JACKSON

REPORT

TO THE

NEW ENGLAND DIVISION
CORPS OF ENGINEERS

ON

RIPPOWAM RIVER FLOOD CONTROL
PLANS 1 AND 2

HH&B Hayden, Harding & Buchanan, Inc.
Consulting Engineers

MAY 1978

C A L C U L A T I O N S

RIPPOWAM RIVER FLOOD CONTROL

PLANS 1 AND 2

JOB NO. 78143
DATE 5/12/78
BY
CHK'D BY

HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

SHEET NO. 1/1
JOB
SUBJECT
CLIENT

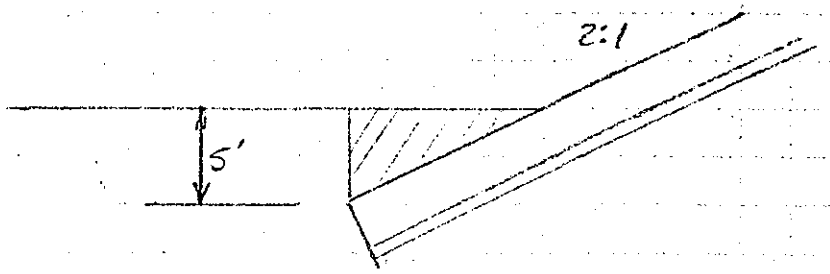
SUMMARY SHEET
EXCAVATION

TOTAL EXCAVATION (CY)

PRIORITY	CHANNEL EX	RIPRAP EX	RIPRAP TOE EX	CHANNEL UNDER BRIDGE EX	TOTAL EX (CY)
3	68439	47111	6566	3850	125966
5	26520	13089	1525	1180	42314
6	28721	16370	2585	3325	52001
8	35271	21960	3726	0	60957
			14,396		

281232 C

CHANNEL
EXTRA EXCAVATION FOR RIPRAP



CROSS-HATCHED AREA: $\frac{5' \times 10'}{2}\left(\frac{1}{27}\right)(L) = .93\ CY/LF/SIDE$

BROAD STREET TO NORTH STREET

$L = 820'$, $U = 820(.93) = 763\ CY \times 2 = \underline{1525\ CY}$

NORTH STREET TO WOODSIDE WALKWAY

$L = 1390'$; $U = 1390(.93)(2) =$ $\underline{2585\ CY}$

WOODSIDE WALKWAY TO BRIDGE STREET

$L = 2000'$; $U = 2000(.93)(2) =$ $\underline{3720\ CY}$

BRIDGE STREET TO CLUB SPRING PARK

$L = 3530$, $U = 3530(.93)(2)$ $\underline{6566\ CY}$

JOB NO. 7843.1
DATE 5/11/78
BY AHP
CHKD BY

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SHEET NO. 1/2
JOB
SUBJECT
CLIENT

CHANNEL BOTTOM EX. FOR RIPRAP

Assume riprap extends 50' upstream and downstream from each bridge

COLD SPRING ROAD BRIDGE
NORTH STREET BRIDGE

L = 50 + 50 + 54 = 154'
W = 75'
D = 42" + 12" gravel = 54" = 4.5'

VOLUME = $154 \times 75 \times \frac{4.5}{27}$ = 1925 CY EX.

INCLUDES 1500 CY OF RIPRAP
INCLUDES 425 CY OF GRAVEL

OTHER BRIDGES VARY ONLY SLIGHTLY FROM THESE WIDTHS EXCEPT FOR WOODSIDE WALKWAY.

WOODSIDE WALKWAY
L = 50 + 50 + 12 = 112'
W = 75'
D = 4.5'

VOLUME = $112 \times 75 \times \frac{4.5}{27}$ = 1400 CY

INCLUDES 1100 CY OF RIPRAP
INCLUDES 300 CY OF GRAVEL

JOB NO. 78143.1
DATE 5/11/78
BY ATP
CH'D BY

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BOSTON, MASSACHUSETTS

SHEET NO. 2/2
JOB
SUBJECT
CLIENT

21" THICK RIPRAP
UNDER BRIDGES

BROAD STREET

L = 50 + 50 + 54 = 154'
W = 75'
D = 21" + 12" gravel = 33" = 2.75'

VOLUME = 154 x 75 x 2.75 / 27 = 1180 CY

INCLUDES 750 CY OF RIPRAP
INCLUDES 430 CY OF GRAVEL

JOB NO. 73143-1
DATE 4/6/73
BY S.J. Chen
CHD BY RTP

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BOSTON, MASSACHUSETTS

SHEET NO. 1
JOB
SUBJECT
CLIENT

X-SEC. Location	Length Ft.	Area of Channel Excavation SF	Avg. Area of Channel Excavation SF	Total Excavation CY	Total Excavation Adj.	Priority
Broad St. (Bridge)		281				
	820		316	9,597	10458	5
X-SEC assumed MIDWAY		351				
	820		501.5	15231	16092	5
North St. (Bridge)		652				
	1390		549	28,263	29721	6
Woodside Walkway		446				
	1925		447.5	31,905	33925	8
X-SEC 75' D.S.		449				
	75		484.5	1,346	1346	8
Bridge St. (Bridge)		520				
	3476		523.5	67,396	67396	3
X-SEC 54' D.S.		527				
	54		521.5	1043	1043	3
Cold Spring Road (Bridge)		516				
	8560 LF		Total	154,781 CY		

ADJUST BY +5200 CY TO REFLECT FIELD SURVEY

154781
+ 5200

159981

CALL 160000 CY
TOTAL EXCAVATION

JOB NO. 78143.1
DATE 4/6/78
BY ATD
CH'D BY

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SHEET NO. 1A/
JOB
SUBJECT
CLIENT

FIELD ADJUSTMENTS

LOCATION	LENGTH L.F.	X-SEC. AREA S.F.	TOTAL EX (CY)
BROAD ST BRIDGE	540	281	5620
1100' S. of N. ST BRIDGE	1500	652	36222
990' S. of WOOD. WALK.	1390	446	22960
400' N. of WOOD. WALK	1525	449	25360
X SECTION 75' D.S. BROAD ST			

TOTAL 90162 CY

COMPARES FAVORABLY TO ORIGINAL SUBQUANTITY OF 84996 CY

Δ EX = + 5200 CY

JOB NO.
DATE
BY S.T. Chen
CHK'D BY AP

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SHEET NO.
JOB
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CLIENT

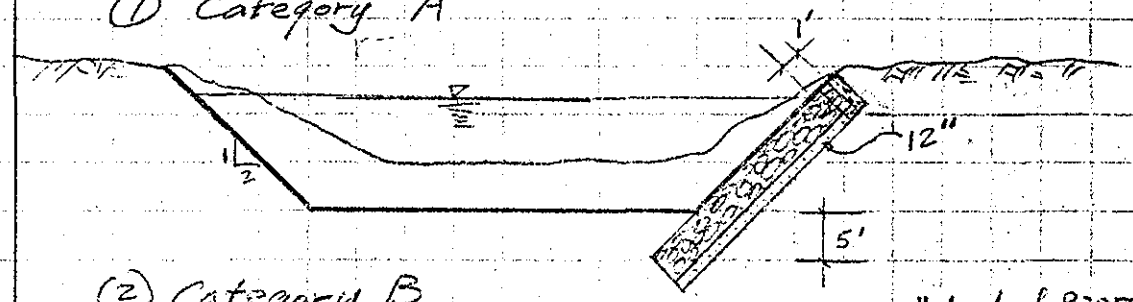
At Q = 7128 cfs

the Depth of Water = 10' ±

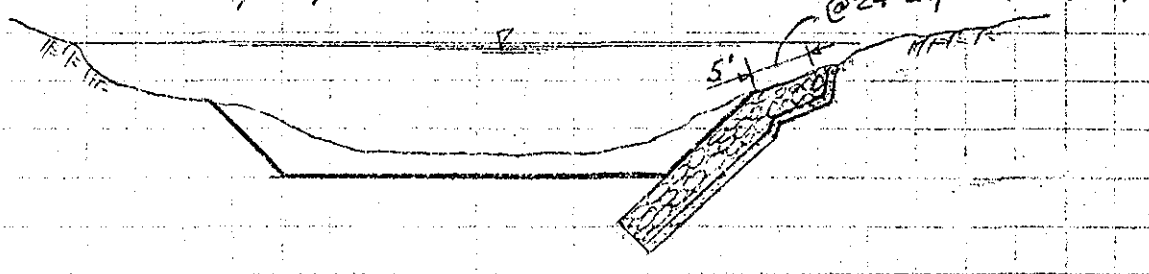
the velocity of flow will be reduced on the existing embankment

therefore, the riprap layer thickness may divide into two categories

① Category A



② Category B



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DATE
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SHEET NO.
JOB
SUBJECT
CLIENT

OK

From Woodside St. to Bridge St. (PRIORITY 8)

Left Side Channel (WEST SIDE)

Area of Excavation for Riprap (SF)	Length (Ft.) By Scale (200' Scale Map)	Average Area	Total Volume (CF)
29 x 3.5 = 101.5	1925	108.5	208863
33 x 3.5 = 115.5	75	126	9450
39 x 3.5 = 136.5			
5 x 2 = 10	600	10	600

Right Side Channel (EAST SIDE)

