APPENDIX C

EXAMPLE DESIGN CALCULATIONS FOR RETENTION OF SOLIDS AND INITIAL STORAGE

C-1. General. This appendix presents example calculations for containment area designs for the retention of suspended solids and initial storage. The examples are presented to illustrate the use of field and laboratory data and include designs for sedimentation, weir design, and requirements for initial storage capacity. Only those calculations necessary to illustrate the procedure are included in the examples.

C-2. Example I: Containment Area Design Method for Sediments Exhibiting Flocculent Settling.

a. Project Information.

(1) Each year an average of 300,000 cubic yards of fine-grained channel sediment is dredged from a harbor. A new in-water containment area is being constructed to accommodate the long-term dredged material disposal needs in this harbor. However, the new containment area will not be ready for approximately 2 years. One containment area in the harbor has some remaining storage capacity, but it is not known whether the remaining capacity is sufficient to accommodate the immediate disposal requirements. Design procedures must be followed to determine the residence time needed to meet effluent requirements of 4 grams per litre and the storage volume required for the 300,000 cubic yards of channel sediment. These data will be used to determine if the existing containment area storage capacity is sufficient for the planned dredged material disposal activity. The existing containment area is about 3 miles from the dredging activity.

(2) Records indicate that for the last three dredgings, an 18-inch pipeline dredge was contracted to do the work. The average working time was 17 hours per day, and the dredging rate was 600 cubic yards of in situ channel sediment per hour. The project depth in the harbor is 50 feet.

b. Results of Containment Area Survey. The existing containment area has the following dimensions:

(1) Size: 96 acres.

(2) Shape: length-to-width ratio of about 3.

(3) Volume: 1,548,800 cubic yards (average depth, from surveys, is 10 feet).

(4) Weir length: 24 feet (rectangular weir).

(5) Minimum ponding depth: 2 feet (assumed).

c. Results of Laboratory Tests and Analysis of Data. Sediment and dredging-site water characterization was conducted as described in Chapter 3.

A pilot settling test was conducted, and no interface was observed during the first 4 hours of the test. An 8-inch column test was then run to determine flocculent and compression settling properties. The following data were obtained from the laboratory tests:

(1) Salinity of dredging site water: <1 part per thousand.

(2) Channel sediment in situ water content w : 85 percent.

(3) Specific gravity G_s : 2.69.

(4) Grain size analysis indicates approximately 20 percent of the sediment is coarse grained.

(5) Observed flocculent settling concentrations as a function of depth (see Table C-l).

(6) Percent of initial concentration with time (see Table C-2). This is determined as follows:

(a) Column concentration at the beginning of tests is 132 grams per litre.

(b) Concentration at l-foot level at time = 30 minutes is 46 grams per litre (Table C-l).

(c) Percent of initial concentration = 46 ÷ 132 = 0.35 = 35 percent.

(d) These calculations are repeated for each time and depth to develop Table C-2.

(7) Plot the percent of initial concentration versus the depth profile for each time interval from data given in Table C-2 (see Figure C-1).

(8) Determine concentration as a function of time (15-day settling column data) (see Table C-3).

(9) Plot time versus concentration from data in Table C-3 as shown in Figure C-2.

d. Design Concentration. Compute the design concentration as follows:

(1) The project information is:

(a) Dredge size: 18 inches.

(b) Volume to be dredged: 300,000 cubic yards.

(c) Average operating time: 17 hours per day.

(d) Production: 600 cubic yards per hour.

(2) Estimate the time of dredging activity:

Table C-1
Observed Flocculent Settling Concentrations with Depth, in Grams per Litre*

Time, min	Depth from Top of Settling Column, ft 1	2	3	4	5	6	7
0	132.0	132.0	132.0	132.0	132.0	132	132
30	46.0	99.0	115.0	125.0	128.0	135	146
60	25.0	49.0	72.0	96.0	115.0	128	186
120	14.0	20.0	22.0	55.0	78.0	122	227
180	11.0	14.0	16.0	29.0	75.0	119	
240	6.8	10.2	12.0	18.0	65.0	117	
360	3.6	5.8	7.5	10.0	37.0	115	
600	2.8	2.9	3.9	4.4	14.0	114	
720	1.01	1.6	1.9	3.1	4.5	110	
1,020	0.90	1.4	1.7	2.4	3.2	106	
1,260	0.83	1.14	1.2	1.4	1.7	105	
1,500	0.74	0.96	0.99	1.1	1.2	92	
1,740	0.63	0.73	0.81	0.85	0.94	90	

* Note: Although a 6-foot test depth is recommended, an 8-foot depth was used in this test.

Table C-2

Percent of Initial Concentration with Time*

Time T, min	Depth from Top of Settling Column, ft 1	2	3
0	100.0	100.0	100.0
30	35.0	75.0	87.0
60	19.0	37.0	55.0
120	11.0	15.0	17.0
180	8.0	11.0	12.0
240	5.0	8.0	9.0
360	3.0	4.0	6.0
600	2.0	2.2	3.0
720	1.0	1.2	1.4

* Note: Initial suspended solids concentration = 132 grams per litre.

