Quantifying Volume Reduction for a New Permit

2017 UDFCD Annual Seminar

Holly K Piza, PE

Project Manager

Watershed Services Program

Thank you…

SEMSWA

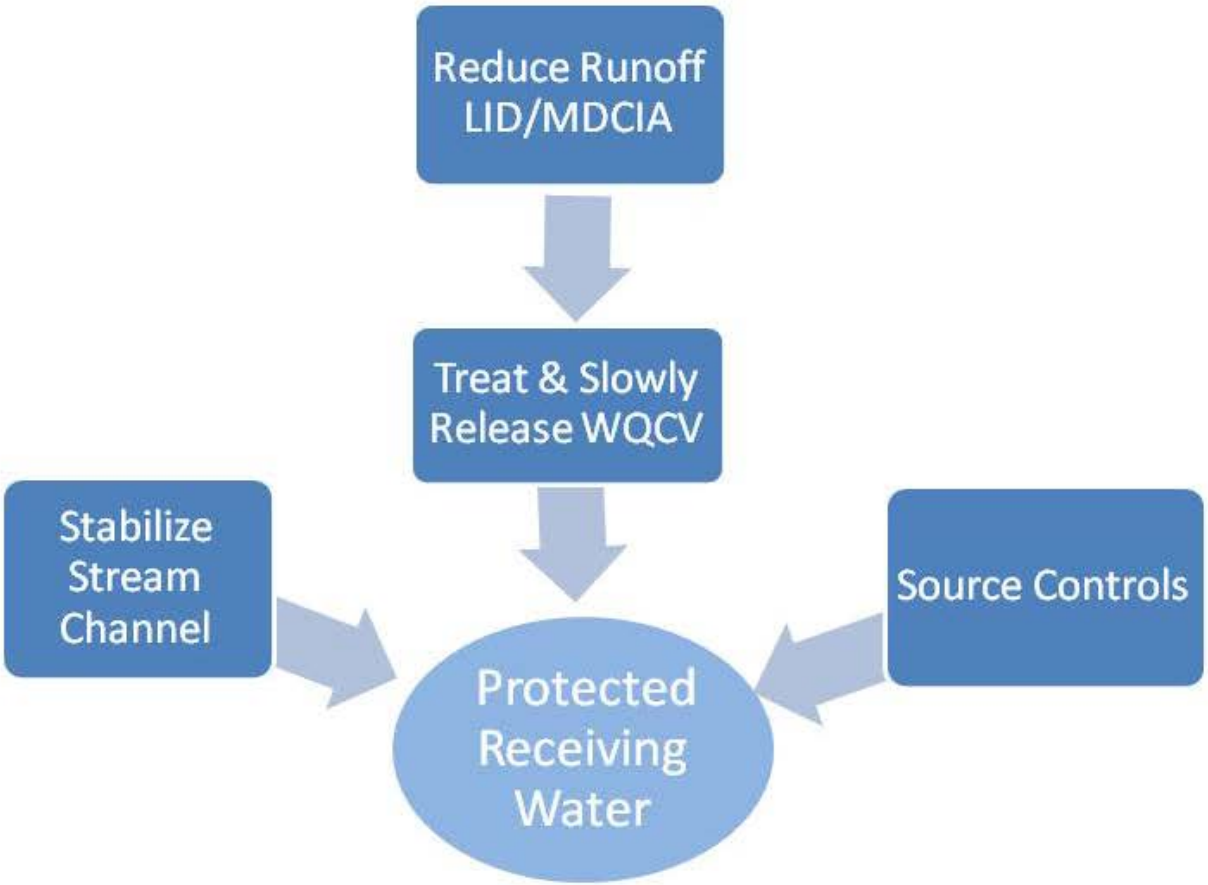
Douglas County

Ashley Byerley

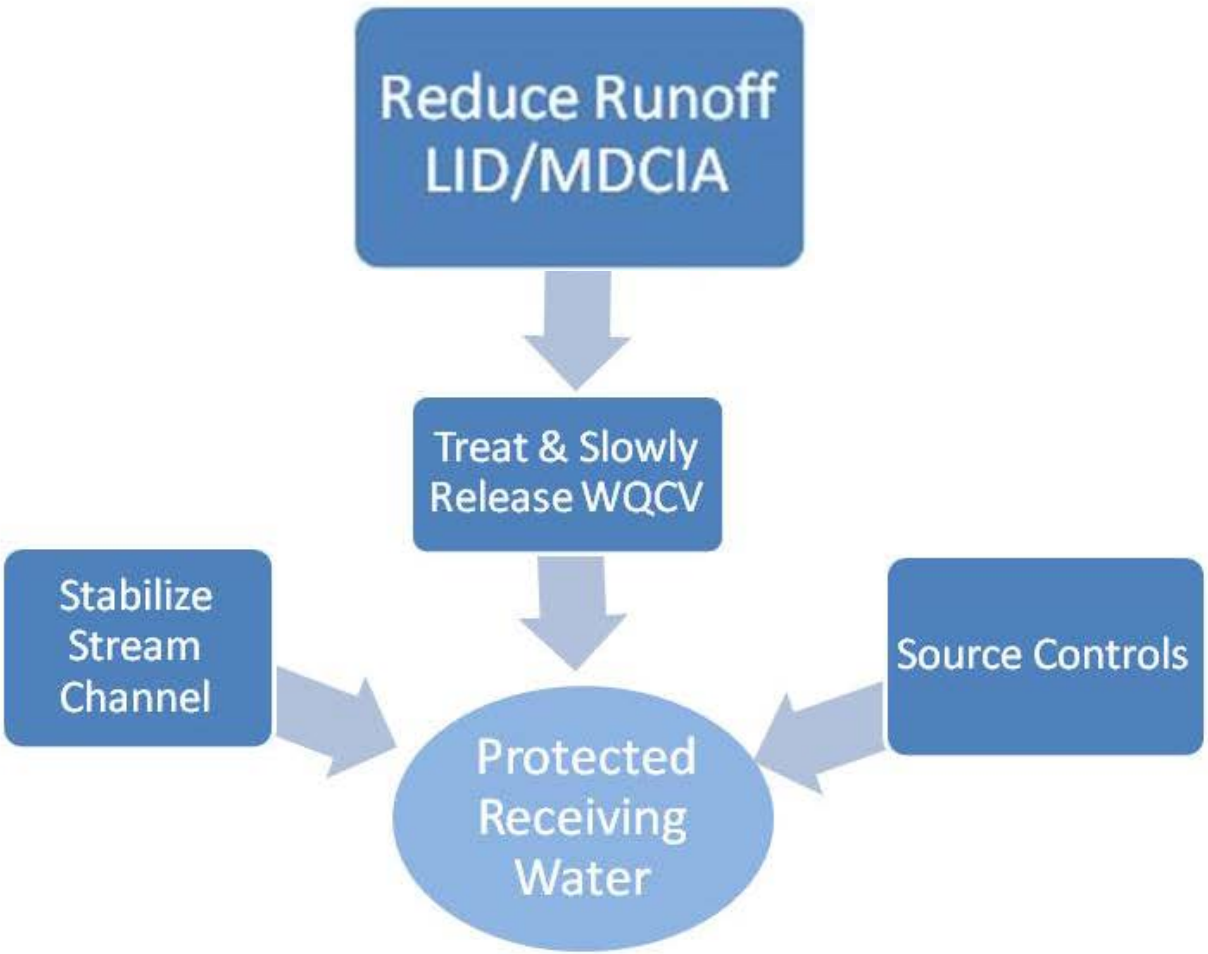
Carrie Powers

Muller Engineering

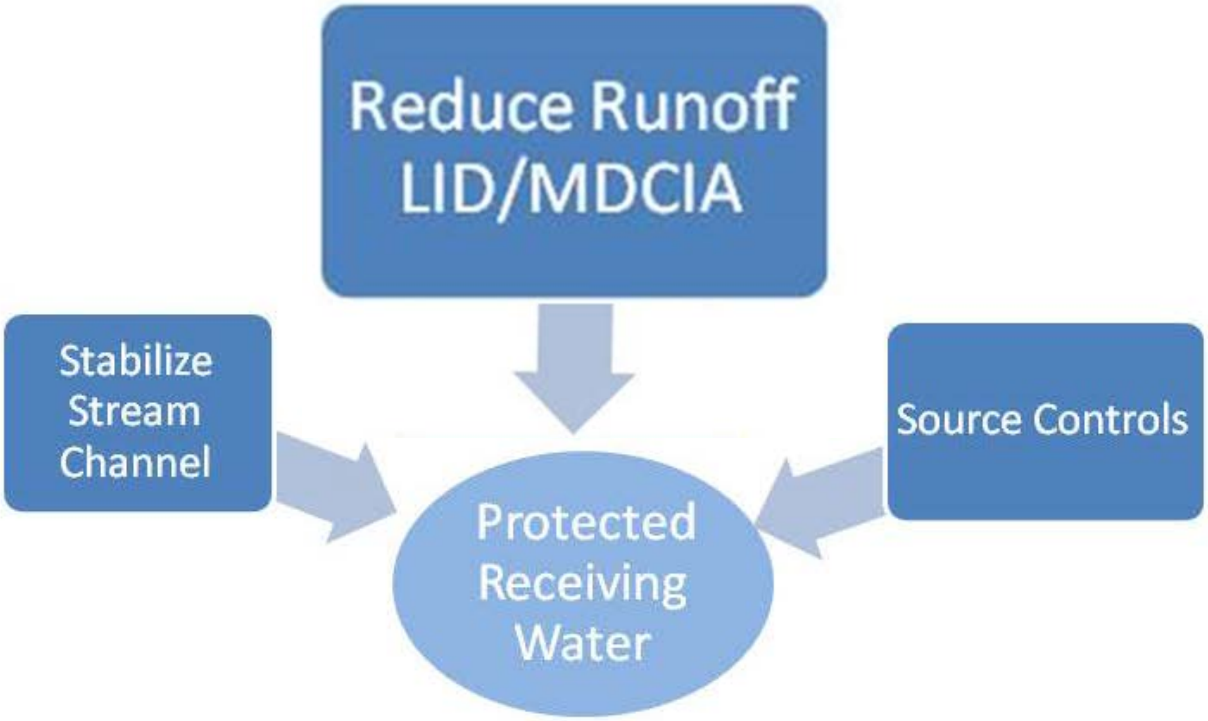
4-Step Process



4-Step Process



4-Step Process



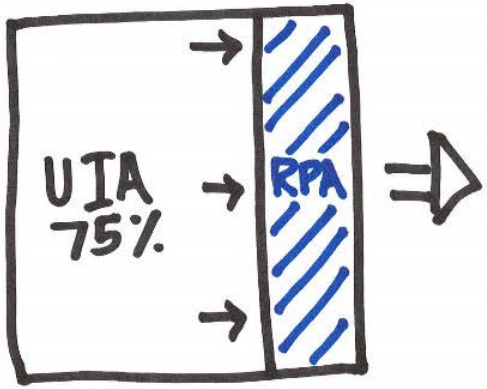