32 x 3.5 = 112	1925	113.75	218969
33 x 3.5 = 115.5	75	129.5	9713
41 x 3.5 = 143.5			

Total — 447595 CF = 16578 CY

Area of Excavation for Gravel (SF)

Left Side Channel

36 x 1 = 36	1925	35.5	68338
35 x 1 = 35	75	38	2,850
41 x 1 = 41			

Right Side Channel

39 x 1 = 39	1925	37	71,225
35 x 1 = 35	75	38.5	2,888
42 x 1 = 42			

Total 145301 CF = 5382 CY

JOB NO. _____
DATE _____
BY S.J. Chen
CH'D BY ATP

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SHEET NO. _____
JOB _____
SUBJECT _____
CLIENT _____

From Broad St. to North St. (PRIORITY 5)

Left Side Channel (WEST SIDE)

Area of Excav. For Riprap (SF)	Length (Ft). By Scale (200' Scale Map)	Average Area	Total Volume
25.5 x 1.75 = 45			
	820	50	41000
31 x 1.75 = 54			
	770	59	45430
36 x 1.75 = 63			
	30	99.0	2970
36 x 3.5 = 126			
	20	126.0	2520
36 x 3.5 = 126			
		Sub Total	91,920 CF → 3,400 CY

Right Side Channel (EAST SIDE)

21 x 1.75 = 37			
	820	45.0	36900
30 x 1.75 = 53			
	770	90.0	69315
36 x 3.5 = 126			
	30	126.0	3780
36 x 3.5 = 126			
	20	126.0	2,520
36 x 3.5 = 126			
		Sub Total	112,115 CF → 4,150 CY

NORTH ST TO BROAD STREET EXPERIENCES RESIDUAL FLOODING THEREFORE RIPRAP REQUIRED OVER TOP OF CHANNELS

$$\frac{21''}{12} \times 5' \times 1600 \times 2/27 = 1037 \text{ CY}$$

TOTAL 8587 CY

JOB NO.
DATE
BY S.J. Chen
H'D BY ATP

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SHEET NO.
JOB
SUBJECT
CLIENT

From Broad St. to North St. (PRIORITY 5)

OK

Left Side Channel

Area of Excav. for Gravel (SF)	Length (Ft.) (200' Scale Map)	Average Area	Total Volume
27.5 × 1 = 27.5			
	820	30.25	24,805
33 × 1 = 33			
	820	35.5	29,110
38 × 1 = 38			

Right Side Channel

23 × 1 = 23			
	820	27.5	22,550
32 × 1 = 32			
	820	35	28,700
38 × 1 = 38			
		Total	105,165 CF = 3,895 CY

Plus Riprap Ex.

5 × 1 × 1640 × 2/27 = 607

TOTAL 4502 CY

JOB NO.
DATE
BY S. J. Chen
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From North St. to Woodside St. (PRIORITY 6)

Left Side Channel (WEST)

Area of Excav. for Riprap (SF)	Length (Ft) By Scale (200' Scale Map)	Average Area	Total Volume
36×3.5=126 29×3.5=101.5	1390	113.75	158113
5×2=10	200	10	2000

Right Side Channel (EAST)

36×3.5=126 32×3.5=112	1390	119	165410
5×2=10	700	10	7000
		Total	332523 CF = 12316 CY

Area of Excav. for Gravel (SF)

Left Side Channel

38×1=38 36×1=36	1390	37	51430

Right Side Channel

38×1=38 39×1=39	1390	38.5	53515
		Total	104,945 CF = 3,887 CY

Rus 5' OVERLAP: 5×1×(700+1200)/27 = 167

TOTAL 16370 CY

JOB NO. _____
DATE _____
BY S.T. Chen
CH'D BY HFF

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CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

SHEET NO. _____
JOB _____
SUBJECT _____
CLIENT _____

From Bridge St. to Cold Spring Road (Page 3)

Left side channel

Area of Excavation for Riprap (SF)	Length (Ft) (By Scale 200' Scale Map)	Average Area	Total Volume
39 × 3.5 = 136.5	3476	122.5	425,810
31 × 3.5 = 108.5 35 × 3.5 = 122.5	54	115.5	6,237
5 × 2 = 10	3476	10	34760

Right side channel

41 × 3.5 = 143.5	3476	127.75	444,059
32 × 3.5 = 112 31 × 3.5 = 108.5	54	110.25	5,954
5 × 2 = 10	3476	10	34760

Total = 951562 = 35244 CY

Area of Excavation for Gravel (S.F.)

42 × 1 = 42	3476	40	139,040
38 × 1 = 38 37 × 1 = 37	54	37.5	2,025

Right side channel

43 × 1 = 43	3476	41	142516
39 × 1 = 39 37 × 1 = 37	54	38	2052

Total = 285,633 CF = 10,579 CY

Rock Excavation [illegible]
5 × 1 × 3476 × 2/27 [illegible]

[illegible]
11,576 [illegible]

JOB NO.
DATE
BY S.J. Chen
CHKD BY HTP

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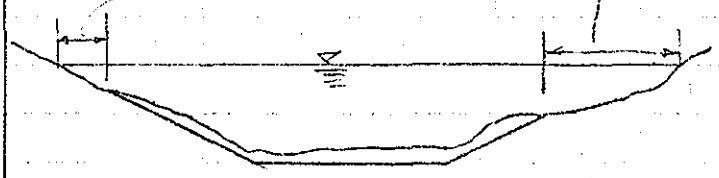
BOSTON, MASSACHUSETTS

SHEET NO.
JOB
SUBJECT
CLIENT

Flood residual Area



For Plan see 200' scale map.

section.

From Broad St. to Woodside Walkway

$16.9 \times 200^2 = 676{,}000$ SF
$= 15.52$ Acres

74 House within the flood residual area

2 House within the improved channel

From Woodside Walkway to Bridge St.

$0.39 \times 200^2 = 15600$ SF
$= 0.36$ Acres

From Bridge St to Cold Spring Road

$18.83 \times 200^2 = 753200$ SF
$= 17.3$ Acres

- 49 House within the flood residual area
- Plus 2 LARGE APT. COMPLEXES WITH AN ESTIMATED 125 UNITS
- 2 Houses within improved channel

Assume It will be no filed prob. for the diversion of the channel flow in order to provide a dry channel condition during the channel excavation period.

Therefore use Method A for the toe of riprap revetment protection.

① From Broad St to North Street
V = 9.57 ± fps

From Plate 29 — EM 1110-2-1601, Appendix III, 1-7-7

get Weight of Avg. size Stone (W_{50}) = 130 lb.

From Sheet ETL 1110-2-120, 14-5-1971
@ 50% lighter By weight of specific Weight = 165 lbs/cu Ft.

Use Thickness = 21 inch.

② From North Street to Old Spring Road
V = 13.54 fps

From Plate 29 - EM 1110-2-1601, Appendix III, 1-7-70
get Weight of Avg. Size Stone (W_{50}) = .800 ± lb.

From Sheet ETL 1110-2-120, 14-5-1971
@ 50% lighter By weight of specific Weight = 165 lbs/cu Ft

