RESPONSE 33

APPENDIX III-2B-1

ACTIVE FACE RUNOFF CONTROL BERM SIZING

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Reviewed by: CGD

1.0 OBJECTIVE

Calculate the required size of the stormwater containment berm at the landfill active face as a function of plane area of the active area.

2.0 GIVEN

- Waste slope of 4H:IV
- 25 years, 24 hour storm event of 7.9 inches;
- Berm slope of 2H:1V;
- 1.0 ft. freeboard on berm

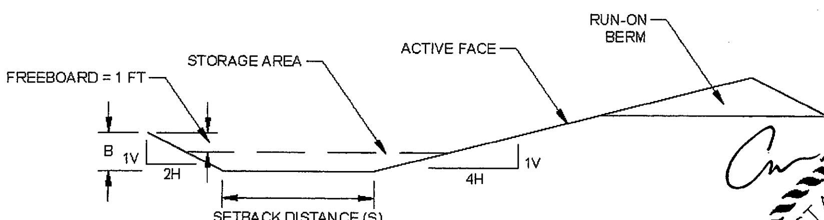
3.0 ASSUMPTIONS

- Stormwater run-on to the active face will not be allowed
- 50 percent run-off from the active face, i.e., 50% infiltration

4.0 CALCULATION

Derive relationships for the amount of runoff from the 7.9 inch design storm and the available storage volume as a function of the active face area.

Cross-section of the Active Face and Containment Berm



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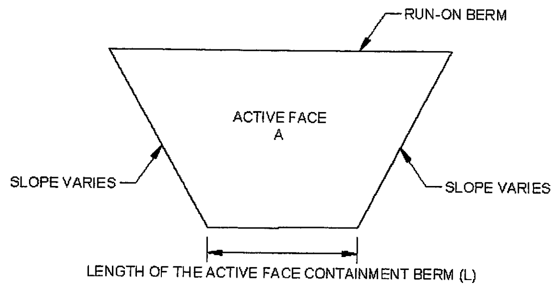
Elevation View of the Active Face and Containment Berm



4.1 Runoff, R

$$R = .5\left(7.9 \div 12\,{}^{in}/_{ft}\right) \times A = \frac{0.66}{2} \times A = .33 \times A$$

Where:

R = total runoff into the active area containment berm (cf)

A = total area of the active face (sf)

4.2 Storage, V

$$V = L \times \left(\frac{S + (S + (B-1) \times 2 \times (B-1) \times 4)}{2}\right) \times (B-1)$$

$$V = (3B^2 + (S-6) \times B - S + 3) \times L$$

Where:

V = storage capacity an active face containment berm (cf)

L = length of the active face containment berm (ft)

4.3 Height of Berm, B

Now set runoff, R, equal to storage, V, and solve for the height of berm, B.

$$B = \frac{6 - S + \sqrt{S^2 + 7.92\frac{A}{L}}}{6}$$

For typical site operations, the maximum berm height will be 6 ft. The operator can vary the berm length and setback distance to limit the berm height to 6 ft.

Now plot B versus L for various values of S and A. Figures 1 through 8 present the plots for active working areas of 10,000, 20,000, 30,000, 40,000 sf, etc., respectively.

4.4 Procedure To Select Berm Size

Procedure to select berm size using Figures 1 through 8:

1) Determine the active face area (A);

2) Select a figure from Figures 1-8 that has an active area closest to, but no less than the actual A. For example, if A=25,000, choose Figure 3 (A=30,000);

3) Determine the minimum setback distance (S) for the daily operation, and select the corresponding curve. If the setback distance falls between the numbers shown on the figure, the closest but smaller value of S will be used. For example, if S=25 ft, choose the curve representing 20 ft; and

4) Measure the length of the active face containment berm, and determine the required berm height from the selected curve. Figures 1 through 8 cover a wide range of berm length (i.e. toe width of the active face) for normal waste fill operations. If the actual berm length is longer than the maximum value on the curve, the maximum berm length on the can be used to determine a conservative berm height. If the actual berm length is shorter than the minimum value on the curve, the operator can use equation (1) above to determine berm height.

Example using attached figures: A = 10,000 sf, s = 20 ft, L = 200 ft => B = 1.8 ft (from Figure 1, curve S = 20 ft).

5.0 CONCLUSION

Figures 1 through 8 and the procedure discussed above provide guidance for determining the size of the stormwater containment berm based on the height of the active face (runoff area), the length of the containment berm, and the setback distance from the active face. The equations presented in this calculation may be used to determine the required berm height for various active face areas, berm lengths, and setback distances.