Table C-3

Concentration of Settled Solids as a Function of Time

Time days	Concentration g/ℓ
1	190
2	217
3	230
4	237
5	240
6	242
7	244
9	249
10	247
15	256

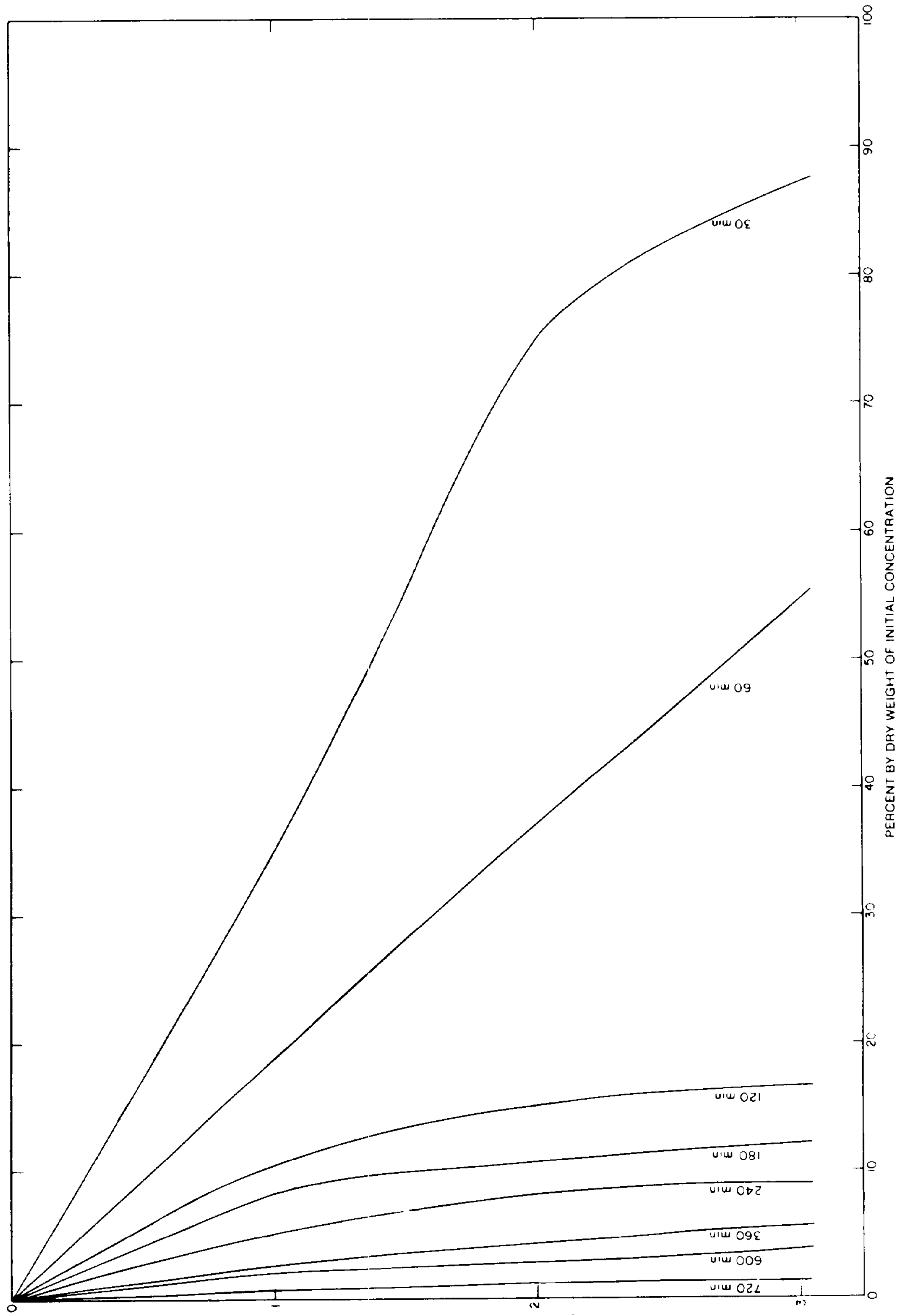

Figure C-1. Percent of initial concentration versus depth profile

$$\frac{300{,}000\ yd^3}{600\ yd^3/hr} = 500\ hr$$

$$\frac{500\ hr}{17\ hr/day} = 29.4 \quad 30\ days$$

(3) Average time for initial dredged material consolidation is:

$$\frac{30\ days}{2} = 15\ days$$

(4) Design solids concentration C_d is the concentration shown in Figure C-2 at 15 days:

$$C_d = 253\ \text{grams per litre}$$

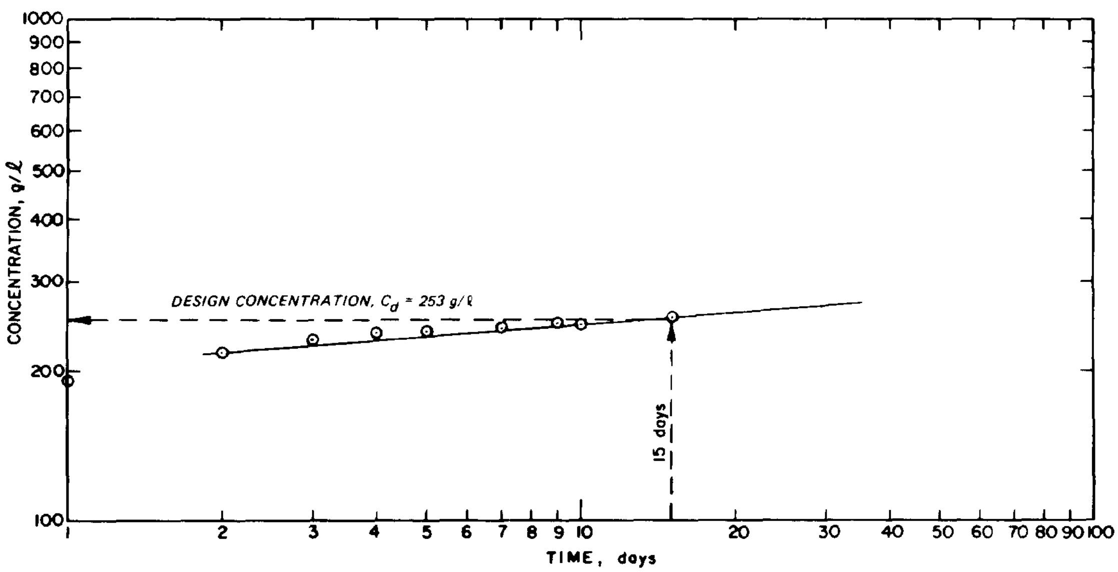

Figure C-2. Time versus concentration

e. Volume Required for Dredged Material. Estimate the volume required for dredged material as follows:

(1) Compute the average void ratio e_o using Equation 4-2:

$$e_o = \frac{G_s \gamma_w}{C_d} - 1$$

where $G_s = 2.69$, $\gamma_w = 1{,}000$ grams per litre, and $C_d = 253$ grams per litre. Thus,

$$e_o = \frac{2.69(1{,}000)}{253} - 1$$

$$e_o = 9.63$$

(2) Laboratory tests indicate that 20 percent of the sediment is coarse-grained material; therefore, the volume of coarse-grained material V_{sd} is

$$V_{sd} = 300{,}000(0.20) = 60{,}000 \text{ cubic yards}$$

and the volume of fine-grained material V_i is:

$$V_i = 300{,}000 - 60{,}000 = 240{,}000 \text{ cubic yards}$$

(3) Compute the volume of fine-grained channel sediments after disposal in the containment area using Equation 4-3:

$$V_f = V_i \left[\frac{e_o - e_i}{1 + e_i} + 1 \right]$$

$$e_i = \frac{wG_s}{S_D}$$

$$= \frac{(85/100)(2.69)}{1.00}$$

$$e_i = 2.29$$

$$V_i = 240{,}000 \text{ cubic yards}$$

$$V_f = \left[\frac{9.63 - 2.29}{1 + 2.29} + 1 \right] (240{,}000)$$

$$V_f = 775{,}440 \text{ cubic yards}$$

(4) Estimate the total volume required in the containment area using Equation 4-4:

$$V = V_f + V_{sd}$$

$$V_{sd} = 60{,}000 \text{ cubic yards}$$

$$V = 775{,}440 + 60{,}000$$

$$V = 835{,}440 \text{ cubic yards}$$

(5) Determine the maximum height of dredged material. Foundation conditions limit dike heights to 10 feet. A ponding depth of 2 feet is assumed using Equation (4-4b):

$$H_{dm_{(max)}} = H_{dk_{(max)}} - H_{pd} - H_{fb}$$

$$H_{dm_{(max)}} = 10 \text{ feet} - 2 \text{ feet} - 2 \text{ feet}$$

$$H_{dm_{(max)}} = 6 \text{ feet}$$

(6) The minimum surface area that could be used must be compared to the available surface area of 96 acres. Using Equation 4-4c:

$$A_{ds_{(min)}} = \frac{V}{H_{dm_{(max)}}}$$

$$A_{ds_{(min)}} = \frac{835{,}440 \text{ yd}^3}{6 \text{ ft}} \times \frac{27 \text{ ft}^3}{\text{yd}^3}$$

$$A_{ds_{(min)}} = 3{,}759{,}480 \text{ ft} = \text{approximately } 86 \text{ acres}$$

Since the minimum required surface area is less than the available 96 acres, the dredged material can physically be stored during the dredging operation.

f. Residence Time Required for Sedimentation. The design residence time is computed as in the following example:

(1) Calculate removal percentages for the assumed ponding depth of 2 feet. Calculating the total area down to a depth of 2 feet from Figure C-l gives an area of 200 (scale units), Calculating the area to the right of the 30-minute time line down to a depth of 2 feet gives 124 (scale units). These areas could also have been determined by planimetering the plot. Compute removal percentages as follows (see Equation 4-7):

$$R = \frac{124}{200} \times 100 = 62$$

For a settling time of 30 minutes, 62 percent of the suspended solids are removed from the water column above the 2-foot depth.

(2) The calculations illustrated in step (1) are repeated for each time, and the results are tabulated in Table C-4.

(3) Plot the data in Table C-4 as shown in Figure C-3.