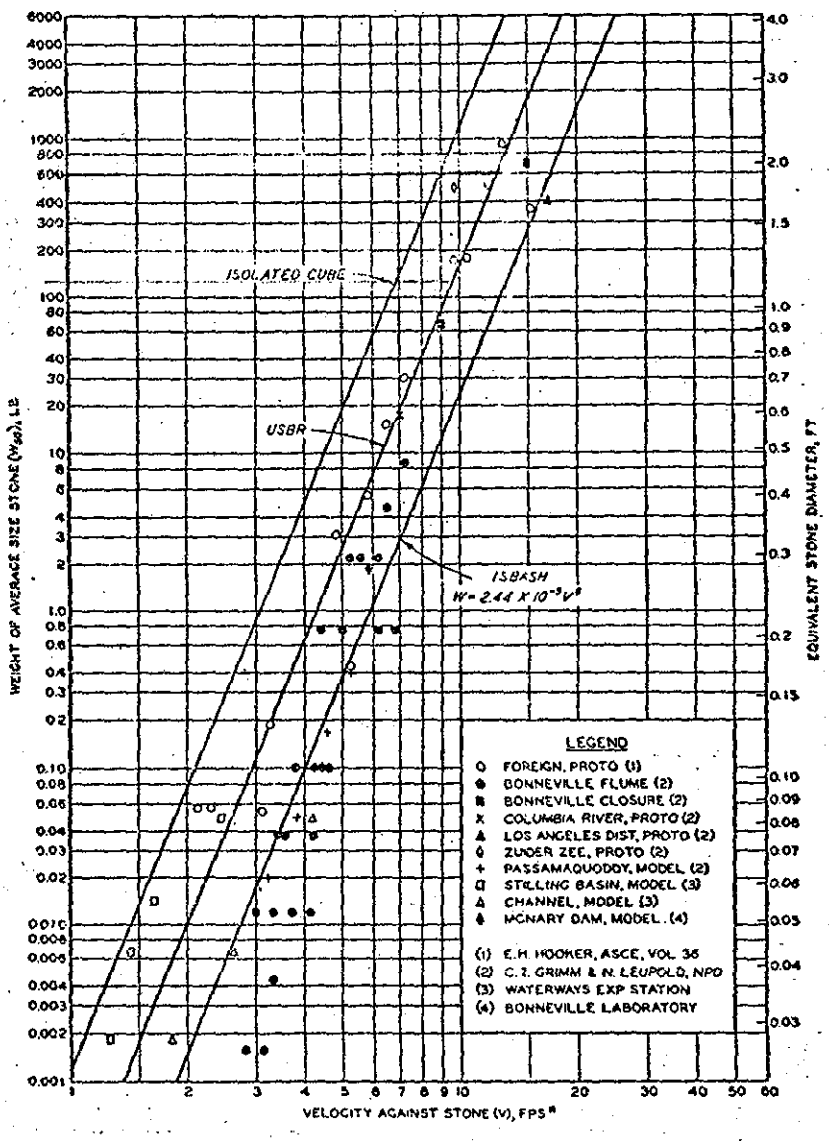
use Thickness = 42 inch

SPECIFIC WEIGHT = 165 LBS/CU FT T=1.0D(100)MAX;1.50D(50)MAX

% LIGHTER BY WEIGHT	LIMITS OF STONE WEIGHT IN POUNDS		LIMITS OF STONE WEIGHT IN POUNDS		LIMITS OF STONE WEIGHT IN POUNDS		LIMITS OF STONE WEIGHT IN POUNDS	
THICKNESS =	12 INCHES		15 INCHES		18 INCHES		21 INCHES	
100	86	35	169	67	292	117	463	185
50	26	17	50	34	86	58	137	93
15	13	5	25	11	43	18	69	29
THICKNESS =	24 INCHES		27 INCHES		30 INCHES		33 INCHES	
100	691	276	984	394	1350	540	1797	719
50	205	138	292	197	400	270	532	359
15	102	43	146	62	200	84	266	112
THICKNESS =	36 INCHES		42 INCHES		48 INCHES		54 INCHES	
100	2303	933	3704	1482	5529	2212	7873	3149
50	691	467	1098	741	1638	1106	2333	1575
15	346	146	549	232	819	346	1166	492

SPECIFIC WEIGHT = 170 LBS/CU FT T=1.0D(100)MAX;1.50D(50)MAX

% LIGHTER BY WEIGHT	LIMITS OF STONE WEIGHT IN POUNDS		LIMITS OF STONE WEIGHT IN POUNDS		LIMITS OF STONE WEIGHT IN POUNDS		LIMITS OF STONE WEIGHT IN POUNDS	
THICKNESS =	12 INCHES		15 INCHES		18 INCHES		21 INCHES	
100	89	36	174	70	300	120	477	191
50	26	18	52	35	89	60	141	95
15	13	6	26	11	45	19	71	30
THICKNESS =	24 INCHES		27 INCHES		30 INCHES		33 INCHES	
100	712	285	1014	406	1391	556	1851	740
50	211	142	300	203	412	278	548	370
15	105	45	150	63	206	87	274	116
THICKNESS =	36 INCHES		42 INCHES		48 INCHES		54 INCHES	
100	2403	961	3816	1527	5697	2279	8111	3244
50	712	481	1131	763	1688	1139	2403	1622
15	356	150	565	239	844	356	1202	507



NOTE: SPECIFIC WEIGHT OF ROCK = 165 LB/CU FT.
*FOR STONE PROTECTION BELOW ENERGY DISSIPATORS USE AS AVERAGE VELOCITY ACROSS END SILL.

VELOCITY VS STONE WEIGHT

SEE TEXT PAGE 36

Plate 29

JOB NO. 7843.1
DATE 4/19/05
BY ATP
CHK'D BY

HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

SHEET NO.
JOB
SUBJECT
CLIENT

LAND TAKING FOR CHANNEL

- AVERAGE 30' ALONG BOTH SIDES OF CHANNEL
- ASSUME 10' ADDITIONAL FOR RIGHT OF WAY

TOTAL WIDTH = 40' / CHANNEL SIDE
x 2 SIDES
= 80'

- CONDITION EXISTS FROM BROAD STREET BRIDGE TO COLD SPRING ROAD BRIDGE
= 8560

AREA = 80' x 8560 = (684800) SF
≈ 16 ACRES ⟸

TO BE APPORTIONED BY RELATIVE CHANNEL LENGTH

JOB NO. 78140.1
DATE
BY S.T. Chen
H'D BY HTP

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CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

SHEET NO.
JOB
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Per Corps of Engineers (Tom Pawlina's meeting with them 3/31/78)

① No protection on channel bottom.

② Use Natural Channel bottom — excavating to the proposed bottom channel elevation

③ It will be no scour occur in the improved channel.

Therefore, we are not going to estimate the quantity of riprap (any protecting material) for the new channel bottom.

Base On My Calculation:

$V = \frac{1.486}{0.02}\left(\frac{1985}{=23+75+23}\right)^{2/3}(.001)^{1/2} = 9.57$ fps (Broad St. to North Street)
(S=.001)

$V = 13.54$ fps (Bridge Street to Cold Spring Road)
(S=.002) (North Street to Woodside Walkway)

From Pg. 36 — "Hydraulic Design of Flood Control Channels" EM 1110-2-16
By Corps of Engineers

Suggest Maximum Permissible Mean Channel Velocity

Channel Material	
Fine gravel	6 fps
Poor Rock (usually sedimentary)	10 fps
Good Rock	20 fps

JOB NO. 78143-1
DATE 3/23/78
BY S J Chen
CHK'D BY

HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

SHEET NO.
JOB
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Watersurface – Improved Channel

Station (Profile)	Elev. in Feet Above MSL	MLW
Dam	16	19.65
36+00	17	19.65
38+00	17	19.65
40+00	17.2	20.85
42+00	17.3	20.86
44+00	17.5	21.15
46+00	17.7	21.35
48+00	19	22.65
50+00	19.2	22.85
52+00	19.3	22.95
54+00	19.5	23.15
56+00	19.5	23.15
58+00	19.7	23.35
60+00	19.8	23.45
62+00	20.0	23.63
64+00	20.4	24.05
66+00	20.7	24.35
68+00	21	24.65
70+00	21.2	24.85
72+00	21.5	25.15
74+00	21.9	25.55
76+00	22.5	26.15
78+00	23	26.65
80+00	23.5	27.15
82+00	23.8	27.45
84+00	24.2	27.85
86+00	24.5	28.15
88+00	25	28.65
90+00	25.2	28.85
92+00	25.5	29.15
94+00	25.8	29.45
96+00	26.2	29.85
98+00	26.4	30.05

JOB NO. 78143.1
DATE 3/23/78
BY S.J. Chen
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BOSTON, MASSACHUSETTS

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Station	Elev. in Feet Above MSL	MLW
100+00	30	33.65
102+00	30.2	33.85
104+00	30.4	34.05
106+00	30.6	34.25
108+00	30.8	34.45
110+00	31	34.65
112+00	31.3	34.95
114+00	31.5	35.15
116+00	31.7	35.35
118+00	31.9	35.55
120+00	32	35.65
122+00	32.3	35.95
124+00	32.5	36.15
126+00	32.7	36.35
128+00	33	36.65
130+00	33.5	37.15
132+00	33.8	37.45
134+00	34	37.65
135+60	34.7	38.35