Figure 1. Berm Height vs. Berm Length for Various Setbacks

A = 10,000 sf

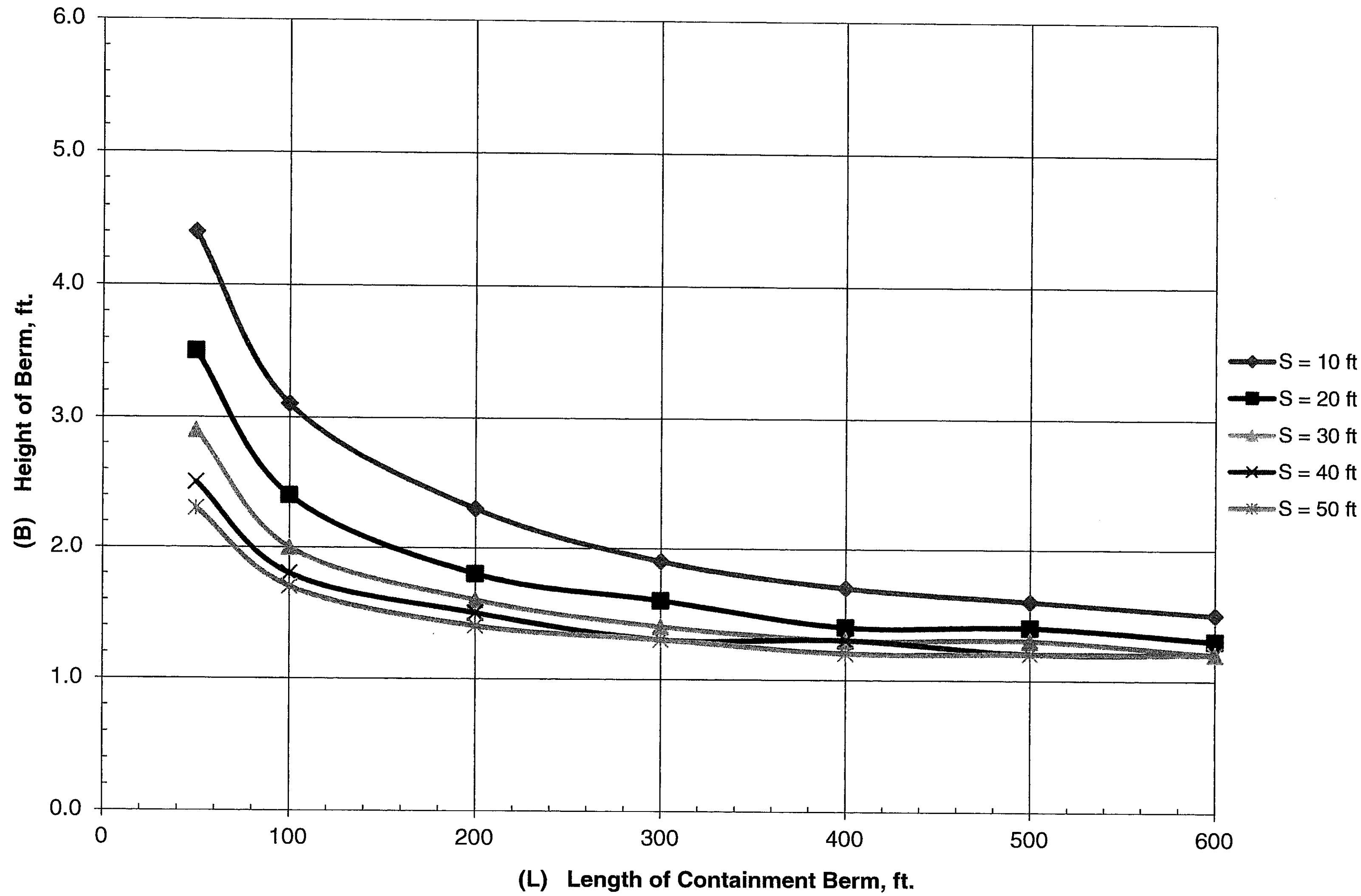


Figure 2. Berm Height