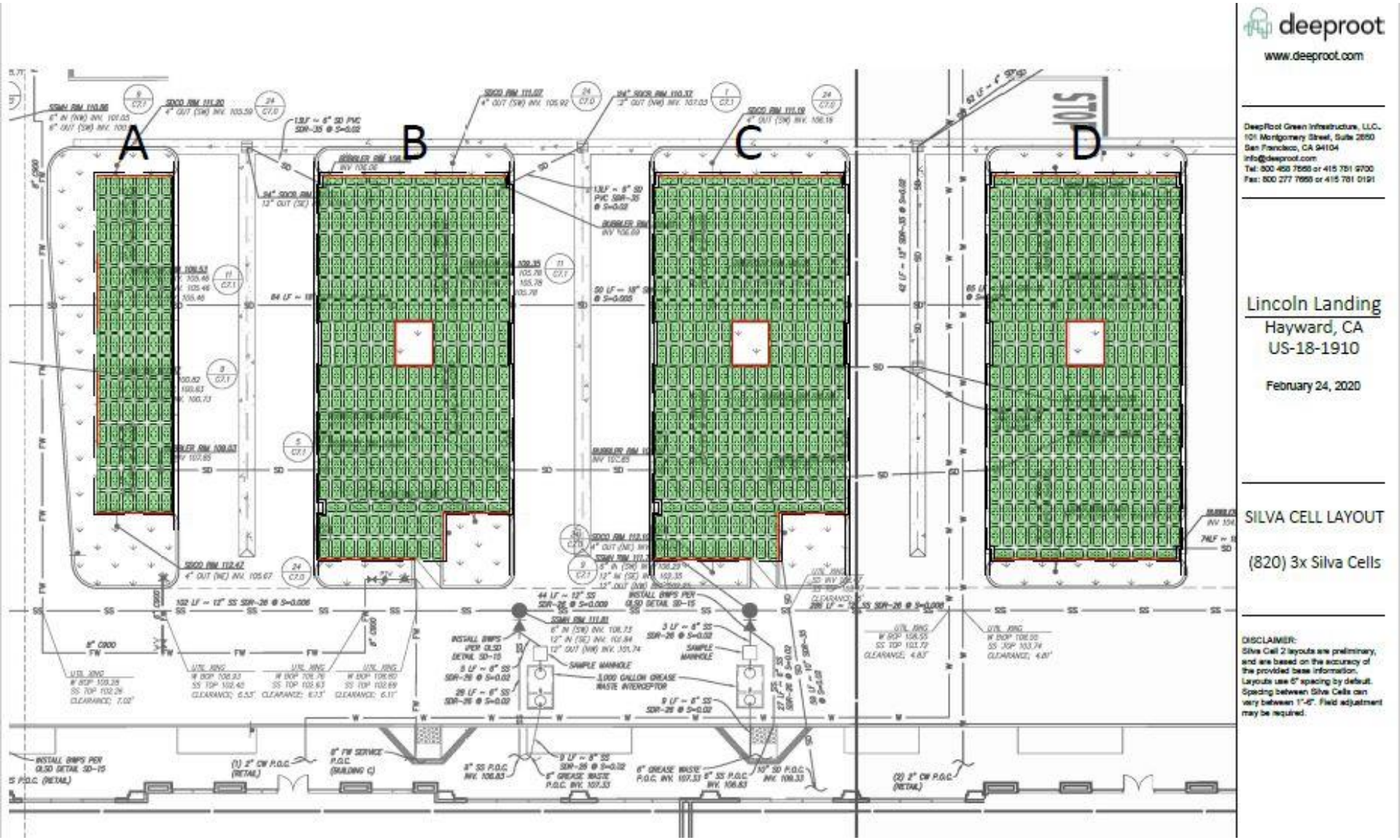
Hayward, CA

2021



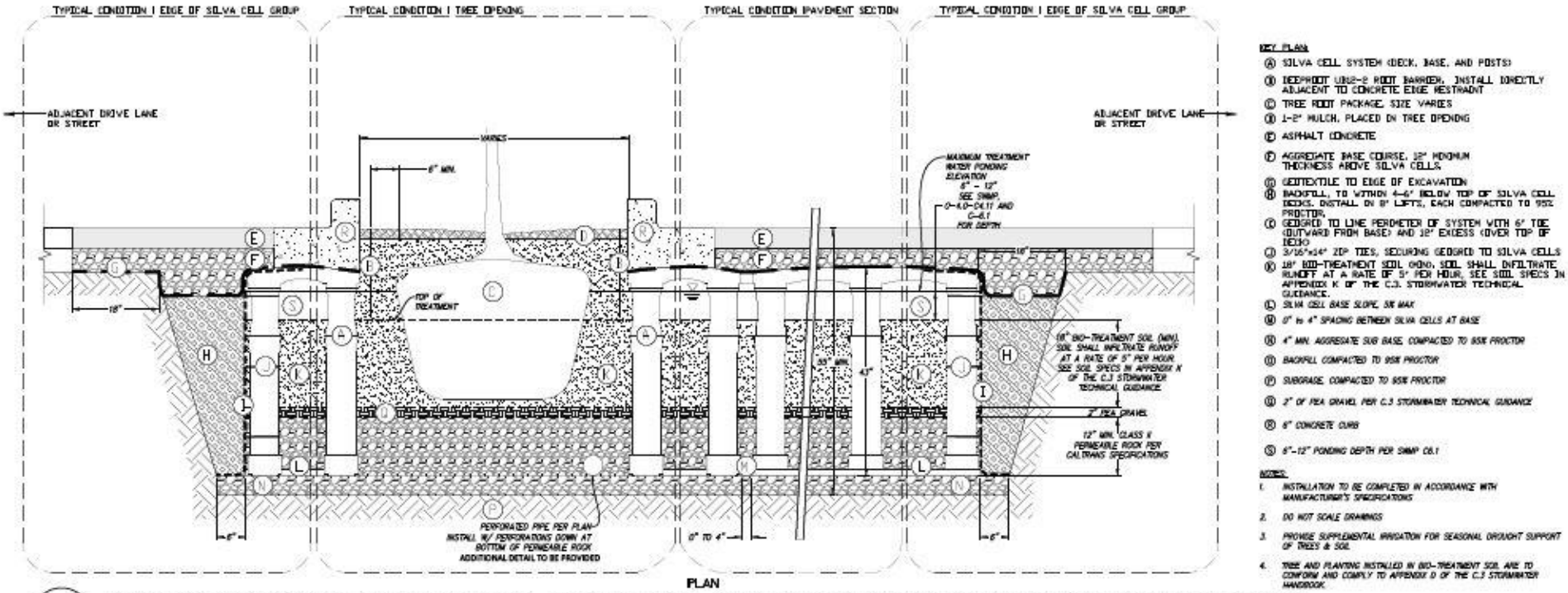
deeproot

Lincoln Landing



deeproot

Lincoln Landing



deeproot

Lincoln Landing

deeproot

Lincoln Landing

deeproot

Lincoln Landing

deeproot

LIVING with Soil Cells in the Public Realm

deeproot

deeproot

SMUD HQ, Sacramento


27
KOMATSU
226

deeproot

Broadway Plaza Promenade, Walnut Creek