Reduced Loading

1 ACRE SITE

TP = 0.5 mg/L

TN = 3.0 mg/L

MDCIA

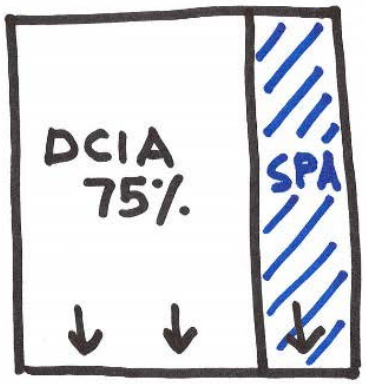


EPA SW CALCULATOR:
DENVER
TYPE C SOILS
CAPTURE RATIO = 0.33
5% SLOPE

⇒ 6.16" avg. annual runoff

34% less

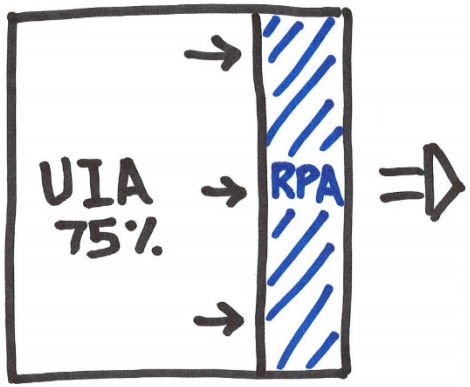
NOT MDCIA



EPA SW CALCULATOR:
DENVER
TYPE C SOILS
CAPTURE RATIO = 0
5% SLOPE

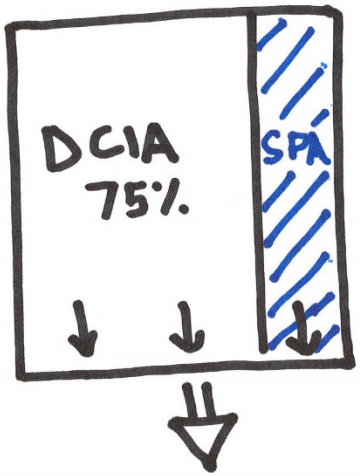
⇒ 9.31" avg. annual runoff

MDCIA



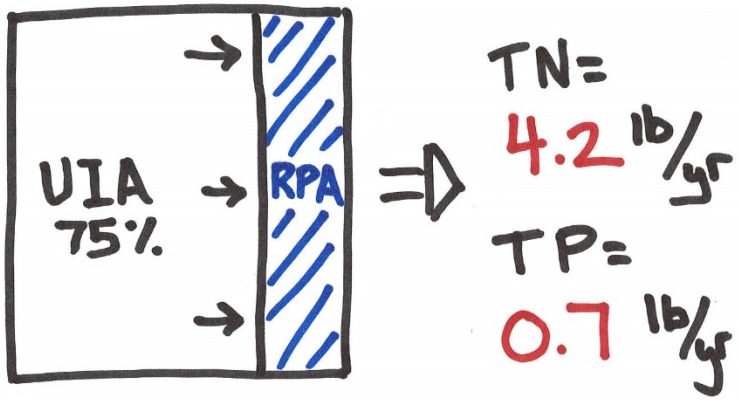