vs. Berm Length for Various Setbacks

A = 20,000 sf

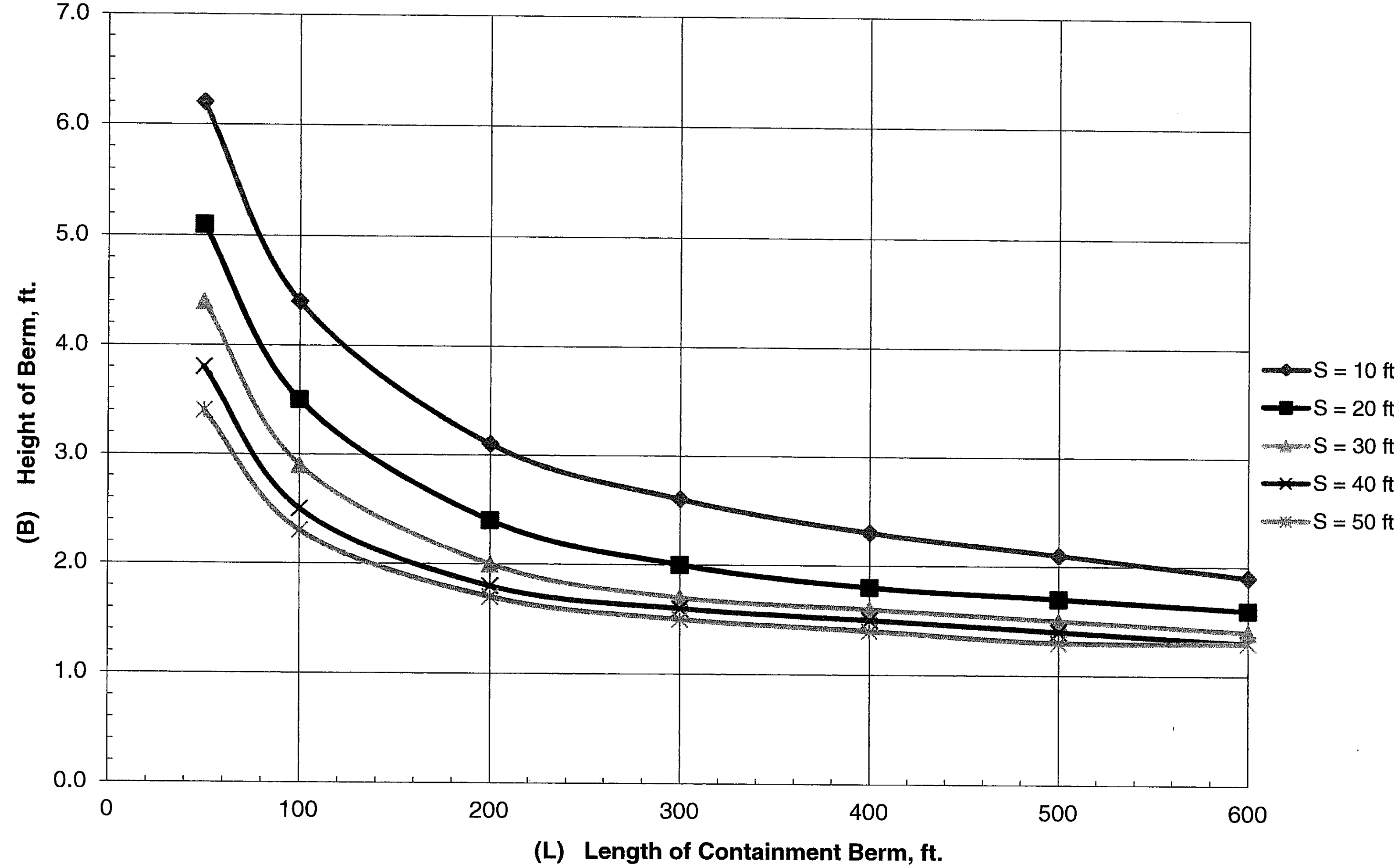


Figure 3. Berm Height vs. Berm Length for Various Setbacks