deeproot

Existing street lighting conduits

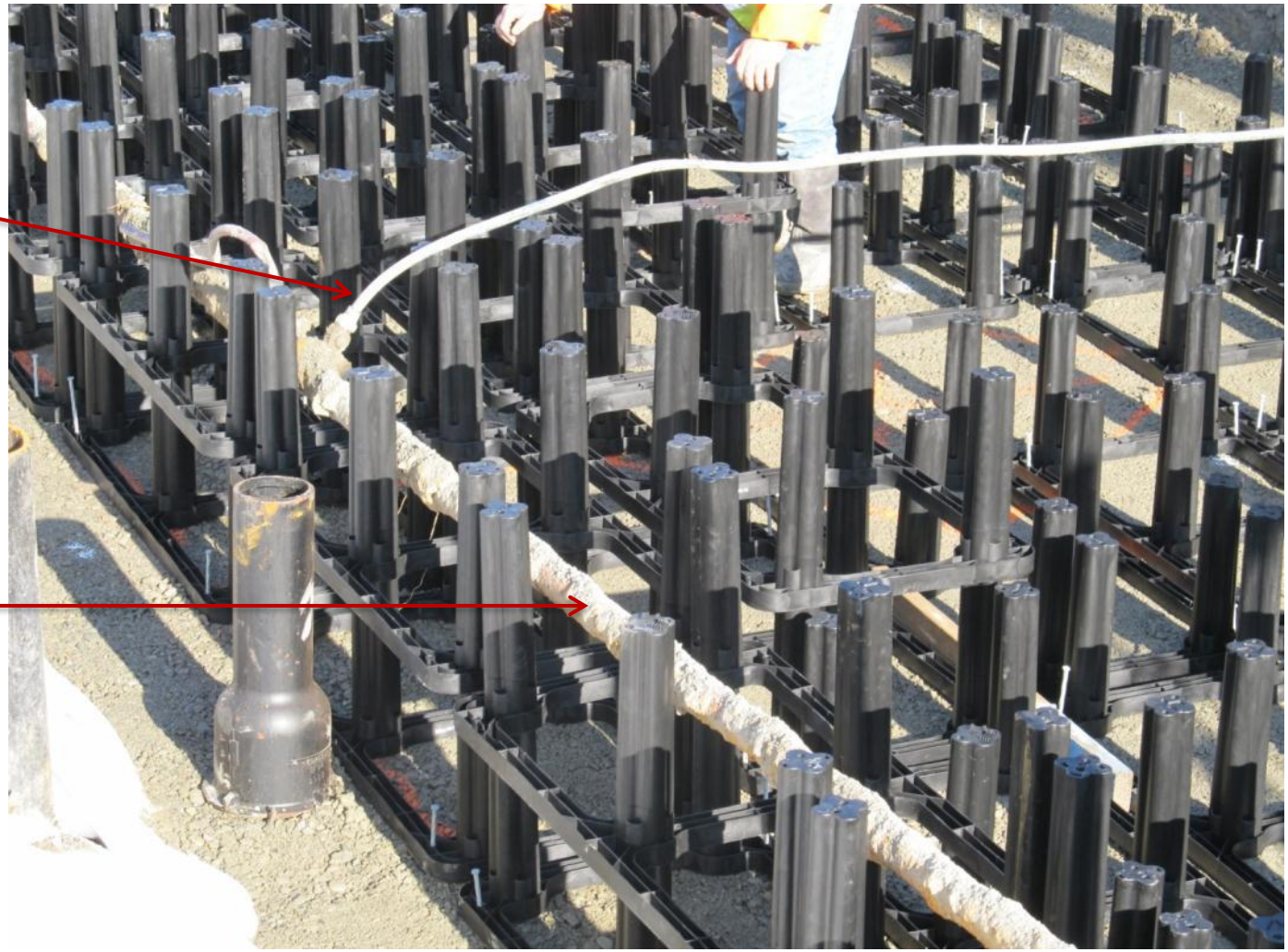
deeproot

Existing gas service

deeproot

Copper service

2”
Watermain



deeproot


Light pole base
Unicon
EASYPOUR

deeproot

The Metropolitan Museum of Art, NYC

Soil Cells as an Underground Utility

Register Silva Cells as an underground facility with the local one-call agency and make it a permanent part of the notification system

Mark utilities for ease of future locating

Caution tape marks utility corridor

Use Locating Equipment

Locating equipment can still be used to locate utility lines once Silva Cells have been installed

Electromagnetic style locators have been used successfully to locate utilities running through Silva Cells

Ground-penetrating radar can also detect the limits of the Silva Cell system.