(4) Determine the mean residence time required to meet the 4-grams-per-litre effluent suspended solids requirements.

$$\text{Required Solids Removal} = \frac{C_i - C_{eff}}{C_i}$$

Table C-4

Removal Percentages as Function of Settling Time

Time, min	Removal, percentage
30	62.0
60	81.0
120	90.2
180	93.1
240	95.5
360	97.0
600	98.4
720	99.3

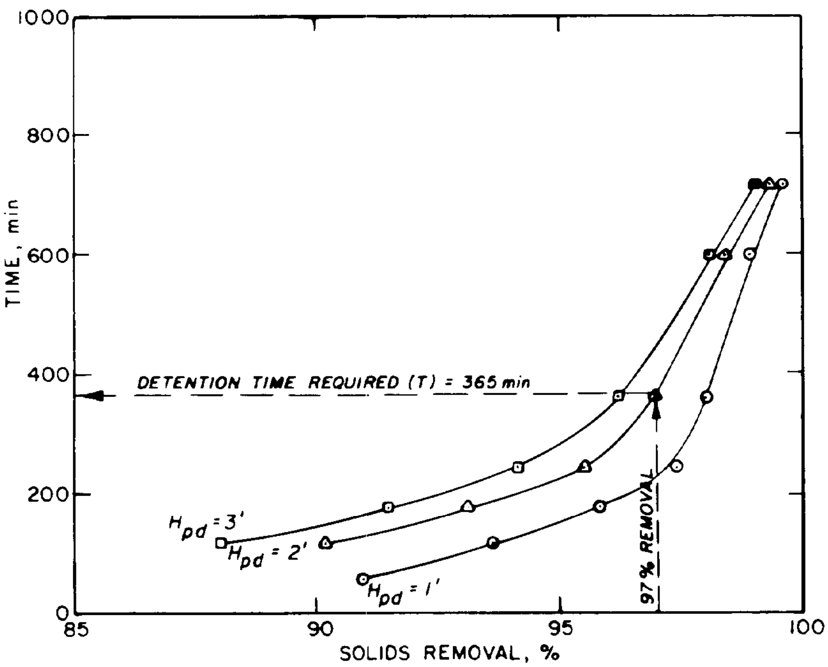

Figure C-3. Solids removal versus time

$$= \frac{132 - 4}{132} = 0.97 \text{ or } 97 \text{ percent}$$

(5) From Figure C-3, T = 365 minutes.

(6) No specific data on hydraulic efficiency exist for this site. Therefore, the hydraulic efficiency correction factor will be estimated using Equation 4-14.

$$\frac{T_d}{T} = 0.9 \left[1 - \exp\left(-0.3 \frac{L}{W}\right)\right]$$

$$= 0.9 \left\{1 - \exp\left[-0.3 (3)\right]\right\}$$

$$= 0.53$$

$$HECF = \frac{T}{d}$$

$$= \frac{1}{0.53}$$

$$= 1.87$$

$$T = HECF\ (T_d)$$

$$= 1.87\ (365)$$

$$= 683 \text{ min}$$

The required theoretical or volumetric retention time equals 683 minutes or 11.4 hours.

g. Design Surface Area Required for Flocculent Sedimentation. Compute this value using Equation 4-13 as follows:

$$Q_i = \frac{\left(\frac{18 \text{ in.}}{12}\right)^2 \pi}{4} \times 15 \text{ ft/sec}$$

$$= 26.5 \text{ ft}^3\text{/sec}$$

$$A_{df} = \frac{T\ Q_i}{H_{pd}\ (12.1)}$$

$$= \frac{11.4\ (26.5)}{2\ (12.1)}$$

$$= 12 \text{ acres}$$

h. Design Surface Area. Since both the A_{ds} and A_{df} are smaller than the available 96 acres, use 96 acres as the design surface area A_d .

$$A_d = 96 \text{ acres} \times 43{,}560 \text{ ft}^2/\text{acre}$$

$$A_d = 4{,}181{,}760 \text{ ft}^2$$

i. Thickness of Dredged Material Layer. Determine the thickness of the dredged material layer from:

$$H_{dm} = \frac{V}{A_d}$$

$$= \frac{835{,}440 \text{ yd}^3 \times 27}{4{,}181{,}760 \text{ ft}^2}$$

$$H_{dm} = 5.4 \text{ ft}$$

j. Required Containment Area Depth (Dike Height). The required containment area depth is determined from:

$$H_{dk} = H_{dm} + H_{pd} + H_{fb}$$

$$= 5.4 + 2 + 2$$

$$H_{dk} = 9.4 \text{ feet}$$

D = 9.4 feet is less than the maximum allowable dike height of 10 feet.

k. Weir Length.

(1) The existing effective weir length L_e equals the weir crest length L for rectangular weirs:

$$L_e = 24 \text{ feet}$$

$$Q_i = 26.5 \text{ cubic feet per second}$$

$$H_{pd} = 2 \text{ feet}$$

Using Figure 4-7 from the main text, a 2-foot ponding depth at the weir requires an effective weir length of approximately 60 feet. The existing 24-foot weir length is therefore inadequate, and additional weir length should be provided.

(2) The remaining volume of 1,548,800 cubic yards in the existing containment area is sufficient to accommodate disposal of the 300,000 cubic yards of maintenance channel sediment into the basin under a continuous disposal operation. Since the required basin depth is less than the existing depth, no upgrading will be necessary to accommodate the first dredging operation.