A = 30,000 sf

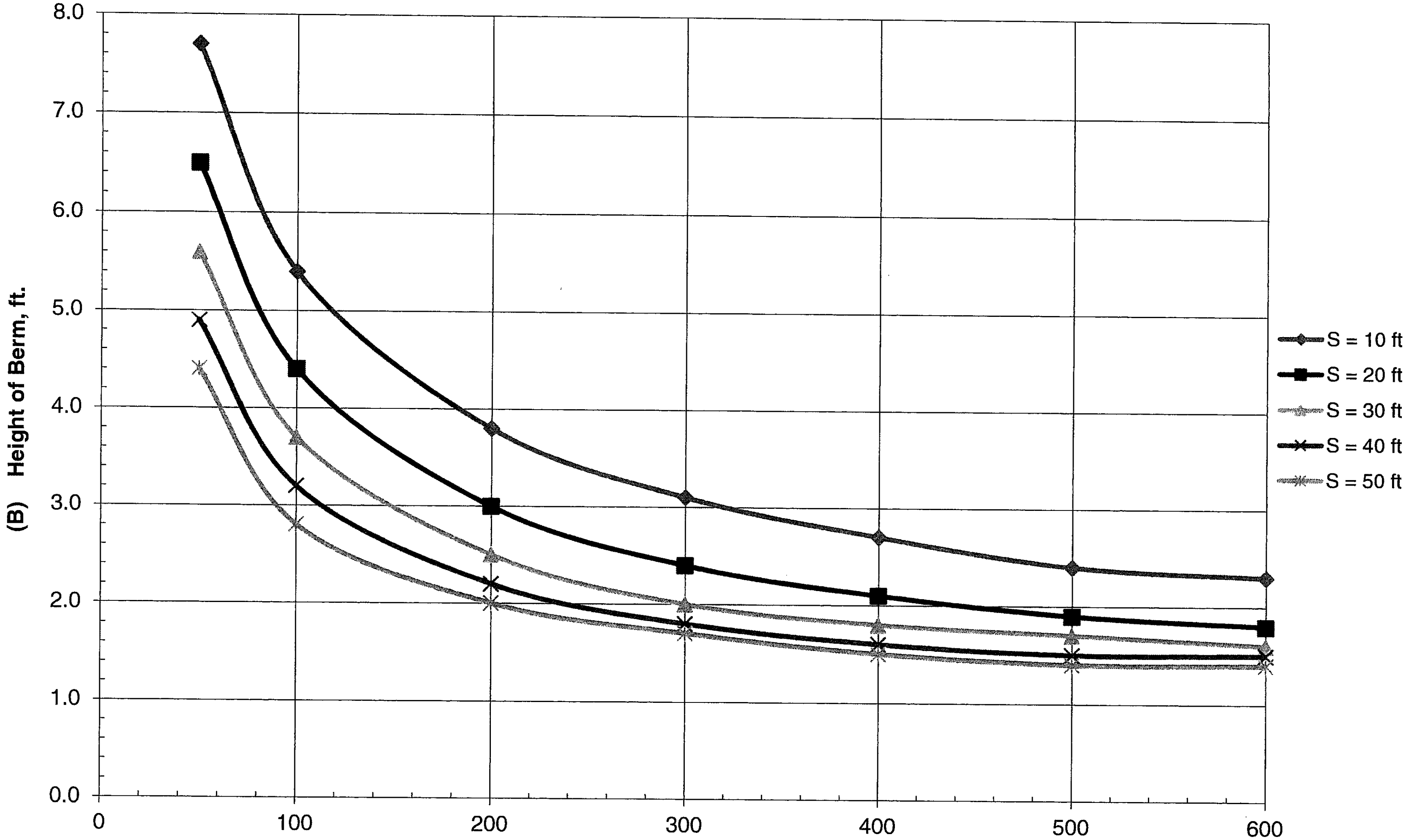


Figure 4. Berm Height vs. Berm Length for Various Setbacks

A = 40,000 sf