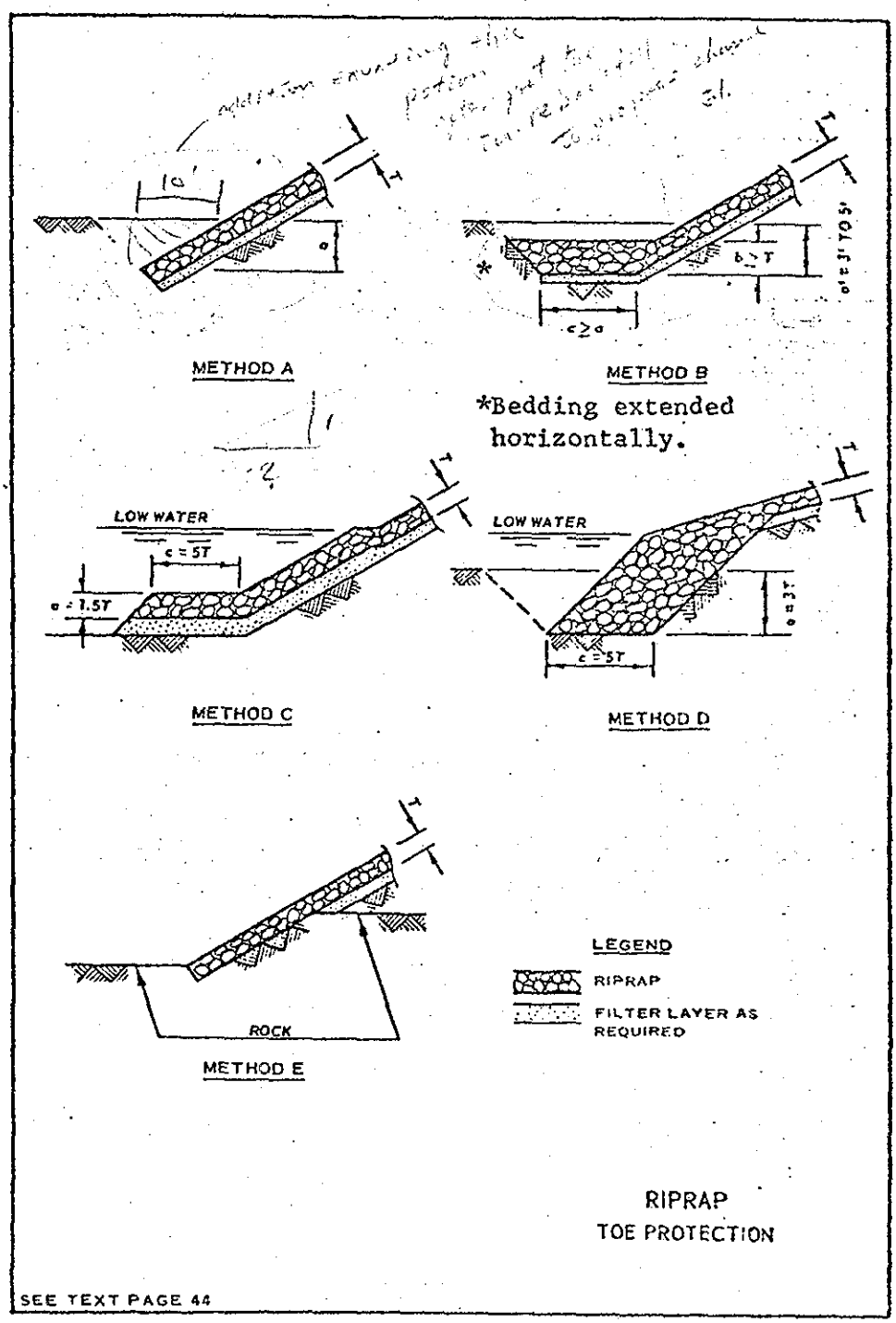

METHOD A
METHOD B
*Bedding extended horizontally.
LOW WATER
c = 5T
a = 1.5T
METHOD C
LOW WATER
c = 5T
METHOD D
ROCK
METHOD E
LEGEND
RIPRAP
FILTER LAYER AS REQUIRED
RIPRAP
TOE PROTECTION
SEE TEXT PAGE 44

Plate 37

by 50 percent when the riprap is placed underwater to provide for uncertainties associated with this type of placement.

(4) An increase in thickness of 6 to 12 in., accompanied by appropriate increase in stone sizes, should be provided where riprap revetment will be subject to attack by large floating debris or by waves from boat wakes, wind, and bed ripples or dunes.

j. Revetment Toe Protection. As the toe of riprap revetment is subjected to greater erosive forces than other areas of bank revetment, the layer thickness should be increased or the toe should be extended below the anticipated scour depth. The following criteria apply to the alternative methods of toe protection illustrated in plate 37.

(1) Method A. When toe excavation can be made in the dry, the normal riprap layer should be extended below the existing groundline a distance a equal to the anticipated depth of scour.

(2) Method B. When the low-flow or groundwater level is near the existing groundline so that toe excavation is in the wet, a horizontal rock toe should be provided to a depth a equal to 3 to 5 ft, a thickness b not less than the layer thickness T, and a base width c not less than a, except that when the anticipated erosion depth is more than 2 or 3 ft below the rock toe, b and/or c should be increased to provide sufficient stone for adjustment of the toe and protection of the revetment as degradation occurs.

(3) Method C. When the riprap is to be placed underwater and design velocities will not cause appreciable streambed erosion, the toe should be placed on the existing channel bottom with a and c equal to 1.5T and 5T, respectively.

(4) Method D. When the riprap is to be placed underwater and appreciable streambed erosion may occur, a thickened rock toe should be placed in a trench with a and c equal to 3T and 5T, respectively.

(5) Method E. When the bottom of the channel is in rock, the normal layer of riprap should be keyed into rock at streambed or berm level.

k. Revetment Top and End Protection. Normally, the upper extremity

of riprap revetment should be terminated at the top of the levee or on the slope at the freeboard level above the design water surface, as shown in end view in plate 38. Consideration should be given to the economy of terminating the top of the revetment below the levee top or design water surface plus freeboard when the design flood with moderate velocities will overtop the revetment only for a short time. The upstream and downstream ends of riprap revetment should be protected against erosion by increasing the revetment thickness or extending the revetment to areas of noneroding velocities. The following criteria apply to the alternative methods of end protection illustrated in plate 38.

(1) Method A. For riprap revetments 12 in. thick, the normal riprap layer should be extended to areas where velocities will not erode the natural channel banks.

(2) Method B. For riprap revetments exceeding 12 in. in thickness, one or more reductions in riprap thickness and stone size may be adopted for a distance a in which velocities decrease to a noneroding natural channel velocity.

(3) Method C. For all riprap revetments that do not terminate in noneroding natural channel velocities, the ends of the revetment should be enlarged, as shown in plate 38. The dimensions a and b should be 3 and 2 times the layer thickness, respectively.

(4) Method D. For riprap revetments exceeding 24 in. in thickness, consideration should be given to the economy of adopting method D instead of method C. The stub, with thickness T_3 equal to T_1, should be placed at the extremity of the revetment proper and the revetment extended a distance a with smaller stone size and thickness T_2 to a noneroding location. The depth b should equal 2.5 times T_1.

1. Riprap Placement. The common methods of riprap placement are hand placing; machine placing, such as from a skip, dragline, or some form of bucket; and dumping from trucks and spreading by bulldozer. Hand placement produces the best riprap revetment, but it is the most expensive method

LAUREL RESERVOIR

WATER	TAKING	DIFFERENCE
2.65 = 264 Acres	4.39 = 437 Acre	173
2.66 = 265 Acres	4.44 = 442	177 Acres

CALL 175 Acres

NOTE: NEED WALL ALONG SE CORNER ADJACENT TO PONE RD
≈ 1500' WALL

NORTH SPRINGS RESERVOIR

WATER	TAKING	DIFFERENCE
1.12 = 112 Acres	3.52 = 351 Acres	239
1.12 = 112 Acres	3.59 = 357 Acres	247

CALL 243 Acres

NOTE: RTE. 137 ALONG WEST SIDE OF RESERVOIR MAY HAVE TO BE CHANGED [illegible] AS A LOW ROAD. DO [illegible]

NOTE: ALSO [illegible] RTE 137 WILL HAVE TO BE [illegible]

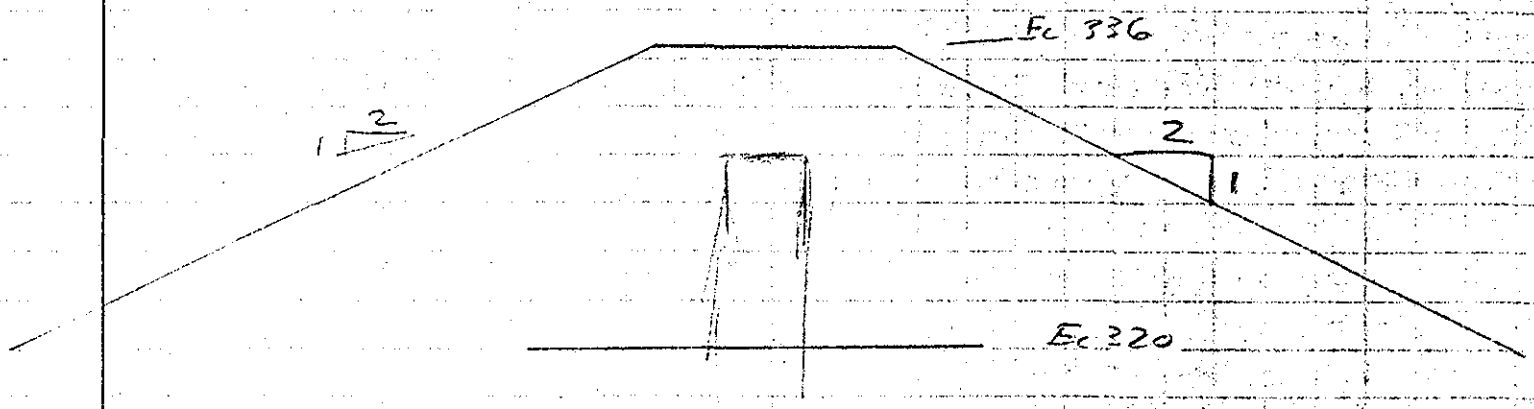
JOB NO. 78143.1
DATE
BY ATT
H'D BY

HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

SHEET NO. 2/3
JOB
SUBJECT
CLIENT

LAUREL RESERVOIR DIKE

RAISE TO EL. 336



AREA = $\frac{1}{2}(32+32+12+12)(16) = 704\,SF$

LENGTH = 1500'

VOLUME = 1.06 MCF = 39200 CY

COST: \$4/CY IN-PLACE & COMPACTED

39200 x 4 = \$156,800

CALL \$160,000

STRUCTURES AFFECTED IN
LAND TAKING

NORTH STAMFORD RESERVOIR: 13
ALSO, 1 CEMETARY
ALSO, SECTIONS OF LAKESIDE DRIVE
≈ 5000 FT

LAUREL RESERVOIR: 7
ALSO, 1100 FT OF LAUREL RD
1100 FT OF TRINITY RD
1000 FT OF PONDS RD (2 SECTIONS

JOB NO. 78-143
DATE MAY 3 1978
BY RHC
CH'D BY ATC

HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

SHEET NO. 1
JOB RIPPOWAM RIVER
SUBJECT NORTH STAMFORD RES
CLIENT CORPS of ENG.