C-3. Example II: Containment Area Design Method for Sediments Exhibiting Zone Settling.

a. Project Information. Fine-grained maintenance dredged material is scheduled to be dredged from a harbor maintained to a project depth of 50 feet. Channel surveys indicate that 500,000 cubic feet of channel sediment must be dredged. All available disposal areas are filled near the dredging activity, but an available tract of 80 acres is available for a new site 2 miles from the dredging project. An evaluation of the foundation conditions indicate that the maximum allowable dike height is 15 feet. The containment area must be designed to accommodate initial storage requirements while meeting effluent suspended solids levels of 75 milligrams per litre. In the past, the largest dredge contracted for the maintenance dredging has been a 24-inch pipeline dredge. This is the largest size dredge located in the area.

b. Results of Laboratory Tests. Sediment and dredging site water characterization was conducted as described in Chapter 3. A pilot settling test was conducted, and an interface was observed within a few hours. A column settling test for zone settling was then conducted as described in Chapter 3. Flocculent settling data were collected above the interface. The test was also continued for 15 days for purposes of evaluating initial storage requirements. The following data were obtained from the laboratory tests:

(1) Salinity: 15 parts per thousand.

(2) Channel sediment in situ water content w : 92.3 percent.

(3) Specific gravity G_s : 2.71.

(4) Depth to suspended solids interface as a function of time for a series of zone settling tests (see Table C-5).

(5) Concentration of settled material as a function of time data (15-day settling column data) (see Table C-6).

(6) Concentration of settled solids versus time curve (see Figure C-4).

(7) Representative samples of channel sediments tested in the laboratory indicate that 15 percent of the sediment is coarse-grained material (> No. 200 sieve).

$$V_{sd} = 500,000(0.15) = 75,000 \text{ cubic yards}$$

$$V_i = 500,000 - 75,000 = 425,000 \text{ cubic yards}$$

(8) Suspended solids concentration data for port samples taken above the interface for the flocculent test (Table C-7).

(9) Concentration profile diagram plotted from data in Table C-7 (Figure C-5). The initial supernatant suspended solids concentration C_o was assumed equal to the highest concentration of the first port samples taken,

Table C-5

Depth to Solids Interface (Feet) as a Function of Settling Time (Hours) at C_i = 150 grams per litre

Time, hr	Depth, ft
0	0
0.25	0.050
0.50	0.090
0.75	0.170
1.0	0.230
2.0	0.420
3.0	0.475
4.0	0.505
5.0	0.530
6.0	0.553
7.0	0.565
8.0	0.575
10.0	0.595
20.0	0.655
30.0	0.690

* From plot of depth versus time V_s = 0.24 feet per hour.

Table C-6

Concentration of Settled Solids
as a Function of Time*

Time Days	Concentration g/ℓ
1	192
2	215
3	219
4	140
5	251
6	272
8	280
10	290
15	320

* See Figure C-3.

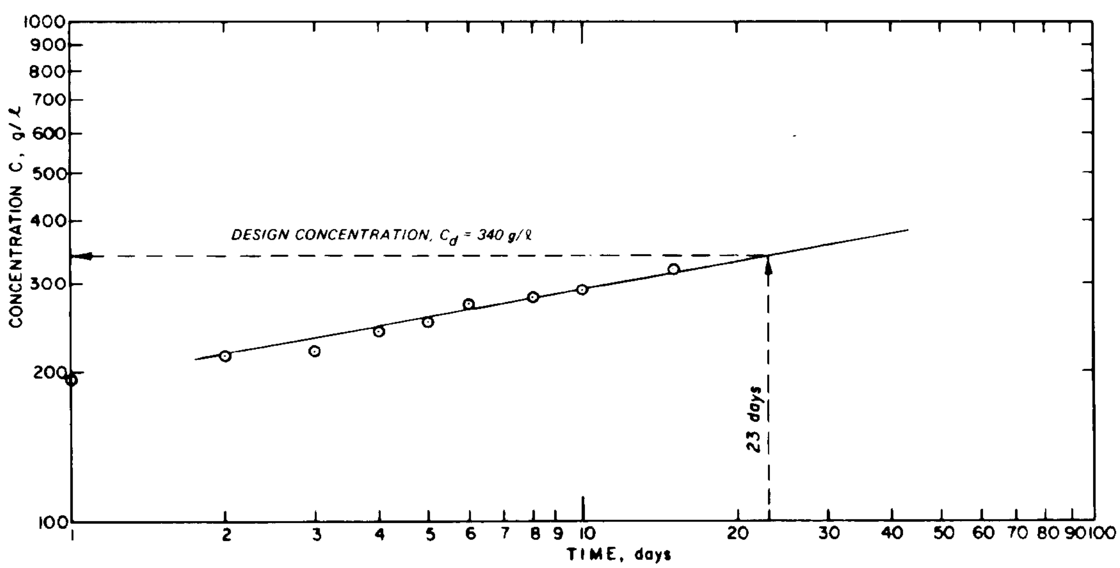

Figure C-4. Concentration of settled solids versus time

Table C-7

Observed Flocculent Settling Data

Sample Extraction Time t (hr)	Depth of Sample Extraction z (ft)	Total Suspended Solids, C (mg/ℓ)	Fraction of Initial, Ø (percent)
3	0.2	93	55
3	1.0	169	100
7	1.0	100	59
7	2.0	105	62
14	1.0	45	27
14	2.0	43	25
14	3.0	50	30
24	1.0	19	11
24	2.0	18	11
24	3.0	20	12
48	1.0	15	9
48	2.0	7	4
48	3.0	14	8

169 milligrams per litre. The concentration profile diagram was therefore constructed using 169 milligrams per litre as Ø = 100 percent.

c. Design Concentration. Compute this value as follows:

(1) The project information is as follows:

(a) Dredge size: 24 inches.