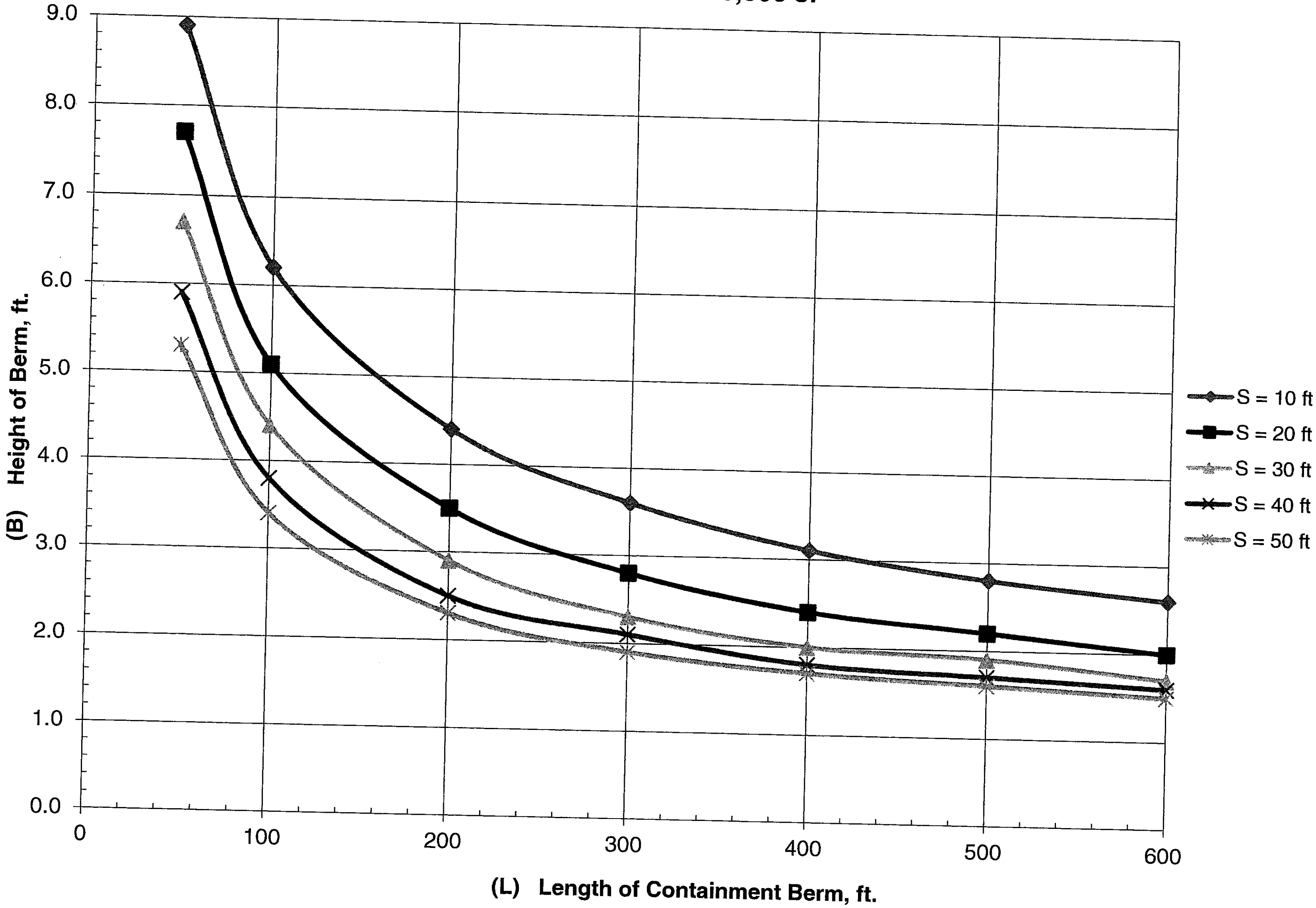


Figure 5. Berm Height vs. Berm Length for Various Setbacks

A = 50,000 sf

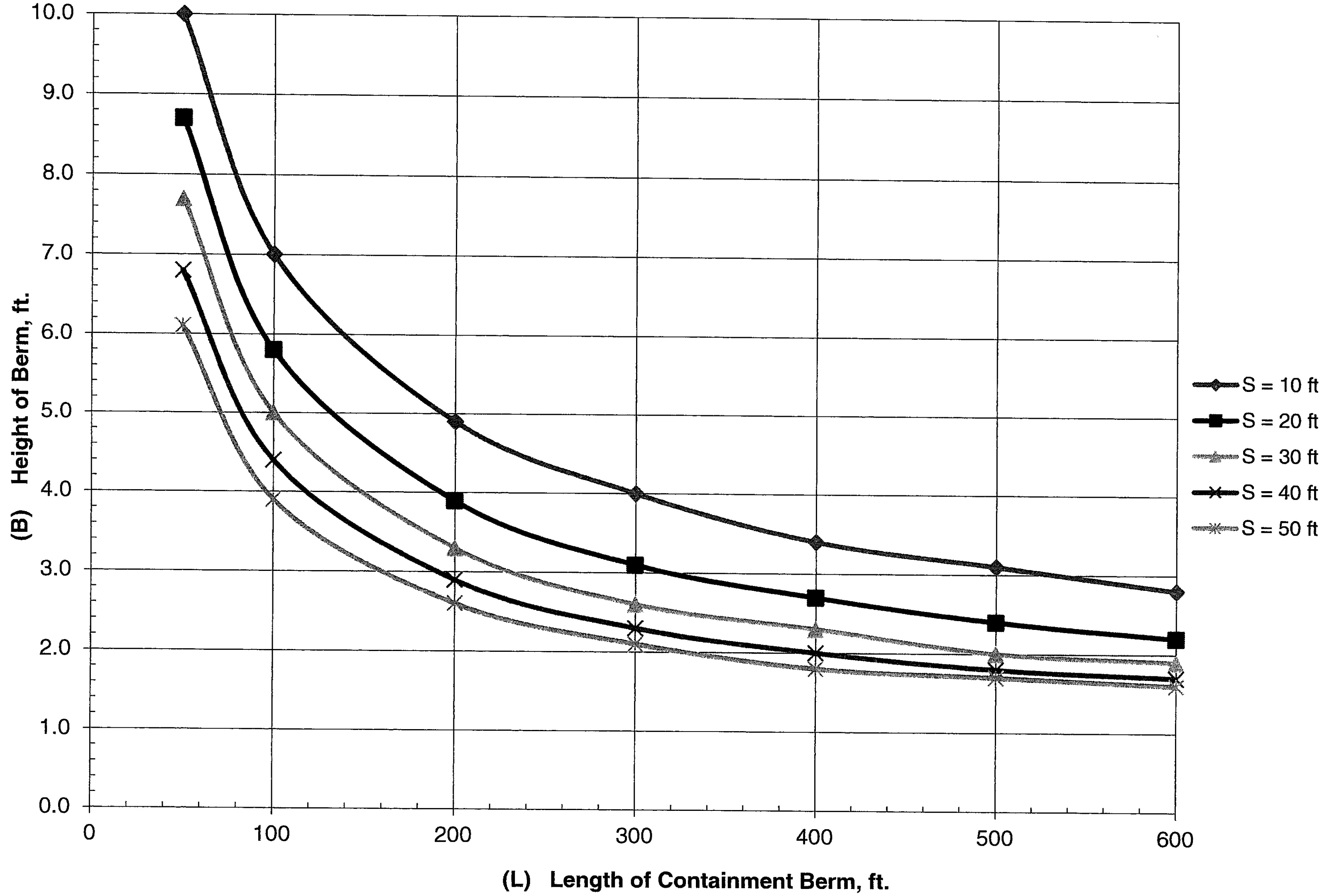