ESTIMATE — NORTH STAMFORD RES

SECTION THRU CONC DAM:

ADDITIONAL CONC. = (62×14 + 11×13) 0.8 + 3×7 = 829.8 C.F/FT

.8 USED SINCE DAM VARIES IN HEIGHT

C.Y. = 829.8 × 390' × 1/27 = 11,986 C.Y.

CLOSURE SECTION = 120' × 320 × 1/27 = 1,422

13,408 C.Y.

REMOVAL OF EXIST EARTH EMBANKMENT.

= (14×50 + 28×53/2).8 = 1153.6 C.F./FT.

C.Y. = 1153.6 × 350 × 1/27 = 14,954 C.Y.

SECTION THRU SPILLWAY:

ADDITIONAL CONC. (10×25 + 10×15×1/2 + 16×5 + 10×4) = 445 C.F/FT.

280 + 8'

445 C.F × 288 × 1/27 = 4747 C.Y.

SECTION THRU EARTH EMBANKMENT:

ADDITIONAL CONC. 16' × 4' = 64 C.F./FT.

64 × 440' × 1/27 = 1043 C.Y.

ADDITIONAL EMBANKMENT.

(12×16 + 15×42 + 48×17) = 1638 C.F./FT.

1638 × 440 × 1/27 = 26,693 C.Y.

THINTER GATES.

4 - 12' High × 20' Wide gates.

3 12000 #/EACH @ $100/lb = $12,000 +50% for Equip. & Hoisting Supports = $18,000 EACH

JOB NO. 78-143
DATE MAY 3 1978
BY RHC
CH'D BY ATF

HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

SHEET NO. 2
JOB RIPPOWAM RIVER
SUBJECT NORTH STAMFORD RES
CLIENT CORPS of ENG.

ESTIMATE NORTH STAMFORD RES.

CONC. = 13,408 + 4747 + 1043 = 19,198 C.Y. x $100 = $1,919,800

EARTH REMOVAL = 14,954 C.Y. x $2.00 = 29,908

EARTH EMBANKMENT = 26,693 x 4.00 = 106,772

TAINTER GATES = 4 x $18,000 = 72,000

CONTROL OF WATER = 200,000

$ 2,328,480

JOB NO. 78-143
DATE MAY 3 1978
BY RHC
CH'D BY AFF

HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

SHEET NO. 3
JOB RIPPOWAM RIVER
SUBJECT LAUREL RD RES
CLIENT CORPS of ENG.

ESTIMATE LAUREL RD RES.

SECTION THRU CONC. DAM:

ADDITIONAL CONC.

$(9.5\times4 + 13\times14 + 22\times13 + 27\times16 + 8\times4) = 970$ C.F/FT

$970 \times 1600 \times 1/27$ = 57,481 C.Y.

CLOOSER SECTION. $320 \times (80+340) \times 1/27$ 4,978

REMOVAL OF EXIST EARTH EMBANKMENT. 62,459 C.Y.

$(34\times10\times\frac{1}{2} + 38\times24) = 1082$ C.F/FT

$1082 \times 1600 \times 1/27$ = 64,119 C.Y.

$\frac{23.49}{2}\times20$

16×20

320

SECTION THRU SPILLWAY

ADDITIONAL CONC.

$(13\times11 - 7\times5 + 12\times5 + 3\times5) = 183$ C.F/FT.

$183\times160\times\frac{1}{27}$ = 1084 C.Y.

TAINTER GATES.

3 TAINTER GATES 15' High x 20' Long.

@ 18000#/EACH @ \$1.00/# = \$18,000 + 50%
for Equip & Hoisting Supports etc = \$27,000 Ea.

JOB NO. 78-143
DATE MAY 3 1978
BY RHC
CH'D BY MT

HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

SHEET NO. 4
JOB Rippowam River
SUBJECT Laurel Rd Res
CLIENT Corps of Eng.

Estimate LAUREL RD RES.

CONC:	= 62,459 + 108 = 63,543 C.Y. × $100	= $6,354,300
EARTH REMOVAL	= 64,119 C.Y. × $2.00	= 128,238
TAINTER GATES.	3 × $27,000	= 81,000
CONTROL OF WATER.		= 100,000
		$ 6,663,538

JOB NO. 78-143
DATE MAY 4, 1978
BY RHC
CH'D BY MAP

HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

SHEET NO. 5
JOB Rippowam River
SUBJECT Bridge Costs
CLIENT Corps of Eng.

ESTIMATE

NORTH ST BRIDGE.

TWO SPANS of 60' EACH = 120'
WIDTH = 40' ROW'Y + 14' FOR SIDEWALKS & RAILS

AREA = 120' x 54' = 6480 □'

6480 x $45/□' = $291,600

REMOVAL OF EXIST STRUCTURE = 25,000

$316,600

WOODSIDE ST WALKWAY

TWO SPANS of 58' = 116'
WIDTH = 12'

AREA = 12 x 116 = 1392 □'

1392 x $25/□' = $34,800

REMOVAL OF EXIST STRUCTURE = 3,000

$37,800

COLD SPRING ROAD

TWO SPANS of 60' EACH = 120'
WIDTH = 54' (See above)

AREA = 54 x 120 = 6480 □'

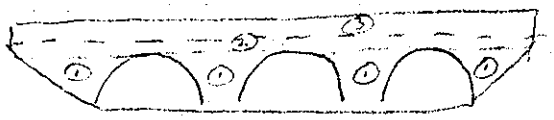
6480 x $45/□' = $291,600

REMOVAL OF EXIST STRUCTURE = 25,000

$316,600

Approx Quantity of Conc. Removal
North St Bridge

Structure ≈ 35' Wide
① ≈ 7' Wide x 10' High Avg
② ≈ 1' High x 85'
③ ≈ 4' high x 1.5' Wide.



① = 7'x10'x35x4 = 9800 C.F. = 363 C.Y.
② = 1x35x85 = 2975 C.F = 110 C.Y.
③ = 4'x1.5x85x2 = 1020 = 38
511 C.Y.

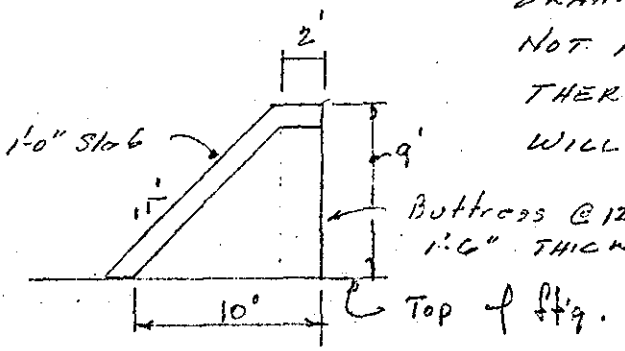
511 x 28 $/C.Y. = $14,308
511 x 50 $/C.Y = $25,550

Say $25,000

Use Same for Cold Spring Rd.

ESTIMATE OF DAM SECTION.

DRAWINGS FURNISHED BY CITY DO NOT AGREE WITH FIELD OBSERVATIONS. THEREFORE ESTIMATE OF DAM SECTION WILL BE USED.



CROSS SECTION

Buttress = $\frac{2+10}{2} \times 8 \times 1.5 =$ 72 C.F. ÷ 12.5 = 5.76

Slab = 1.0 × 13' = 13.00

18.76 C.F.

18.76 = 0.69 C.Y./L.F.

80' of dam must be removed to allow placing of Bascule Gate

80 × 0.69 = 55.2 C.Y.

Additional Conc. for bascule gate.

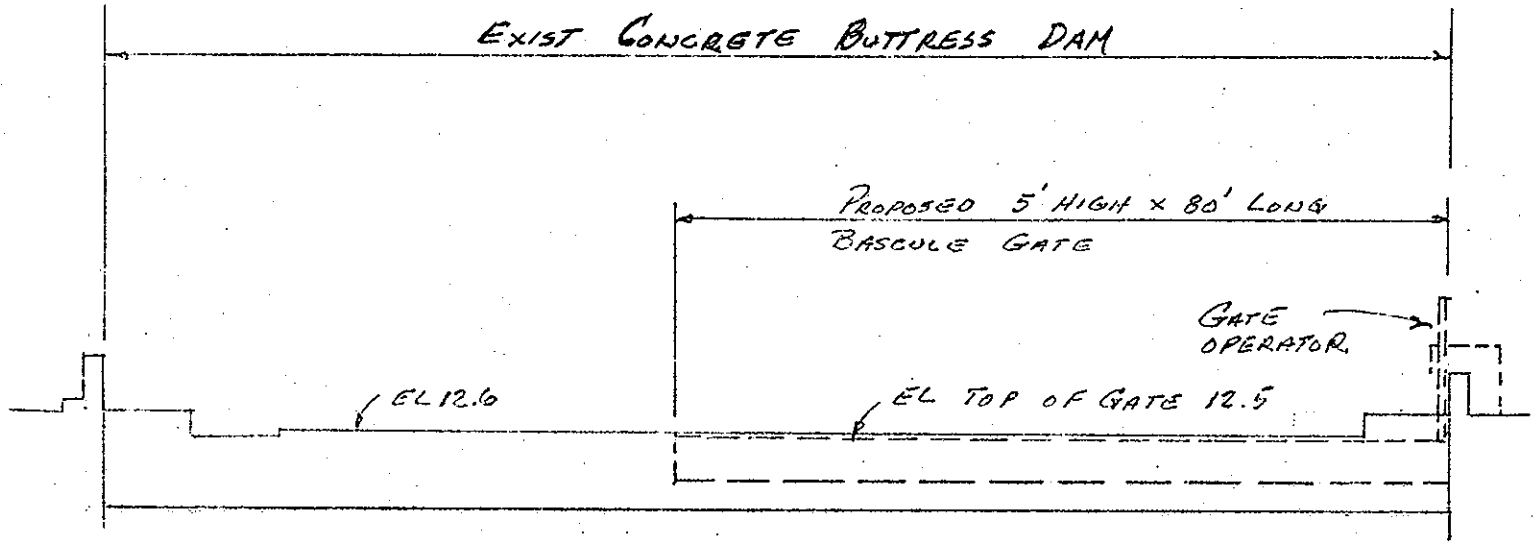
(3'×3' + 14'×3' + 4'×1.5 + 2'×1) = 59 C.F./FT