(b) Volume to be dredged: 500,000 cubic yards.

(2) Good records are available from past years of maintenance dredging in this harbor. They show that each time a 24-inch dredge was used, the dredge operated an average of 12 hours per day and dredged an average of 900 cubic yards per hour.

(3) Estimate the time of dredging activity:

$$\frac{500{,}000 \text{ yd}^3}{900 \text{ yd}^3/\text{hour}} = 556 \text{ hours}$$

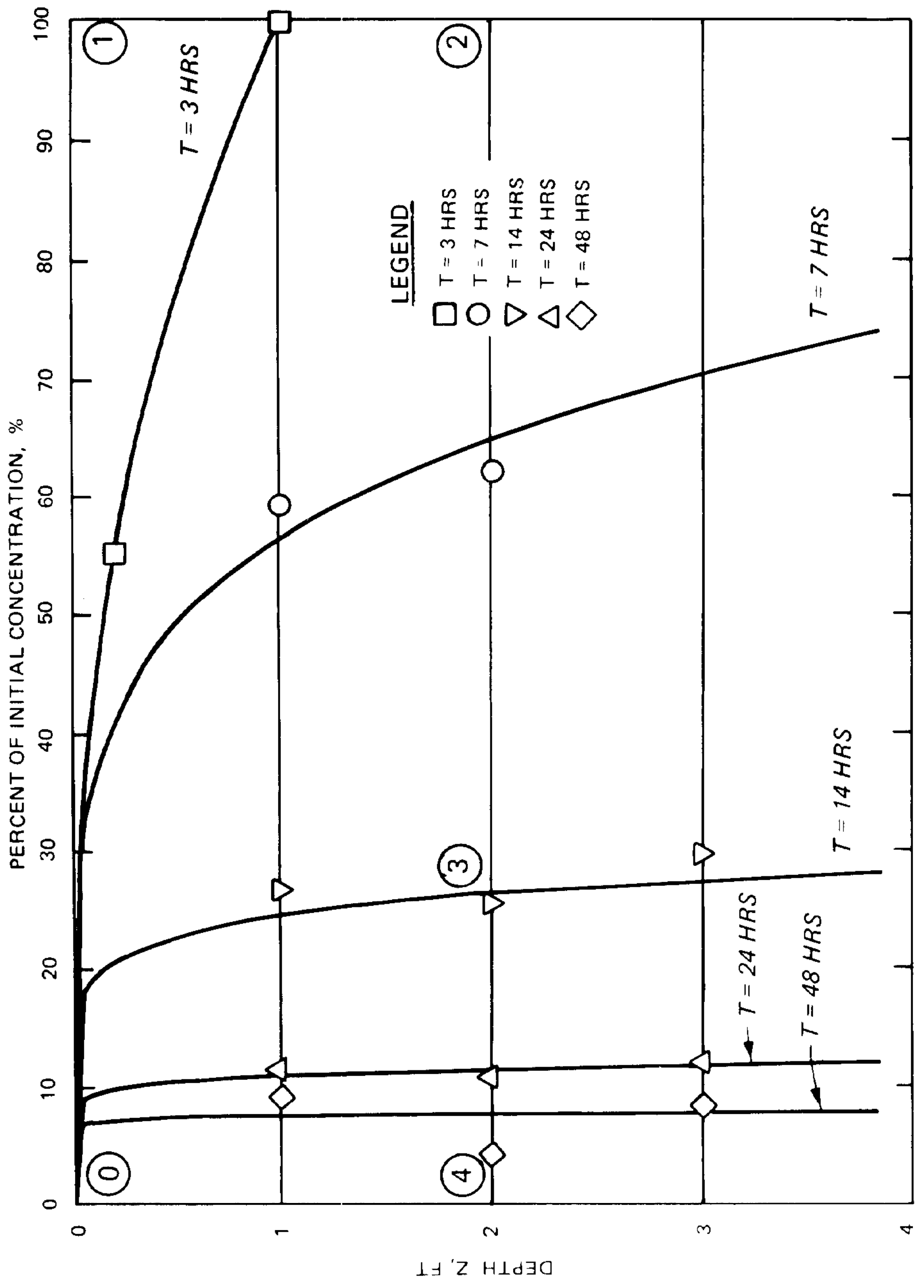

Figure C-5. Suspended solids concentration profile diagram where operating time per day = 12 hours. Thus,

$$\frac{556 \text{ hours}}{12 \text{ hours/day}} = 46 \text{ days}$$

(4) Average time for dredged material consolidation:

$$\frac{46 \text{ days}}{2} = 23 \text{ days}$$

(5) Design concentration is the solids concentration of settled solids shown in Figure C-4 at 23 days:

C_d = 340 grams per litre or 21.1 pounds per cubic feet

d. Volume Required for Dredged Material. This volume is estimated as follows:

(1) Compute the average void ratio using Equation 4-2:

$$e_o = \frac{G_s \gamma_w}{\gamma_d} - 1$$

G_s = 2.71

γ_w = 1,000 grams per litre

γ_d = 340 grams per litre = design concentration C_d (See Figure C-4)

$$e_o = \frac{2.71(1,000)}{340} - 1$$

e_o = 6.97

(2) Compute the volume of fine-grained channel sediments after disposal in containment area using Equation 4-3:

$$V_f = V_i \left(\frac{e_o - e_i}{1 + e_i} + 1 \right)$$

where, using Equation 4-1, $e_i = \frac{wG_s}{S_D}$

$$e_i = \frac{\left(\frac{92.3}{100}\right)(2.71)}{1.00}$$

$$e_i = 2.5$$

$$V_i = 425{,}000 \text{ cubic yards}$$

$$V_f = \left(\frac{6.97 - 2.50}{1 + 2.50}\right) + 1\ (425{,}000)$$

$$= 967{,}785 \text{ cubic yards}$$

(3) Estimate the volume required by dredged material in containment area using Equation 4-4:

$$V = V_f + V_{sd}$$

$$V_{sd} = 75{,}000 \text{ cubic yards}$$

$$V = 967{,}785 + 75{,}000$$

$$= 1{,}042{,}785 \text{ cubic yards}$$

e. Maximum Possible Thickness of Dredged Material at End of Disposal Operation.

(1) Because of foundation problems, dike heights are limited to 15 feet. Therefore, the disposal area must be increased to accommodate the storage requirements. Use Equation 4-4b to determine the allowable dredged material height:

$$H_{dm_{(max)}} = H_{dk_{(max)}} - H_{pd} - H_{fb}$$

$$H_{dk_{(max)}} = 15 \text{ feet}$$

$$H_{pd} = 2 \text{ feet}$$

$$H_{fb} = 2 \text{ feet}$$

$$H_{dm_{(max)}} = 15 - 2 - 2$$

$$H_{dm_{(max)}} = 11 \text{ feet}$$

(2) Compute the minimum possible surface area using Equation 4-4c:

$$A_{ds} = \frac{V}{H_{d_{(max)}}}$$

$$A_{ds} = \frac{1{,}042{,}785\ yd^3 \times \frac{27\ ft^3}{yd^3}}{11\ ft}$$

$$A_{ds} = 2{,}559{,}563\ ft^2$$

$$A_{ds} = 59\ acres$$

Since this value is less than the 80-acre tract available, the dredged material can be physically stored.

f. Minimum Area Required for Zone Sedimentation. This value is computed as follows:

(1) From data in Table C-5, V_s = 0.24 feet per hour.

(2) Compute the area requirement using Equation 4-5:

$$A_z = \frac{Q_i\ (3600)}{V_s}$$

$$Q_i = A_p V_d$$

$$V_p = 15\ ft/sec$$

$$Q_i = \frac{\left(\frac{24\ in.}{12}\right)^2 \pi}{4} \times 15\ ft/sec$$

$$= 47.12\ ft^3/sec$$

$$A_z = \frac{47.12\ (3600)}{0.24}$$

$$= 706{,}800\ ft^2$$

$$A_z = \frac{706{,}800}{43{,}560} = 16.22\ acres$$

(3) Increase the area by a factor of 1.87 (from Equation 4-14) to account for hydraulic inefficiencies (assuming the containment area can be constructed with a length-to-width ratio of approximately 3):

$$A_{dz} = 1.87(16.22 \text{ acres})$$

$$A_{dz} = 30.3 \text{ acres}$$

Thus, the minimum area required for effective zone settling is 30.3 or approximately 30 acres. This is less than the 80 acres available at the site.

g. Retention Time for Suspended Solids Removal.

(1) A relationship of suspended solids remaining versus retention time was developed using the laboratory data in Figure C-5. Ratios of suspended solids removed as a function of time were determined graphically using the step-by-step procedure described in Chapter 4. The lower horizontal boundary for the determined areas corresponded to the minimum average ponding depth of 2 feet. An example calculation for removal ratio for the concentration profile at T = 14 hours and ponding depth of 2 feet using Equation 4-9 is as follows:

$$R_{14} = \frac{\text{Area right of the profile}}{\text{Area total}} = \frac{\text{Area } 1,230}{\text{Area } 1,240} = 0.78$$

The areas were determined by planimeter. The portion remaining at T = 14 hours is found using Equation 4-10 as follows:

$$P_{14} = 1 - R_{14} = 1 - 0.78 = 0.22$$

The concentration of suspended solids remaining is found using Equation 4-11 as follows:

$$C_{14} = P_{14}\, C_o = 0.22 \text{ (169 milligrams per litre)} = 37 \text{ milligrams per litre}$$

Values at other times were determined in a similar manner. The data were arranged in Table C-8. A curve was fitted to the data for total suspended solids versus retention time and is shown in Figure C-6.

Table C-8

Percentage of Initial Concentration and Suspended Solids Concentrations versus Time, Ponding Depth of 2 Feet

Sample Extraction Time, t (hr)	Removal Percentage R_t	Remaining Percentage P_t	Suspended Solids (mg/ℓ)
3	14	86	145
7	47	53	90
14	78	22	37
24	90	10	17
48	94	6	10

(2) Since the final site configuration is not known beforehand, an appropriate value should be selected from Table 4-1 for the resuspension factor. The minimum ponding depth of 2 feet required by the site design is used. A resuspension factor of 1.5 was selected corresponding to an available area <100 acres and ponding depth of 2 feet.