Figure 6. Berm Height vs. Berm Length for Various Setbacks

A = 60,000 sf

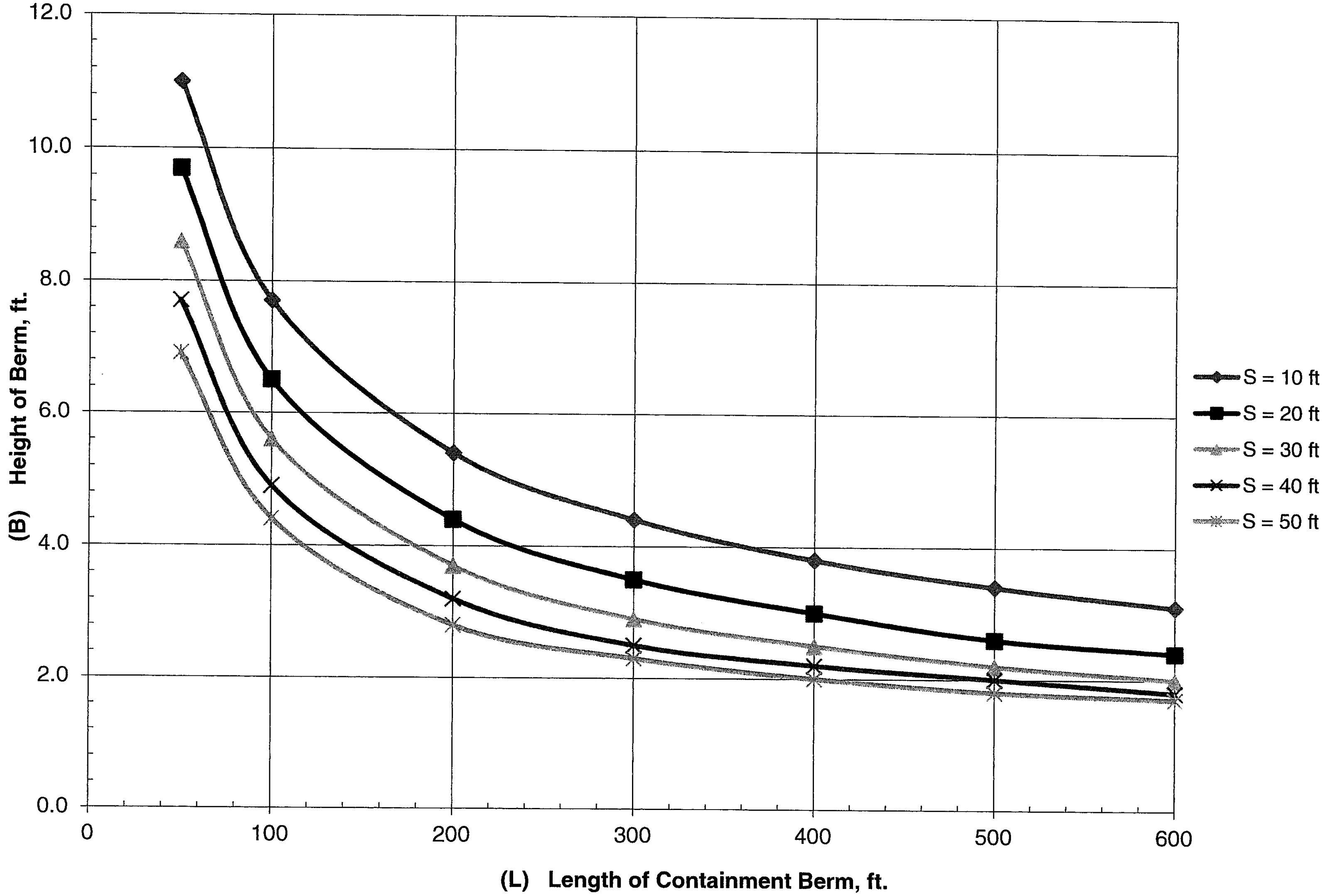