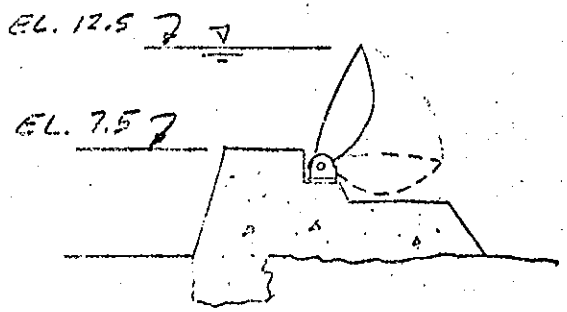
59 × 80 × 1/22 = 175 C.Y.

Removal of Concrete = 55 × $50 = $2,750 Say $5000

ESTIMATE

REMOVAL OF EXIST CONCRETE	$ 3,000
NEW CONC. 175 C.Y. × $100	17,500
BASCULE GATE	400,000
CONTROL OF WATER	30,000
	$ 450,500





ELEVATION MAIN STREET DAM

1" = 20'

SECTION AT GATE

1" = 10'

SECTION 4-4

MAIN STREET DAM

HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

JOB Lippowitch River
SUBJECT Main St Dam
CLIENT Corps of Eng.
SHEET NO.

JOB NO. 78-143
DATE May 16 1978
BY RHG
H'D BY

SUBJECT Castle Hill
COMPUTATION Spillway Piers Bulkheads & Wall
COMPUTED BY CHECKED BY DATE

Typical Gate:
Pier Raising Chicopee Falls DAW 42 - Jan 74 by NPD.

Elev 89.92 to 91.0 = 58.92 x 26' wide = 2118 sf
½" & 3/8" skin plate, A-36 & A441 & A-36
9 ea Total 40,000
Total wt 4[illegible] = 120# sf plus recits.

Estimated Contract 6,403,254 = $169.10/sf.

Hoists & Walkway machinery 1,835,000

8,238,254 = 204.70/sf.

Escalation May 78 by Corps Power house Building Equipment
2,28 (wt) / 1.50 = 1.52
1.52 x 204.70 = $311/sf

Boudreau Hurricane Barrier
3 - 40' x 26' gate
wt estimated at 328,000# 3000 sf = 109# /sf

109# @ $1.50 $164
Add 50% for hoists 82
$246/sf

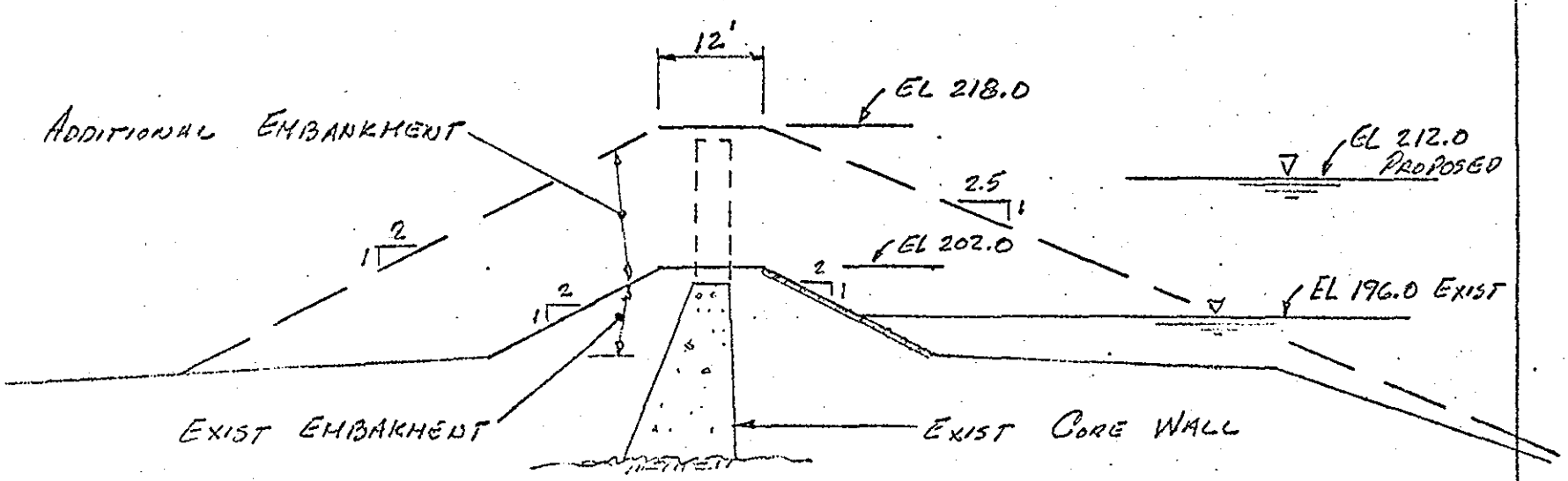
FNR Sept 18 78
Texas Dome 6 - 40' x 28' tainter gate
Low Bid 880,000 + 540,000 hoist = 1,420,000 = $284/sf
2nd low 970,000 + 530,000 = 1,600,000 = 266/sf

Bulkhead, Dam, outlet works 284 / 1.22 = $310/sf

Lincoln School in Derby estimate
3 gates [illegible] 900 sf [illegible] at 1,387,000
$154/sf.

Adjust 2.7 for Castle Hill

ST John Study (1978) $200/sf.
(Castle Hill)
Wareham Cost (1957) $233,000 / 2600 sf = $90/sf x 3.7 = $340/sf.



SECTION THRU EARTH EMBANKMENT

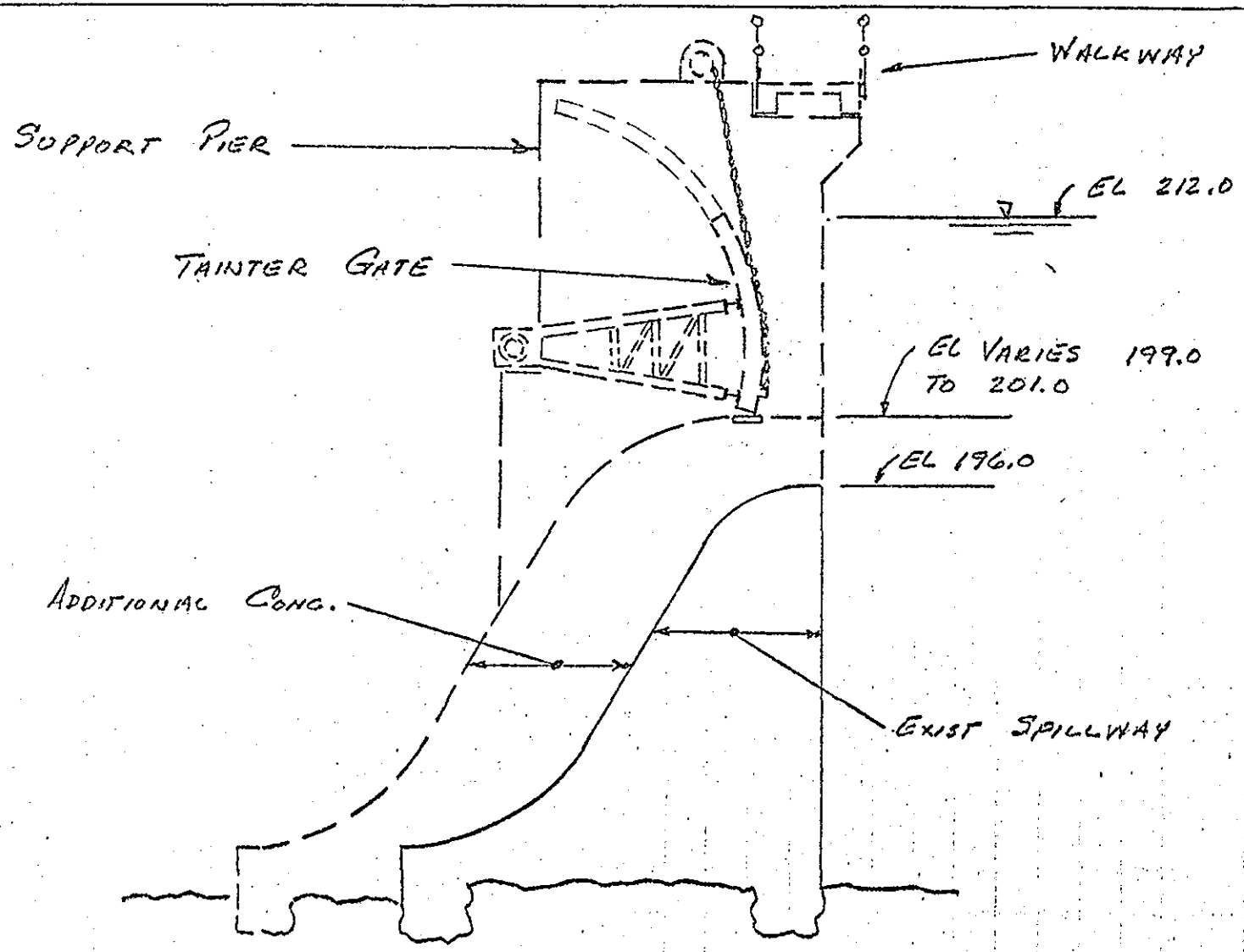
1" = 20'

NORTH STAMFORD RES.

HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

B NO. 78-143
TE APR 28 1978
BY RHC
D BY

JOB RIPRAP RIVER
SUBJECT NORTH STAMFORD
CLIENT CORPS of ENG.
SHEET NO.



SECTION AT TAINTER GATE

1" = 10'

IB NO. 78-143
DATE MAY 1, 1978
BY RHC
I'D BY

HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

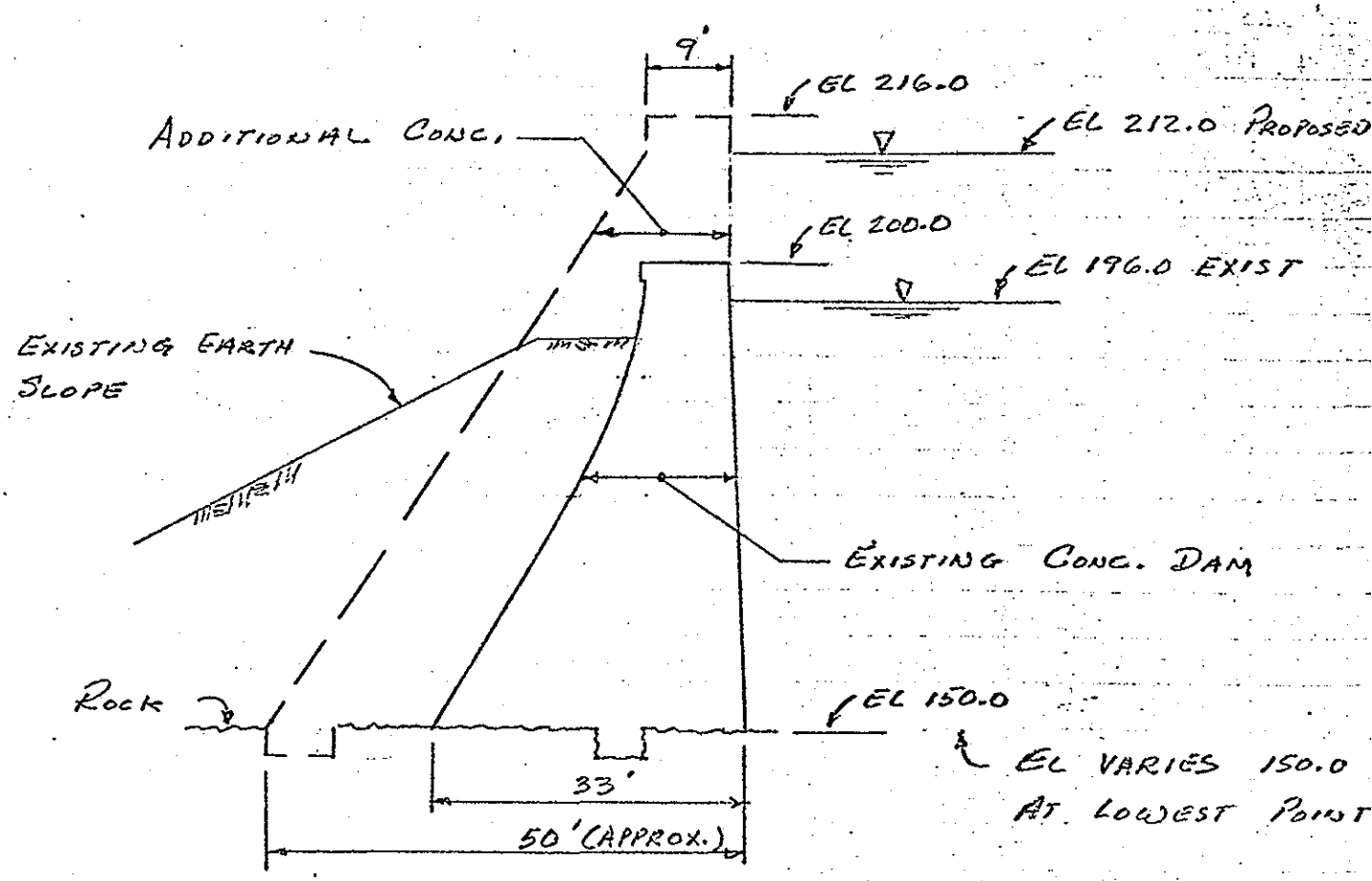
SHEET NO. 2
JOB KIBBEWHA RIVER
SUBJECT NORTH STAMFORD
CLIENT CORPS of ENG.

B NO. 78-143
TE APR 28 1978
BY RHC
D BY

HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

SHEET NO.
JOB LIPPOWICZ RIVER
SUBJECT NORTH STAMFORD R
CLIENT Corps of Eng.

NORTH STAMFORD RES.

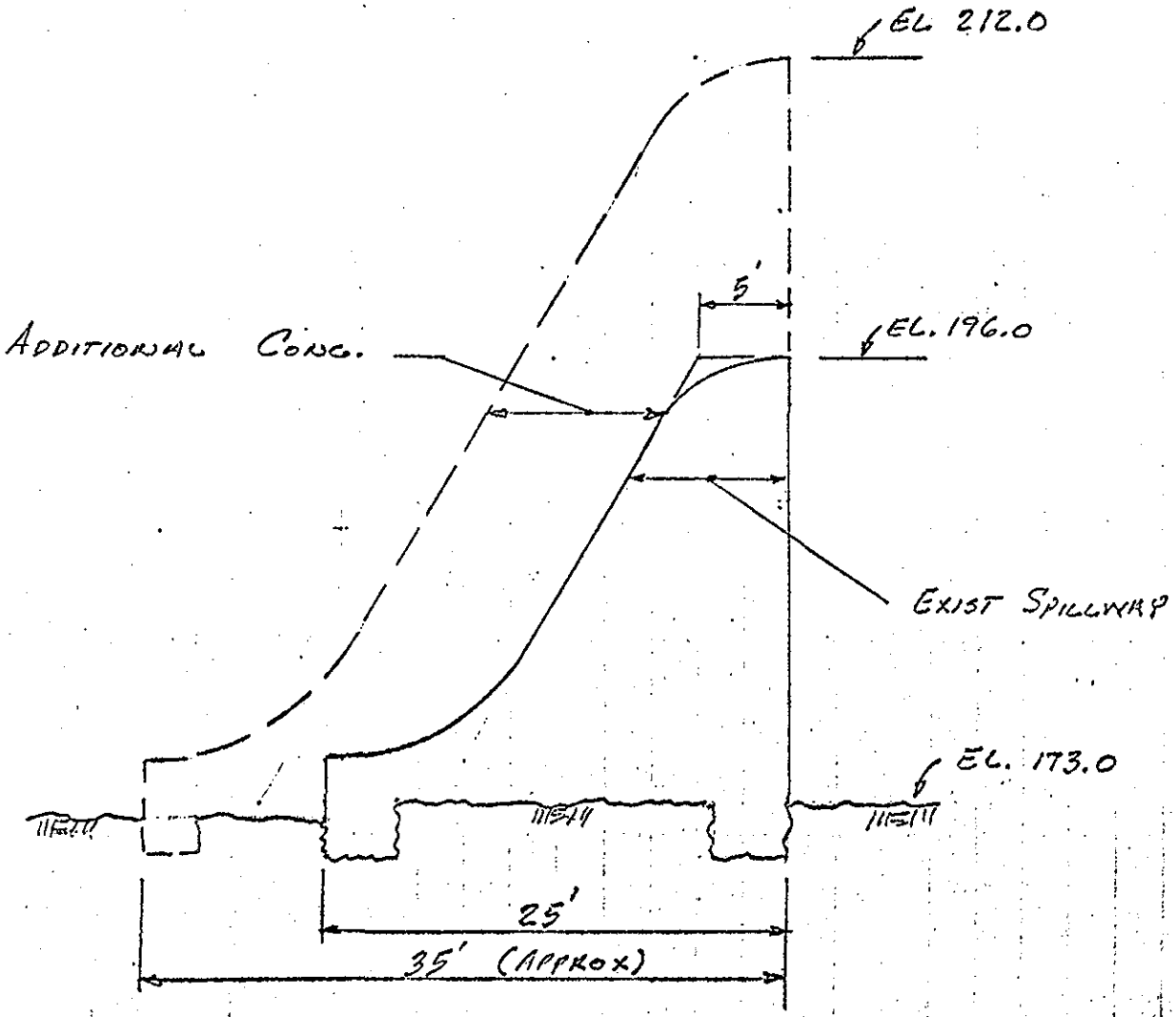


SECTION THRU CONCRETE DAM
1" = 20'

JOB NO. 78-143
DATE Apr. 28 1978
BY RHC
CHKD BY

HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

JOB Squannacook River
SUBJECT North Stafford
CLIENT Corps of Eng.
SHEET NO.