TN= 4.2 lb/yr

NOT MDCIA

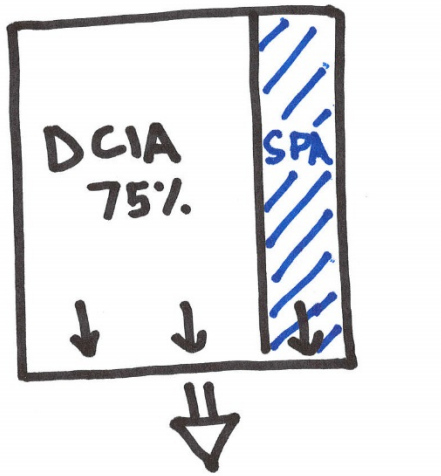


TN= 6.3 lb/yr

MDCIA



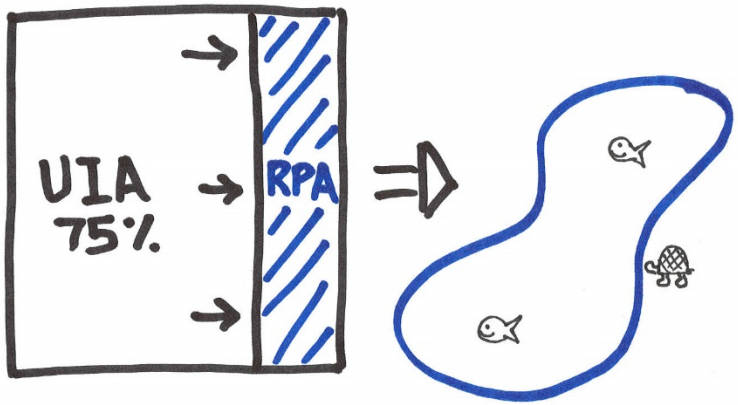
NOT MDCIA



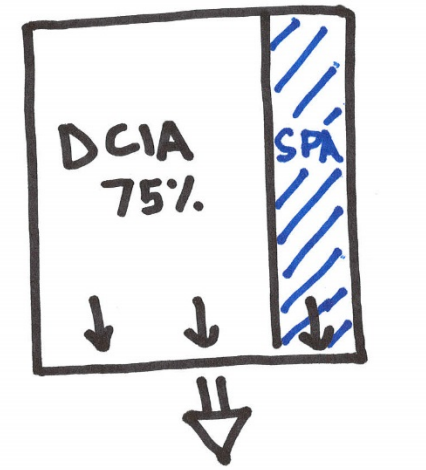
TN= 6.3 lb/yr

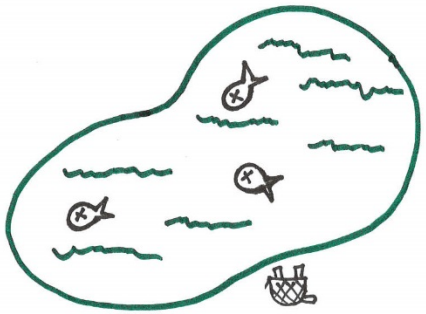
TP= 1.1 lb/yr

MDCIA



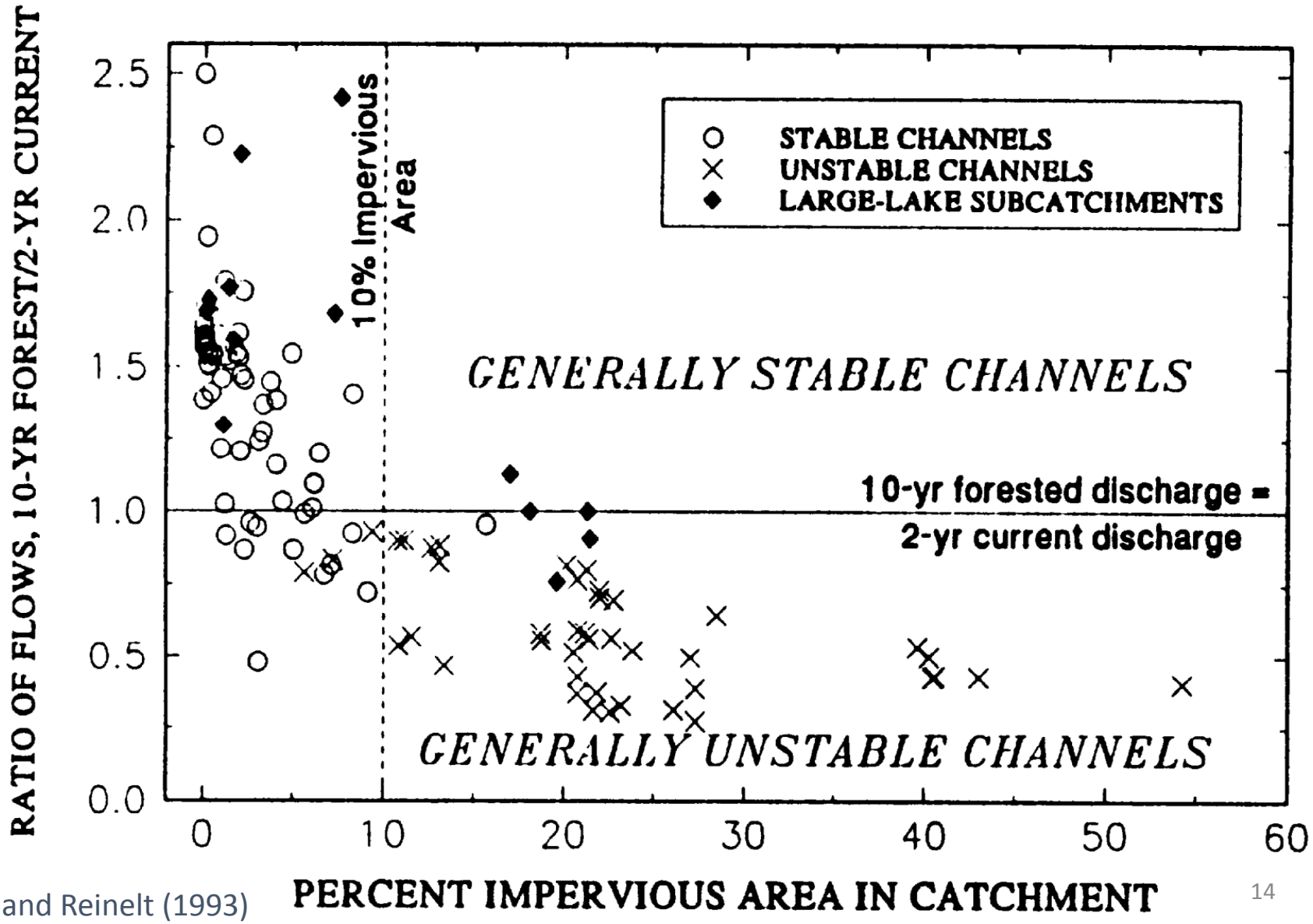
NOT MDCIA





Increased Stream Stability

Runoff = Stability



Booth and Reinelt (1993)

Increased Water Quality

