Appendix B
Stormwater Quality Best Management Practice Design Handbook

Austin Sand Filter Example

TENTATIVE TRACT MAP

BEING A BOUNDARY MAP OF THE SOUTHWEST QUARTER OF SECTION 11, TOWNSHIP 6 SOUTH, RANGE 3 WEST, SAN BERNARDINO MERIDIAN, IN THE COUNTY OF RIVERSIDE.

OWNER/DEVELOPER:

ENGINEER:

ASSESSORS PARCEL NO.:

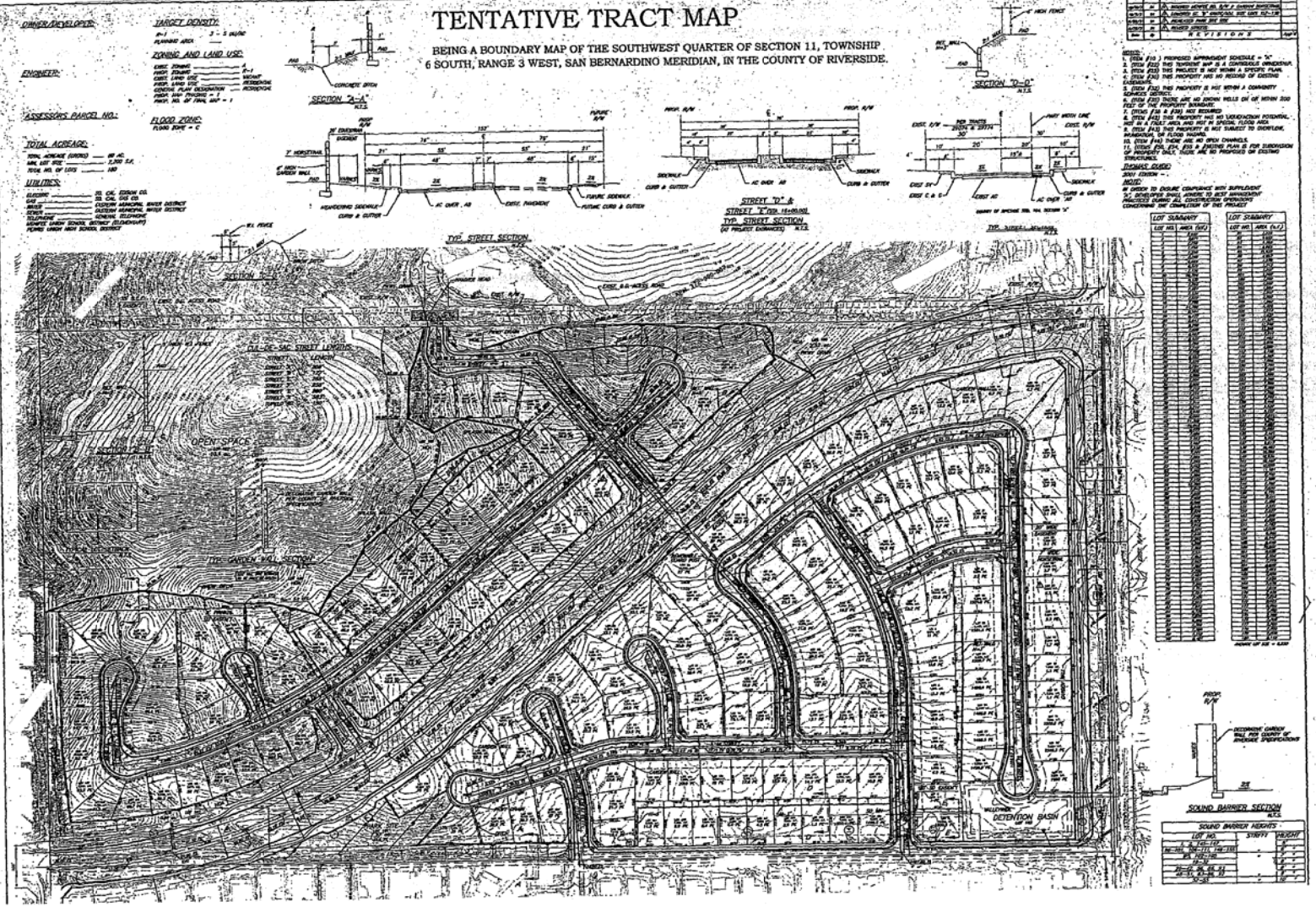
TOTAL ACREAGE:

UTILITIES:

TARGET DENSITY:

ZONING AND LAND USE:

FLOOD ZONE:
FLOOD ZONE = C



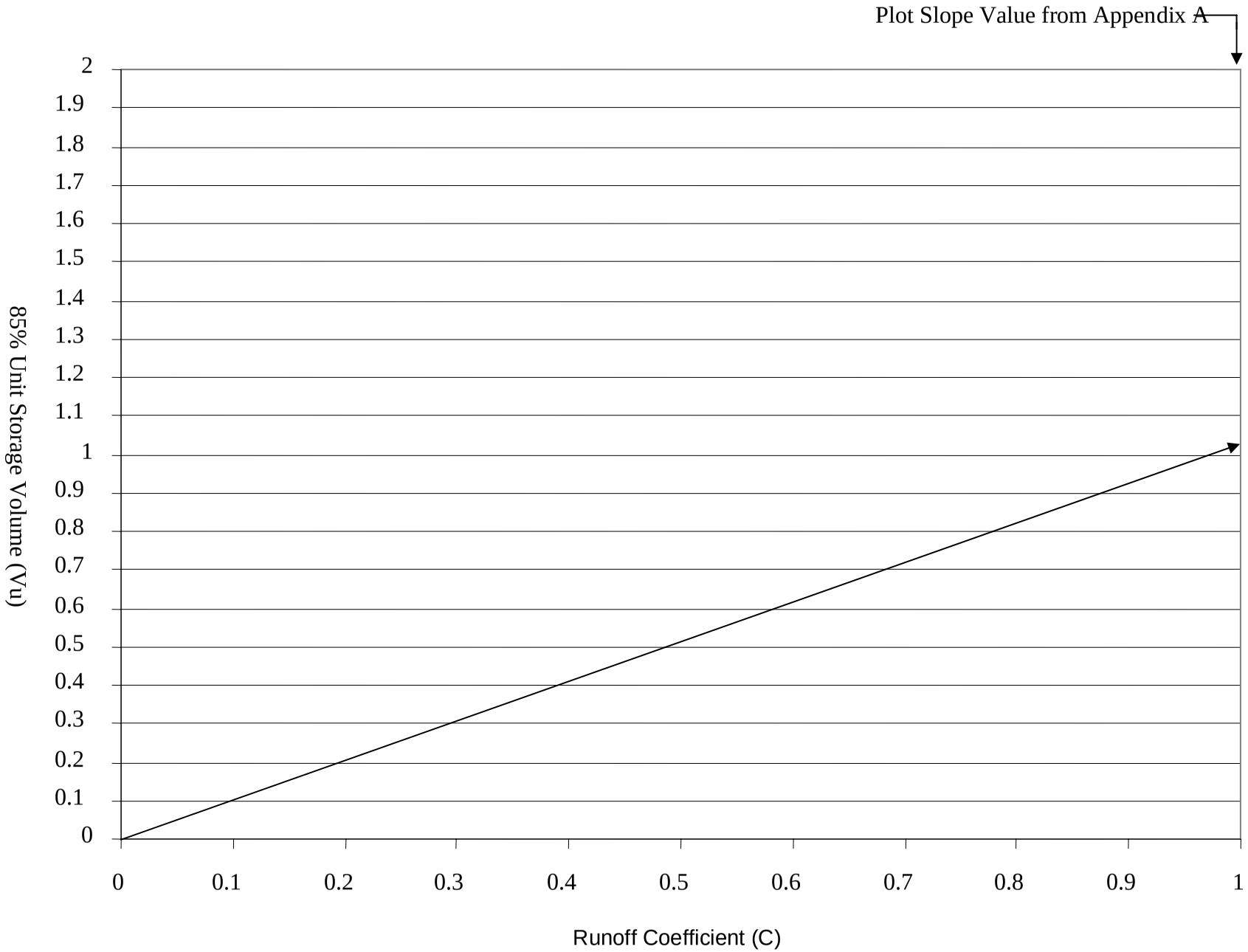


Figure 2 Unit Storage Volume Graph

Datasheet

Site Conditions:

A_{total} = 40 acres (from worksheet 1)
V_{BMP} = 50820 ft^3 (from worksheet 1)
L:W Ratio = 2:1 (min 2:1, consider site constraints)
Site Elevation = 1509.1' (at proposed BMP location)
Outlet Elevation = 1500' (storm drain system to serve as outlet)

Design Assumptions:

Sedimentation Basin Design:
The sedimentation basin volume must be greater than or equal to the V_{BMP}. The maximum depth of water in the sedimentation basin, 2h, is determined based on the total elevation difference between the BMP inlet and outlet.