deeproot

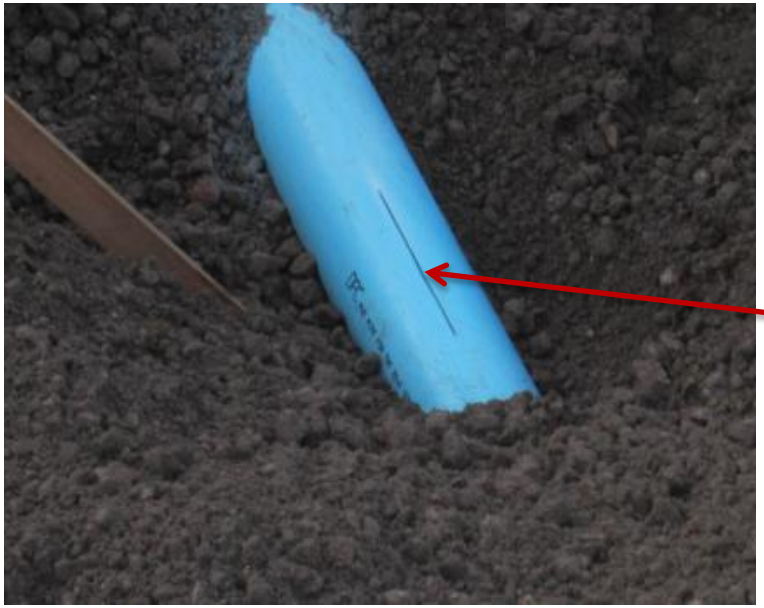
Long Term Maintenance Needs
Repair & Restoration

Repair: Simulated Emergency Water Main (Toronto, Ontario)

DeepRoot, along with the City of Toronto and Toronto Water Participated in a demonstration project that simulated an emergency water main repair scenario.

Repair: Simulated Emergency Water Main

Prior to constructing the Silva Cells, a PVC pipe was buried below the level of the Silva Cells to act as a watermain



A saw cut was made into the pipe to act like a break in the pipe

deeproot

Repair: Simulated Emergency Water Main

A typical Silva Cell system is constructed over the buried pipe

deeproot

Repair: Simulated Emergency Water Main

The planned “break” occurred on a bitterly cold day in January

Silva Cell system with concrete pavement now over the top

Riser pipe and hose connection to the pipe buried under the Silva Cells

deeproot

Repair: Simulated Emergency Water Main

A fire hose from a nearby hydrant was connected to the buried pipe via the riser pipe. When the hydrant was turned on, it flooded the area with water

*Due to the soil in the Silva Cells being loosely compacted, the water came to the surface very near to the location of the break rather than traveling underground

deeproot

Repair: Simulated Emergency Water Main

The pavement over the repair area was sawcut into panels and removed with a backhoe

deeproot

Repair: Simulated Emergency Water Main

The aggregate base was removed and the geotextile fabric over the Silva Cells cut out of the way, exposing the top of the Silva Cells

deeproot

Repair: Simulated Emergency Water Main

At this point, an effort could be made to salvage the Silva Cells for re-use. However, since this simulated an emergency repair, time is of the essence. Therefore, the crew doesn’t stop and just digs right through the Silva Cells

Repair: Simulated Emergency Water Main

Remember, Silva Cells are designed with a 1” to 6” gap between the frames and do not interlock horizontally. Therefore, the adjacent stacks of Silva Cells were not disturbed during the excavation.

Adjacent Silva Cells

deeproot

Repair: Simulated Emergency Water Main

The pipe was exposed and ready to be repaired in essentially the same time as it would be during a traditional repair.

*Note that the lightly compacted soil in the Silva Cells generally puts less downward pressure on the sides of the excavation than traditionally compacted soil which helps the excavation stay open better

deeproot

Restoration Options

There are two ways to approach restoring that area depending on the time frame in which the work must be completed and the available materials:

1. Restore the area temporarily at the time of the repair and do the permanent restoration at a later date.

2. Restore the area permanently at the time of the repair using one of three permanent restoration options.

Restoration Options

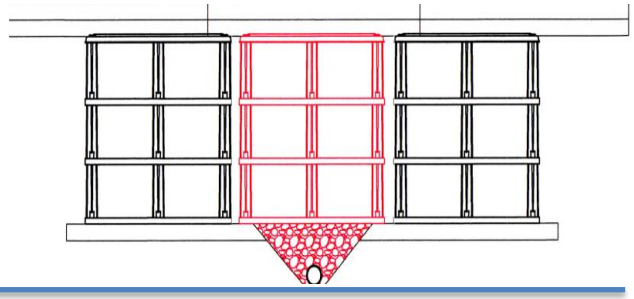
When time is limited, the area can be quickly restored by backfilling the excavation with a lean concrete mix like U-fill or compacted aggregate and temporarily patching the pavement …

Then at a later the date the area can be re-excavated and restored permanently using one of three permanent restoration options.

