Quantifying Volume Reduction for a New Permit

2017 UDFCD Annual Seminar

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Thank you...

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4-Step Process

- Reduce Runoff LID/MDCIA
- Treat & Slowly Release WQCV
- Source Controls
- Stabilize Stream Channel

Protected Receiving Water
4-Step Process

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4-Step Process

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Protected Receiving Water

Protecting People, Property, & the Environment
Reduced Loading
MDCIA

1 ACRE SITE
TP = 0.5 mg/L
TN = 3.0 mg/L

NOT MDCIA

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

⇒ 6.16" avg. annual runoff

34% less

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

⇒ 9.31" avg. annual runoff

Protecting People, Property, & the Environment
MDCIA

UIA 75% → RPA

TN = 4.2 lb/y5

NOT MDCIA

DCIA 75%, SPA

TN = 6.3 lb/y5

Protecting People, Property, & the Environment
Protecting People, Property, & the Environment
Protecting People, Property, & the Environment
Increased Stream Stability
Runoff = Stability

Diagram showing the relationship between the ratio of flows, 10-year forest to 2-year current, and percent impervious area in catchment. The graph compares stable and unstable channels, with stable channels indicated by 'O' and unstable channels by 'X'. The diagram also highlights generally stable and unstable channels.
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

Slope

UIA:RPA

= 

Volume

“...increased loading ratio and increase ground slopes significantly increase the runoff depth”

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
Quantifying reduction
Vegetation and volume reduction

Sheet flow infiltrated vs time

Assumed minimum infiltration capacity

Orth  Heritage 1  Solera  SEMSWA swale
Vegetation and volume reduction

(Contributed by Wright Water Engineers, Inc.)
Vegetation and volume reduction

Sheet flow infiltrated vs time

Infiltration, inches

Time, min

Assumed minimum infiltration capacity

Orth, Heritage 1, Solera, SEMSWA swale

Protecting People, Property, & the Environment
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...