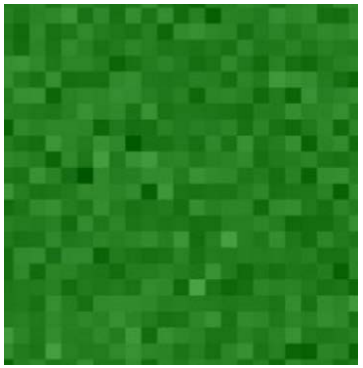
Vegetation and water quality

"Minimum vegetation cover of about 65% is required for concentration reduction to occur, although a rapid decline in performance occurs below about 80%"

Caltrans November 2003

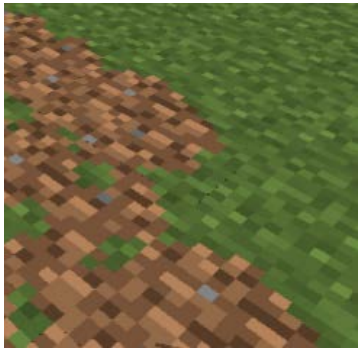
Vegetation and water quality

80%



15 feet for slopes < 10%

65%

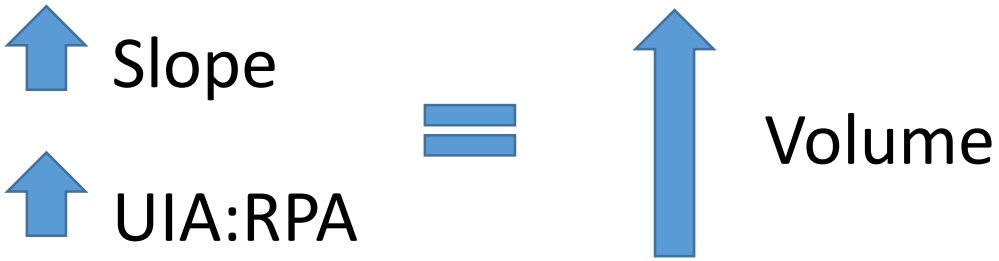


32 feet for slopes < 10%

Slope?