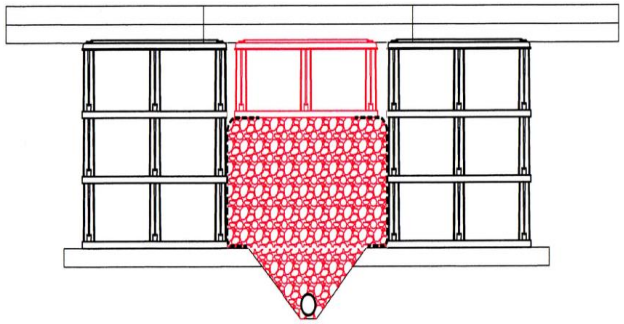
deeproot

Restoration Options

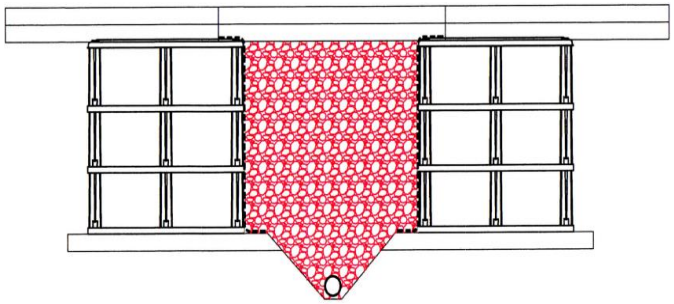
Option 1 – fill/compact the excavation to the bottom of the Silva Cells and re install new or salvaged frames and decks



Option 2 – fill/compact the excavation up to the bottom of the uppermost layer of Silva Cells and re install a single layer of frames and decks



Option 3 – fill/compact the excavation to the bottom of the Silva Cells, install geogrid around the perimeter of the remaining opening and fill with compacted soil, clear stone or flowable fill/U-fill (in the case of flowable fill, try to establish some link between adjacent soil volumes)



deeproot

Last but not least, re-build the permanent pavement

deeproot

Recommended Protocol For Utility Repairs and New Utility Installations

1. Locate

- Call Local One-Call Agency

2. Excavate

- Excavate to level of geotextile
- Expose geotextile fabric, cut and fold back, then remove decks
- Use a Hydro-Vac or hand dig out soil from area of excavation

3. Repair or add service (lateral)

4. Replace Silva Cells

- To replace Silva Cells follow Operations Manual procedures

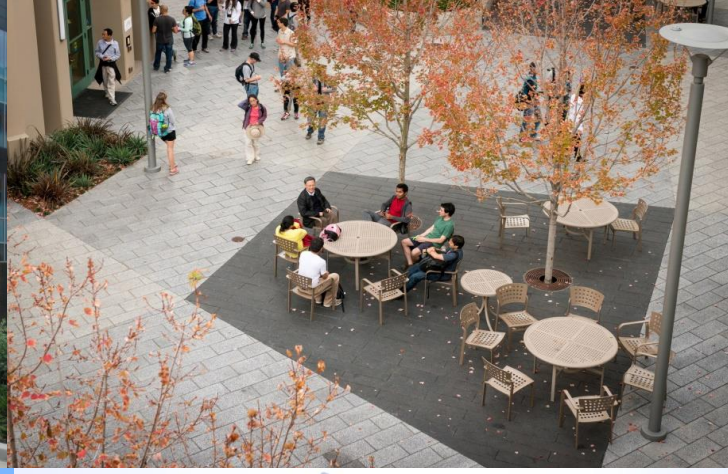
5. Replace permanent surfacing

- Replace or patch paving

for further details, see www.deeproot.com or call 415-781-9700

deeproot

THANK YOU



Rachel Roberts

rachel@deeproot.com

(c) 978.886.1280