Figure 7. Berm Height vs. Berm Length for Various Setbacks

A = 70,000 sf

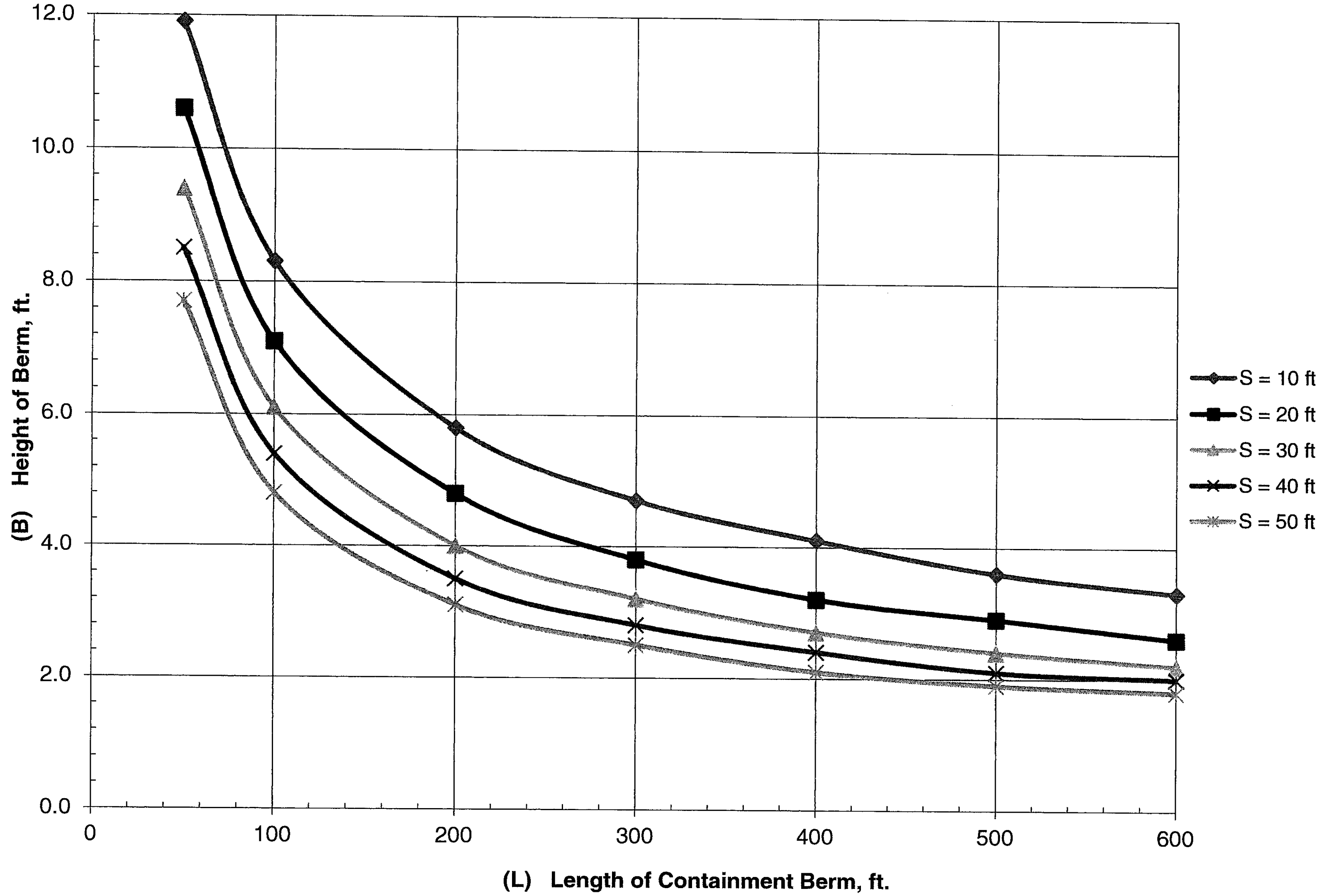
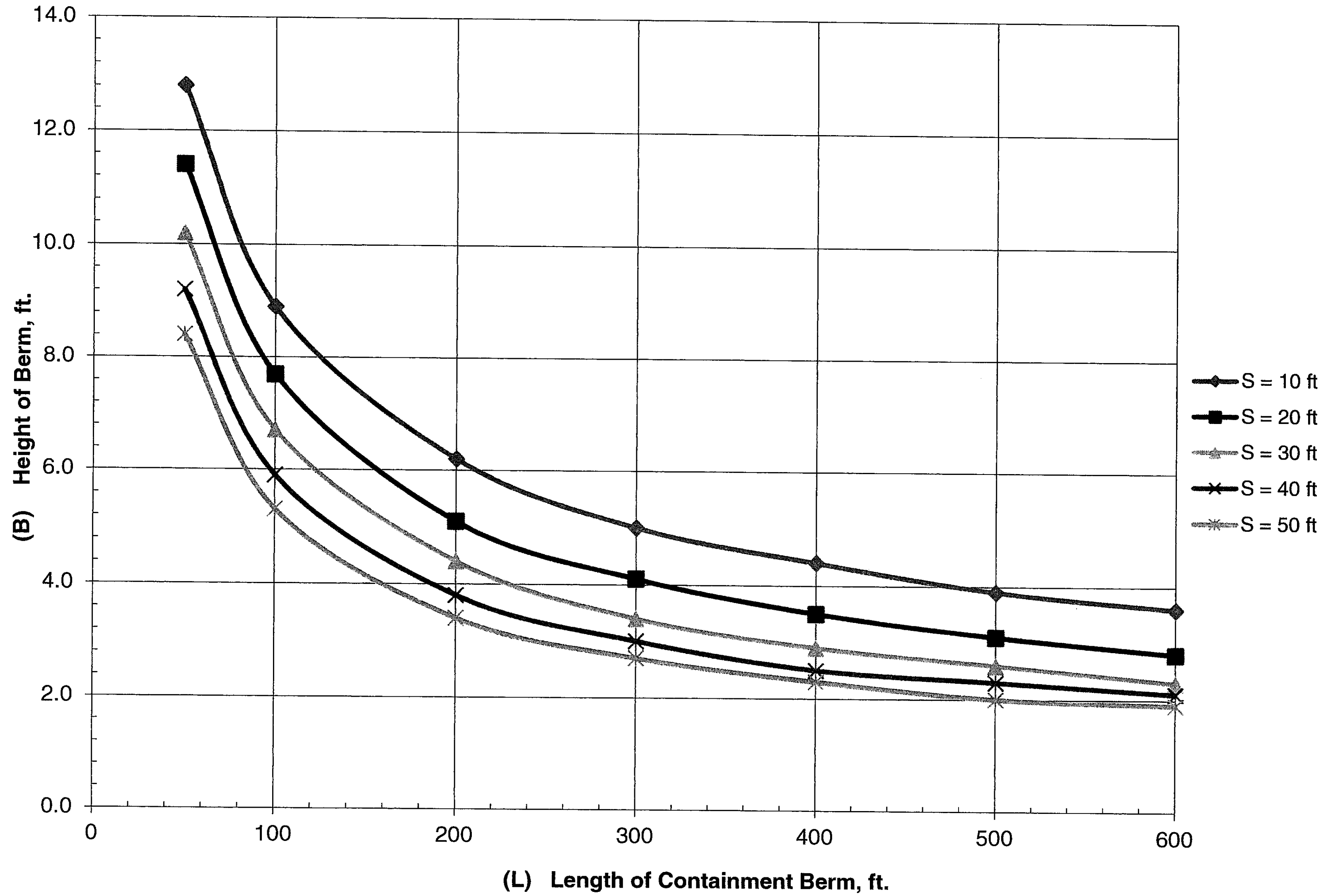