Caltrans November 2003

Vegetation and volume reduction



"…increased loading ratio and increase ground slopes significantly increase the runoff depth"

Slope?

Carmen et al. 2016

Better water quality through engineering?

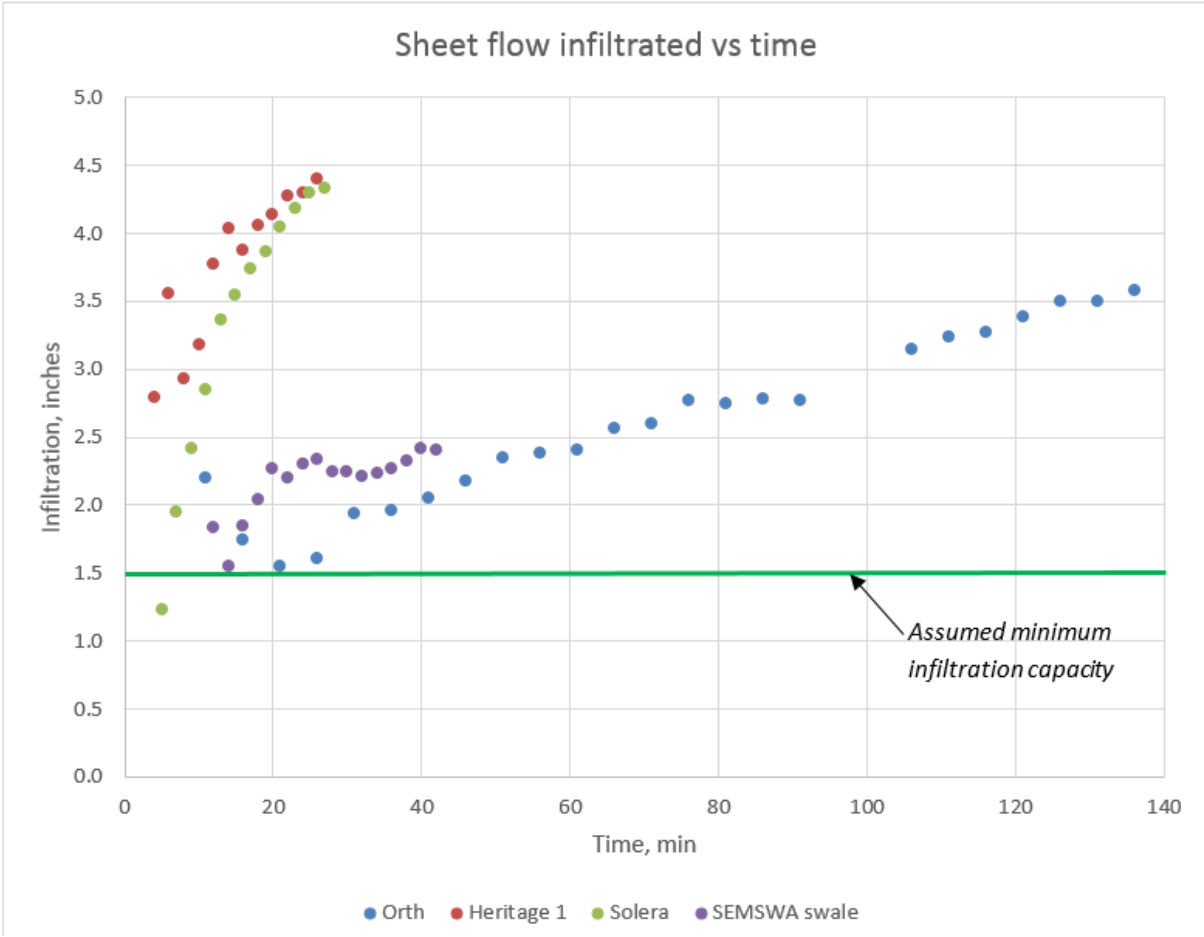
"…vegetation not overrun by gophers produced an effluent quality that was equal to or better than that observed from vegetated buffer strips engineered and operated specifically for water quality improvement."

Caltrans 2003

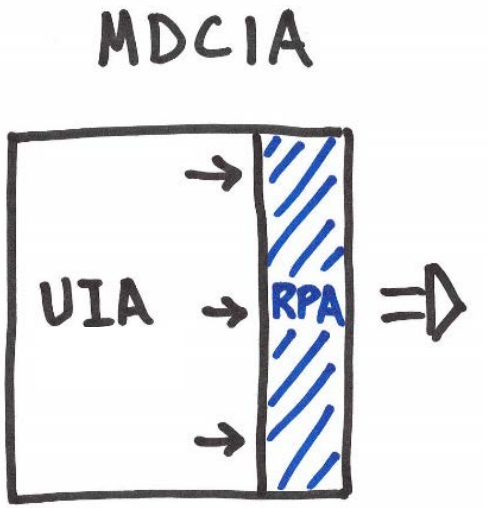
Amendments?