(3) The value of effluent suspended solids of 75 milligrams per litre must be met at the point of discharge and considers anticipated resuspension. The corresponding value for total suspended solids concentration under quiescent settling conditions is determined using Equation 4-12 as follows:

$$C_{col} = \frac{C_{eff}}{RF} = \frac{75 \text{ mg}/\ell}{1.5} = 50 \text{ mg}/\ell$$

(4) The required configuration of the disposal area must correspond to a retention time that will allow the necessary sedimentation. Using Figure C-6, 50 milligrams per litre corresponds to a field mean retention time of 10 hours. To determine the required disposal site geometry, the theoretical retention time should be used. The hydraulic efficiency correction factor was calculated from Equation 4-14 to be 1.87 for an L/W of 3. The theoretical retention time was calculated using Equation 4-8 as follows:

$$T = T_d \text{ (HECF)} = 10 \text{ (1.87)} = 18.7 \text{ hours}$$

(5) The disposal area configuration can now be determined using data on the anticipated flow rate and the theoretical retention time. Since the dredging equipment available in the project area is capable of flow rates up to 47 cubic feet per second, the high value should be assumed. The ponded area required is calculated using Equation 4-13 as follows:

$$A_{df} = \frac{T\,Q_i}{H_{pd}\,(12.1)}$$

$$= \frac{18.7\,(47)}{2\,(12.1)}$$

$$= 36 \text{ acres}$$

The disposal site should therefore encompass approximately 36 acres of ponded surface area if the dredge selected for the project has an effective flow rate not greater than 47 cubic feet per second. In this case, the surface area of 36 acres required to meet the water quality standard is greater than the minimum surface area of 30 acres required for effective zone settling. However, the area required for storage, 59 acres, is the controlling surface area. The design surface area A_d is therefore 59 acres.

h. Determination of Disposal Area Geometry. From previous calculation, the minimum design area is 59 acres as required for initial storage. This corresponds to the following values as previously calculated:

$$H_{dm} = 11 \text{ feet}$$

H_{pd} = 2 feet

H_{fb} = 2 feet

A_d = 59 acres

i. Design for Weir.

(1) The design parameters are:

Q_i = 47 cubic feet per second

H_{pd} = 2 feet

(2) Using Figure 4-7, approximately 55 feet of effective weir length is required.

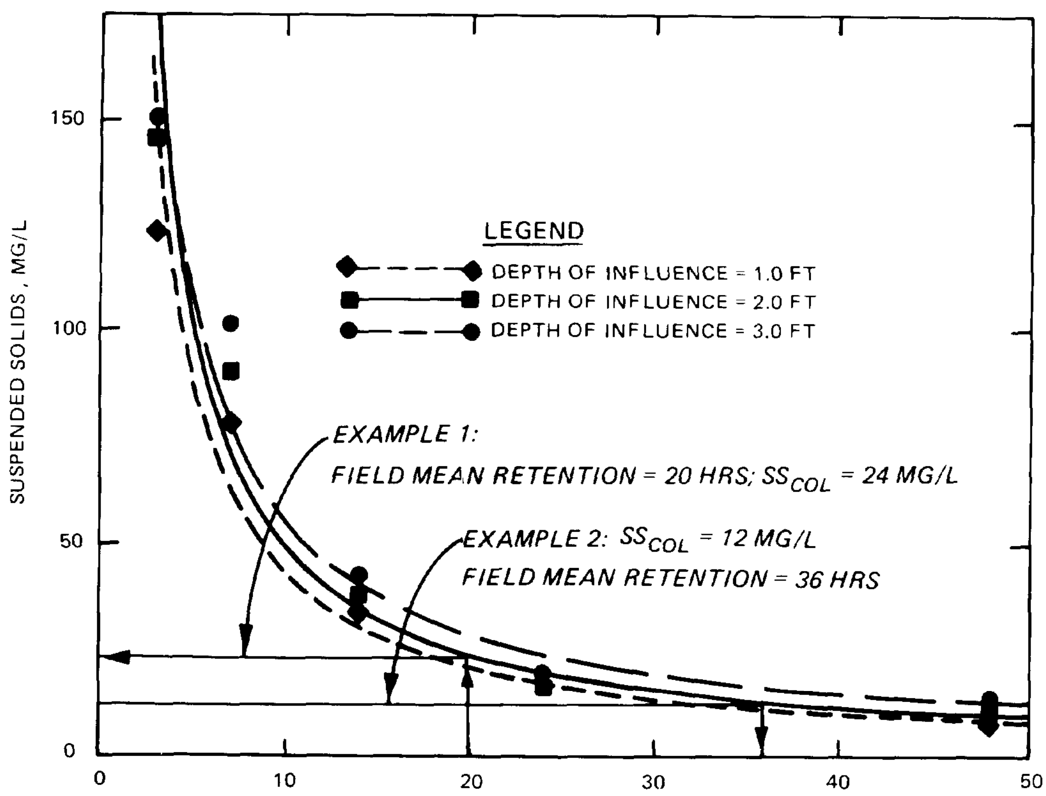

Figure C-6. Plot of supernatant suspended solids concentration versus time from column settling tests