Using Figure 9:
Elev. of point A = 1500.1 ft (assuming 10' to connect to outlet at 1% slope)
Filter Depth = 3 ft (assuming the minimum depth of 3 ft)
Elev. of point B = 1503.1 ft
Elev. of point C = 1509.1 ft (site elevation)
2h = [(C-B)-1' freeboard]
= 5 ft

Sedimentation Basin Area
$A_s = V_{BMP} / (2h) = 50820\ ft^3 / (5\ ft) = 10164\ ft^2$

$L = 2 * W$
$A_s = 2W^2$
$10164\ ft^2 = 4*W^2$

$W = 71.3$ ft → round to 72 ft
$L = 144$ ft
$A_S = 10368\ ft^2$

Filter Basin Design:
The minimum filter basin surface area is determined with the following equation:

$A_f = V_{BMP} / 18$
$= 50820\ ft^3 / 18 = 2823\ ft^2$

$V_{fb} = A_f$ * filter depth
$= 2823\ ft^2 * 3\ ft = 8469\ ft^3$

The required filter basin volume shall be at least 20 percent of the VBMP:

$V_r = 0.2 * V_{BMP} = 10164\ ft^3 \geq V_{fb}$ → Not Ok, increase filter area

$A_f = V_r$ / filter depth
$= 10164\ ft^3 / 3\ ft = 3388\ ft^2$

width = 72 ft (same as sedimentation basin)
length = $3388\ ft^2 / 72\ ft = 47.1$ → round to 50 ft

$A_f = 3600\ ft^2$
$V_f = 3600\ ft^2 * 3\ ft = 10800\ ft^3$

$V_{fb} = A_f$ * filter depth
$= 2823\ ft^2 * 3\ ft = 8469\ ft^3 \geq Vr$ → Ok

Worksheet 7

Design Procedure Form for Austin Sand Filter

Designer: Jennifer Otterson
Company: Riverside County Flood Control and Water Conservation District
Date: 5/20/04
Project: BMP Example
Location: Winchester/Antelope Valley Area

1. Determine Design Storage Volume (Use Worksheet 1) a. Total Tributary Area (maximum 100) b. Design Storage Volume, V_{BMP}	A_{total} = 40 acres V_{BMP} = 50820 ft^3
2. Maximum Water Height in Sedimentation Basin* a. Invert elevation at connection to storm drain system. b. Sand Filter invert elevation (consider min. grade (1%) from storm drain). Point A, Figure 9. c. Estimate filter depth or use min. (3'). d. Top elevation of filter bed. Point B, Figure 9. e. Surface elevation at BMP inlet. Point C, Figure 9. f. Determine max. allowable height (2h) of water in the sedimentation basin using the elevation difference between points C and B. (min. 2', max. 10') 2h = [(C-B) – 1' Freeboard]	Elev. Storm Drain = 1500 ft Elev. Pt A = 1500.1 ft Filter Depth = 3 ft Elev. Pt B = 1503.1 ft Elev. Pt C = 1509.1 ft 2h = 5 ft
3. Size Sedimentation Basin a. Find Sedimentation Basin Area, A_s $A_s = V_{BMP} / (2h)$ b. Determine basin length and width, using a length to width ratio ≥ 2:1 $A_s = 2 \times W^2$ length = 2 x width	A_s = 10164 ft^2 width = 72 ft length = 144 ft
4. Size Filter Basin a. Determine Filter Basin Area, A_f minimum $A_f = V_{BMP} / 18$	A_f = 3600 ft^2

b. Determine Filter Basin Volume $V_f = A_f$ x filter depth (part 2c)	$V_f =$ 10800 ft^3
c. Determine Required Volume, V_r $V_r = 0.2 \times V_{BMP}$	$V_r =$ 10164 ft^3
d. Check if $V_r \geq V_f$? If no, redesign with an increased filter depth or increase filter area.	Check $V_r \geq V_f$ ok

Notes:
The total surface area occupied by this BMP is 0.32 Acres

* Based on these elevations, is there a sufficient elevation drop to allow gravity flow from the outlet of the control measure to the storm drain system? If no, investigate alternative on-site locations for treatment control, consider another treatment control measure more suitable for site conditions, or contact the District to discuss on-site pumping requirements.