Quantifying reduction

Vegetation and volume reduction

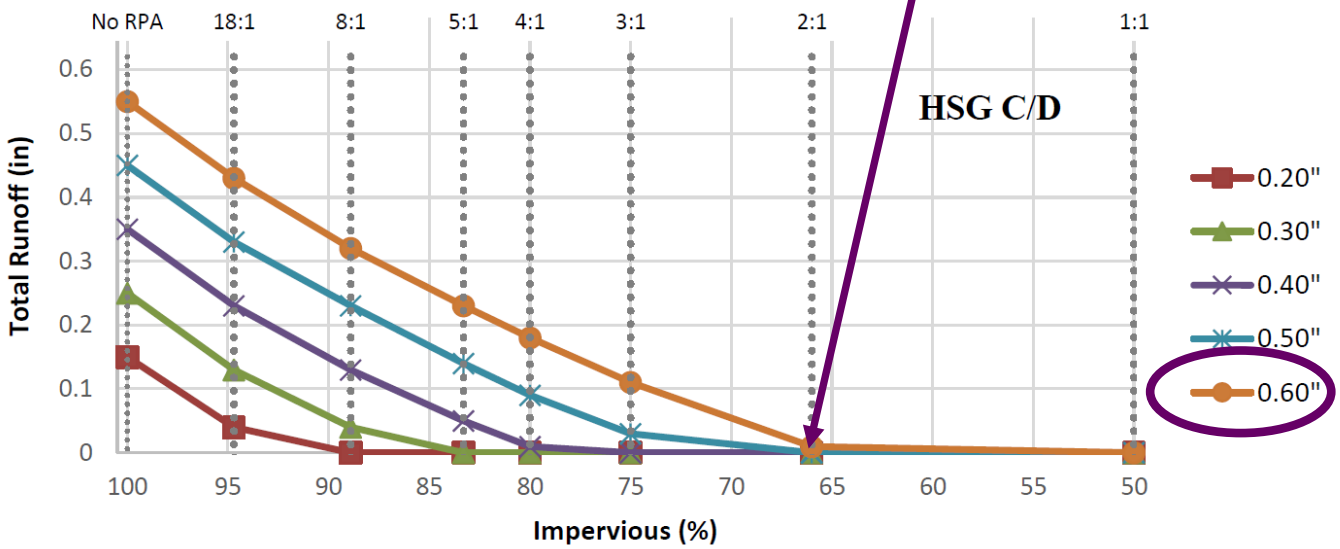


Vegetation and volume reduction



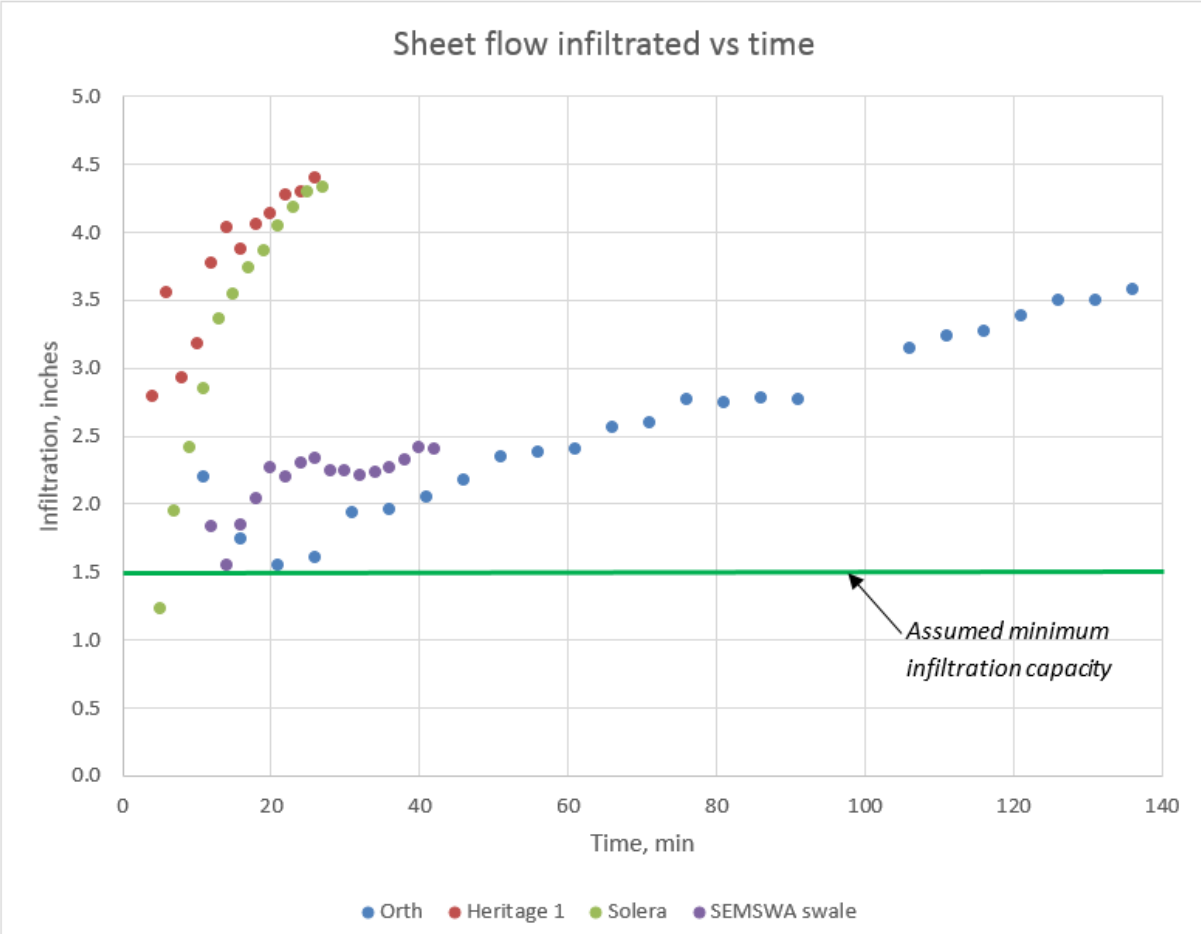
SWMM

67% UIA and 33% RPA = no runoff for WQCV



(Contributed by Wright Water Engineers, Inc.)