Figure 8. Berm Height vs. Berm Length for Various Setbacks

A = 80,000 sf



final cover or additional placement of waste is resumed on the intermediate cover area.

4.1 General Erosion and Sedimentation Assessment

In assessing the landfill construction and operational practices for potential erosion and sedimentation, the site will consider impacts to sensitive areas, such as steep slopes, surface waters, areas with erodible soils, and existing discharge channels. Also, the facility will disturb the smallest vegetated area possible, keep the amount of cut and fill to a minimum, and maintain the aforementioned sensitive areas. During the construction of landfill cells, it will be necessary to disturb the soil by clearing and grubbing, excavating and stockpiling, rough and final grading, constructing perimeter channel(s), and seeding and/or planting. The BMPs described in the following sections will be utilized to ensure minimal impacts to water quality during these phases of construction and stockpiling activities. Standard TxDOT specifications of these BMPs are included in Appendix III-2D.

To guard against soil loss, the phased development plan for landfill cell construction and solid waste placement will be followed. The figures in Part I/II of this permit application describe in detail the required fill sequence planning, including sequencing of drainage and run-off controls, to ensure adequate slope stability and limited erosion and soil loss.

4.2 Run-on and Run-off Control for Active Disposal Areas

Run-on and run-off controls for active disposal areas will be utilized to minimize the potential for stormwater contamination. The working face of the active disposal area will be encompassed by a run-on berm (top berm) and a run-off berm (toe berm) for the purpose of segregating potentially contaminated and non-contact stormwater. The containment berms are designed to accommodate the 25-year, 24-hour storm, the equivalent of a 7.9-inch rainfall event. The top berm is designed to accommodate upstream watersheds that may flow towards the working face and divert the collected uncontaminated stormwater around the working area for discharge through a permitted stormwater outfall. The toe berm is designed to accommodate storage of stormwater that has potentially contacted the open working face. Perpendicular to the toe berm, side berms of the same size as the toe berm will be constructed at both ends of the toe berm to contain the collected contaminated water. The berm height requirements and design configurations are detailed in Appendix III-2B.

As a result of progressive disposal and filling operations, ongoing berm extensions/construction may be required to accommodate adequate stormwater run-on diversion (top berm) and proper storage of run-off contact waters (toe berm). The daily disposal operations will include an evaluation of the existing containment berms' capability to manage stormwater run-on and run-off, and adjustments will be made as needed.