SECTION THRU SPILLWAY

1" = 10'

JOB NO. 78-143
DATE MAY 1 1978
BY RHC

HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

SHEET NO.
JOB Pipeowam River
SUBJECT Laurel Rd Res
CLIENT Corp. of Eng.

RES. DAM VARIES 10' to 57' Avg = 42'

MAX DAM HEIGHT - 57
AVG DAM HEIGHT - 42

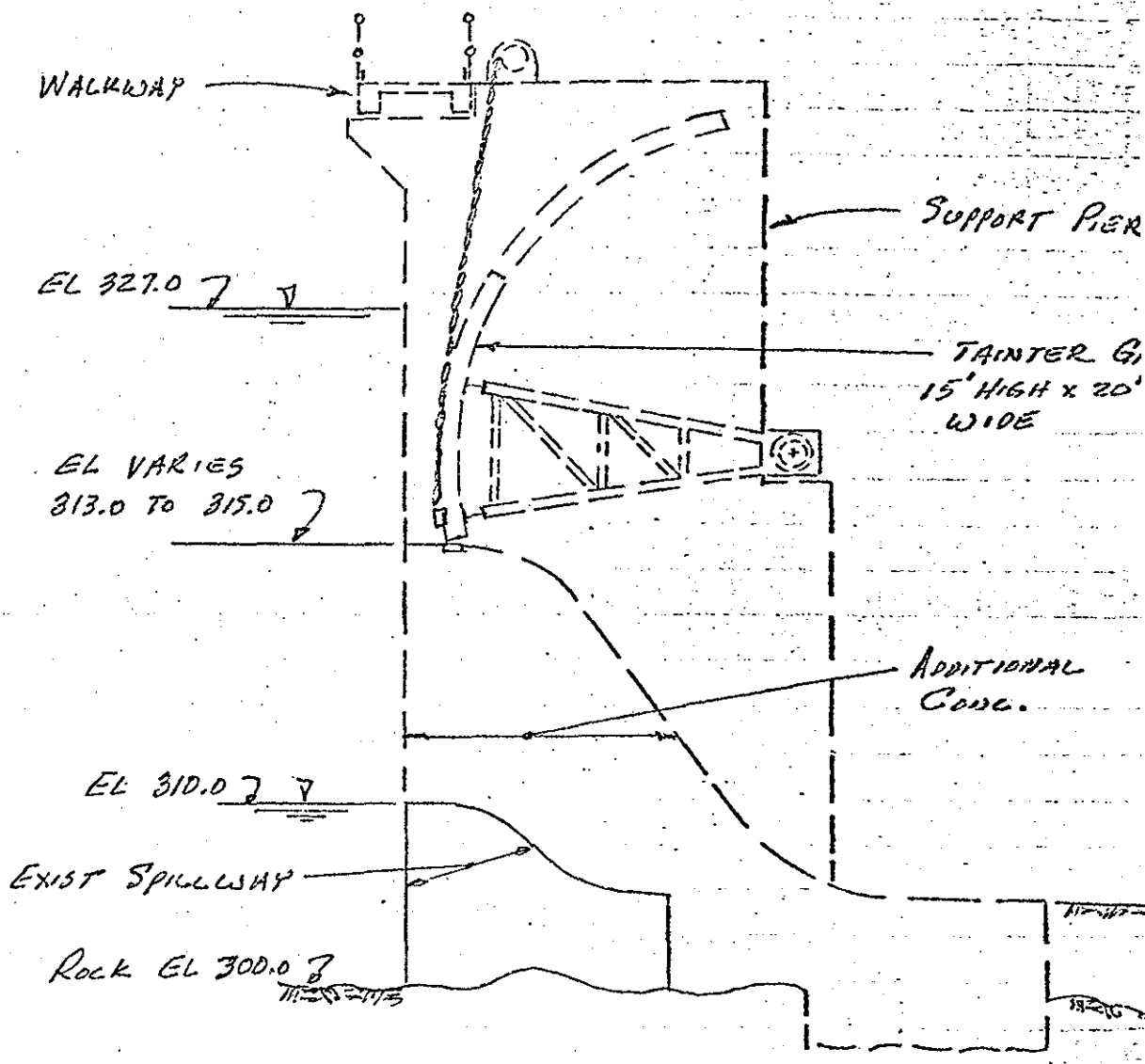
SECTION THRU DAM

1" = 20'

JOB NO. 78-143
DATE MAY 3 1978
BY RHC
CHKD BY

HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

SHEET NO.
JOB RIPPOWAM RIVER
SUBJECT LAUREL RD RES
CLIENT CORPS of ENG.



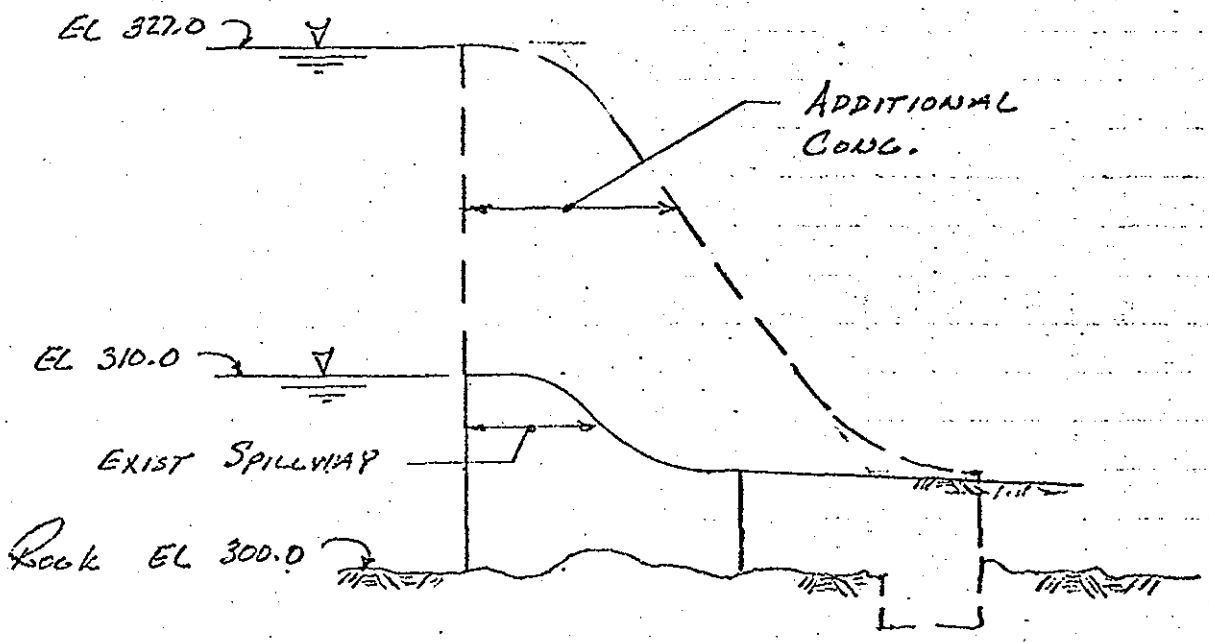
SECTION AT TAINTER GATE

1" = 10'

B NO. 78-143
DATE MAY 2 1978
BY DHC
D BY

HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

SHEET NO.
JOB RIPPOWAM RIVER
SUBJECT LAUREL RD RES
CLIENT CORPS of ENG.



SECTION THRU SPILLWAY
1" = 10'

ALLIS-CHALMERS

BOX 712 • YORK, PENNSYLVANIA 17405/717 792-3511

YORK PLANT
HYDRO-TURBINE DIVISION

HAYDEN, HARDING & BUCHANAN, INC.
MAY 10 2 14 PM '78
JOB NO. 78143
REF'D TO RC

May 10, 1978

Hayden, Harding & Buchanan
1340 Soldiers Field Road
Boston, Massachusetts 02135

ATTENTION: Mr. Ron Cheney

SUBJECT: Main Street Dam
Bascule Gate
A-C Inquiry No. 6-35062

Dear Mr. Cheney:

As requested in our telecon on May 4, 1978, the following is our present day preliminary price for one (1) 7' high by 80' long Bascule gate:

FOUR HUNDRED TEN
THOUSAND DOLLARS.....$410,000.00

The above price is FOB York and include all necessary hardware, including automatic level controls. Installation and concrete would be additional. Enclosed are copies of our Bulletin 54B2812-02, Installation List, and Technical Paper 54R2806-1.

If you would send us a sketch of the proposed site, we would be pleased to review and offer recommendations.

We trust this information will be helpful to you. Should you have any questions, please do not hesitate to contact us.

Very truly yours,

M. S. Barandy

M. S. Barandy
Sales Engineer

MSB/db
Enclosure

cc: Mr. D. M. Misner, C. R. Swaney Company, Inc., Hingham, Mass.