Vegetation and volume reduction



Soil compaction and saturation

Compaction

Saturation

Infiltration of clayey soils

Compaction

Infiltration of sandy soils

Pitt et al. 2001

The wetted area

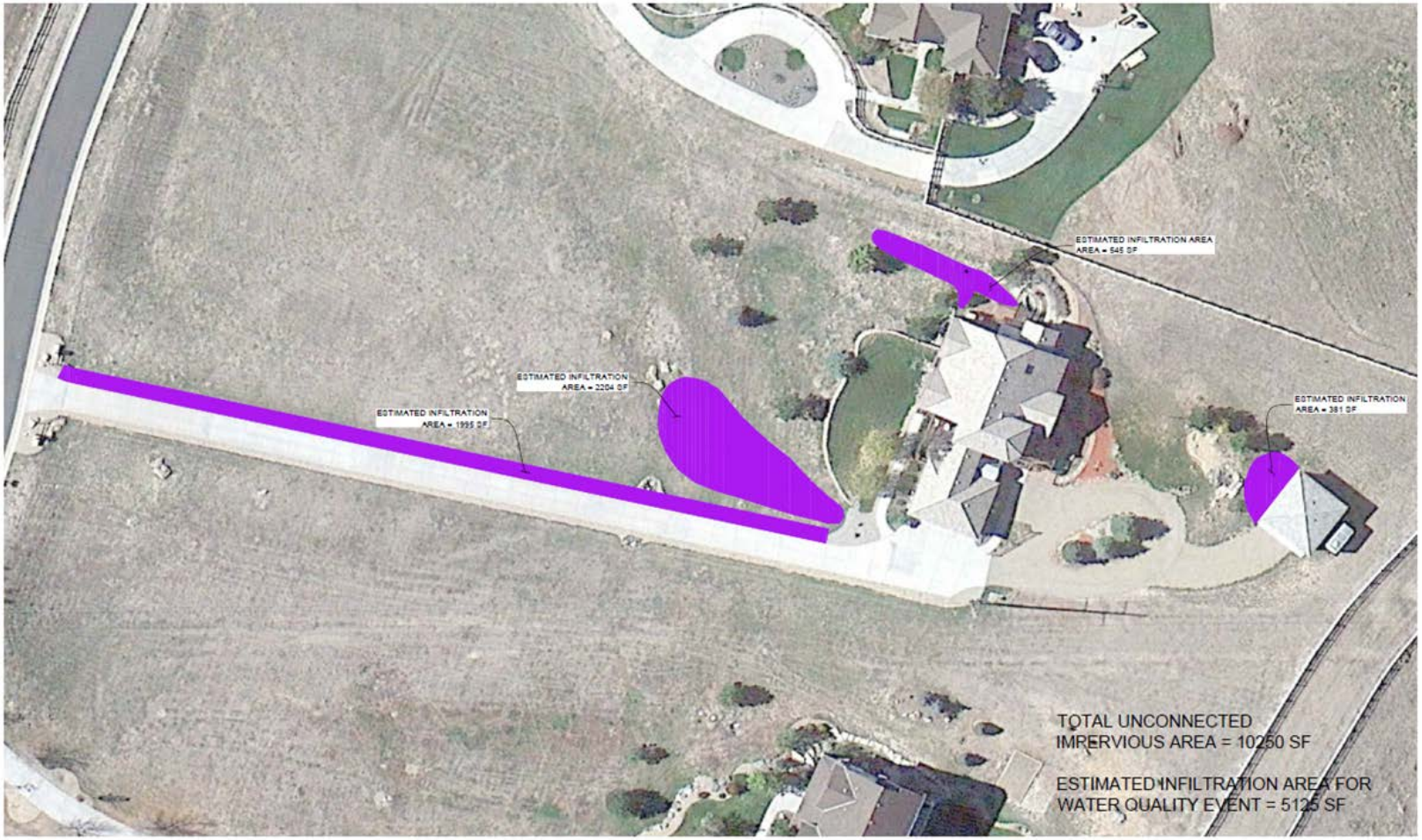
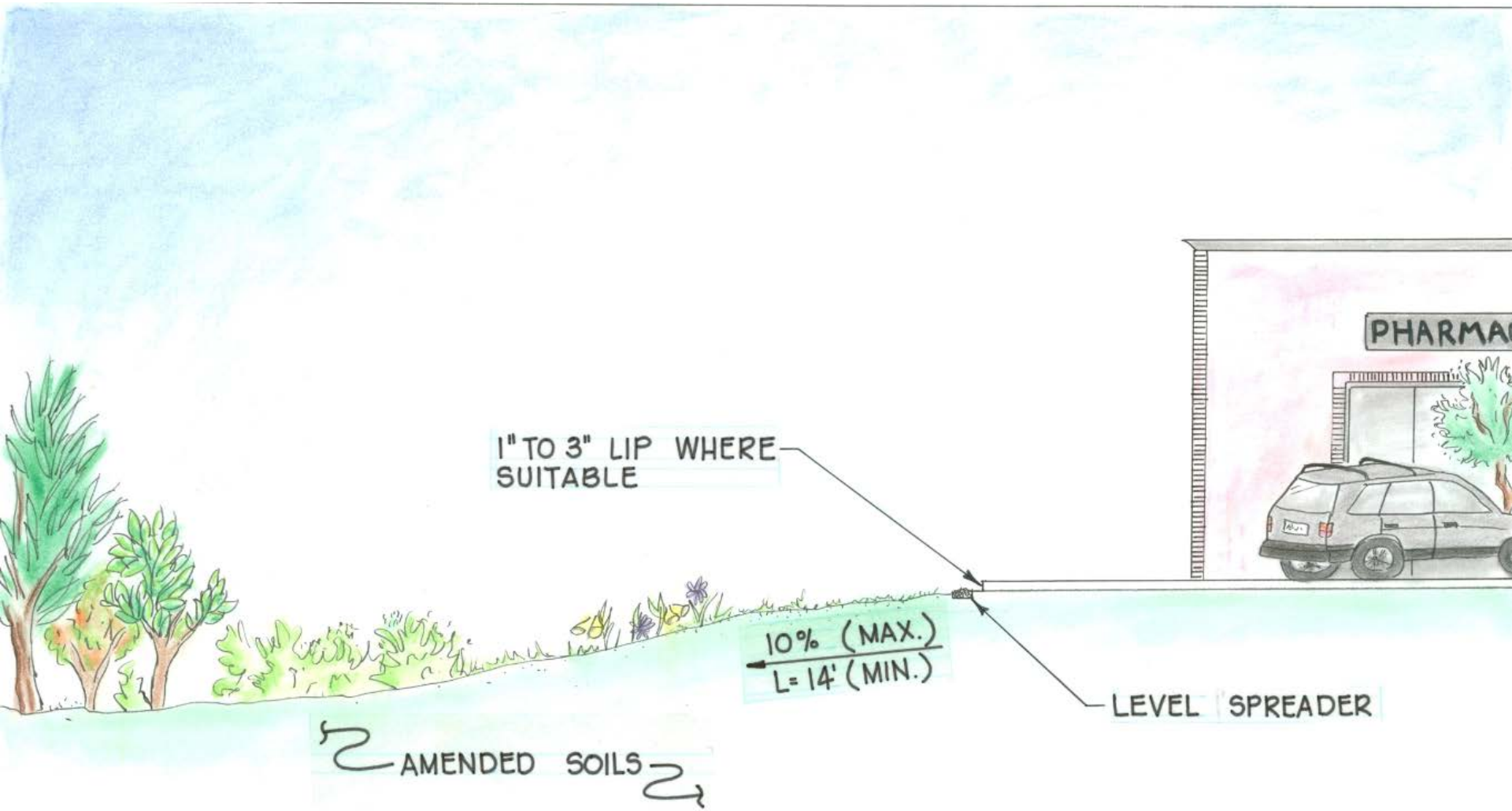
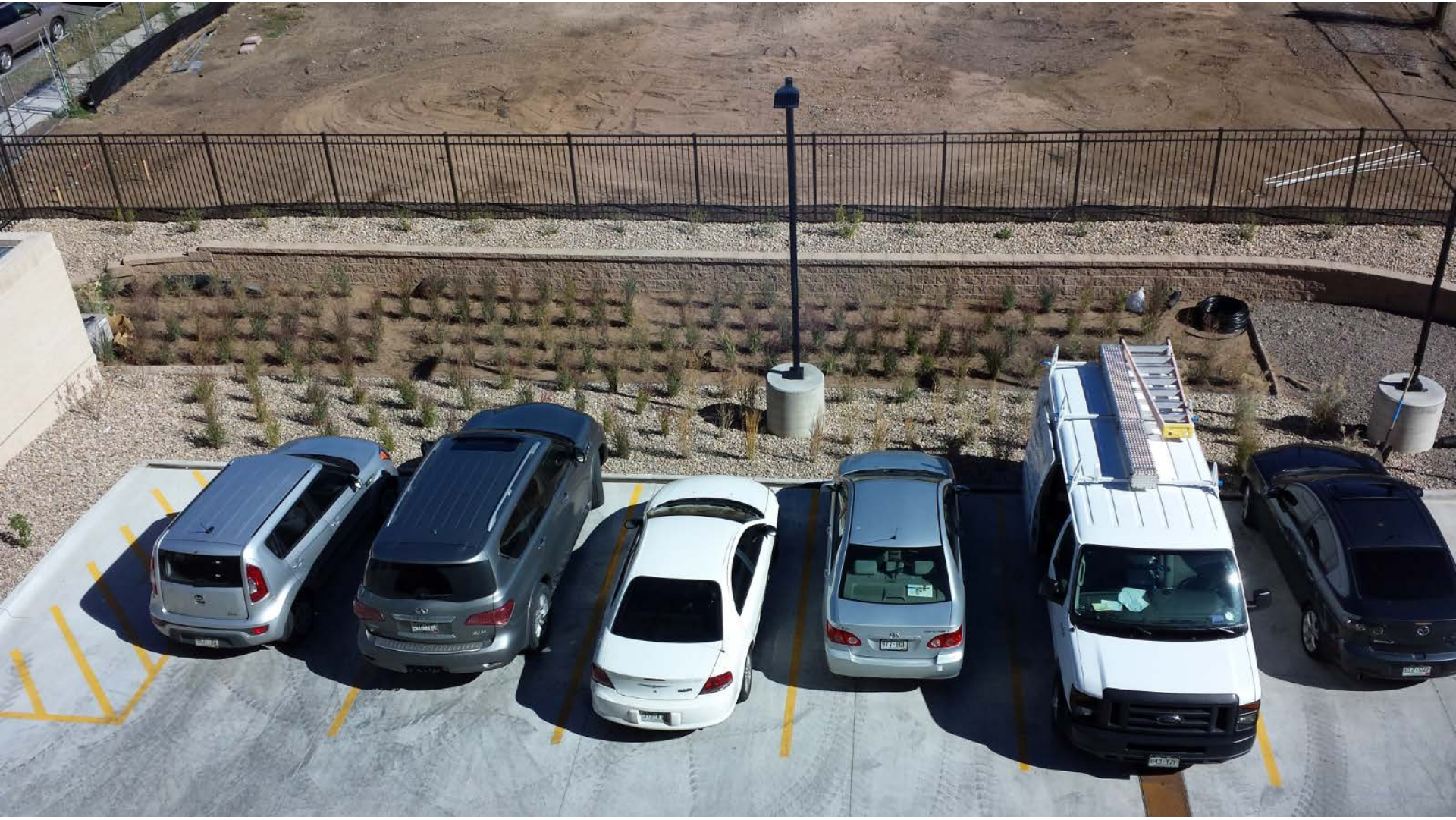


Figure 13 from Wulliman (February 2012) – Large lot memo – Part 1 w appendices

How do we do it?





Guidance to include:

Vegetation

Slope

UIA:RPA

Level Spreader Guidance

More coming soon…