APPENDIX E

CIVIL DESIGN

(QUANTITY CALCULATION)

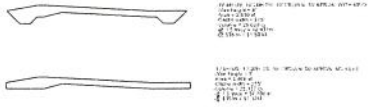
LOWER CACHE RIVER 1135

CIVIL DESIGN CALCULATIONS

R2200, R90, & FILTER MATERIAL

VOLUME CALCULATIONS FOR WEIR STRUCTURES

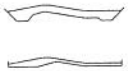
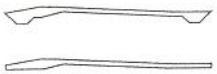
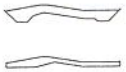
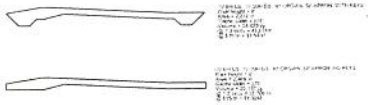
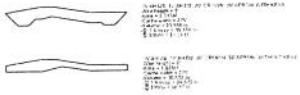
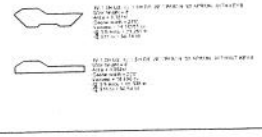
Q = 2,250 cfs (Weir ht = 7')

	SECTION 1 1V:6H US, 1V:20H DS, 20' CROWN, 50' APRON	SECTION 2 1V:6H US, 1V:20H DS, 10' CROWN, 50' APRON	SECTION 3 1V:6H US, 1V:6H DS, 20' CROWN, 50' APRON	SECTION 4 1V:6H US, 1V:6H DS, 10' CROWN, 50' APRON	SECTION 5 1V:1.5H US, 1V:1.5H DS, 20' CROWN, 50' APRON
t = 4'					
t = 6'					
t = 8'					

AREAS (sf)

			OPTION 1		OPTION 2		OPTION 3		OPTION 4		OPTION 5	
			w/key	w/o key	w/key	w/o key	w/key	w/o key	w/key	w/o key	w/key	w/o key
RIPRAP THICKNESS	4'	Area (sf)	1648	1351	1541	1194	1592	882	1485	782	981	574
	6'	Area (sf)	1990	1656	1854	1678	1762	1113	1636	984	1141	755
	8'	Area (sf)	2663	2301	2547	2223	2130	1424	1996	1314	1229	935

Q = 3,000 cfs (Weir ht = 8')

	SECTION 1 1V:6H US, 1V:20H DS, 20' CROWN, 50' APRON	SECTION 2 1V:6H US, 1V:20H DS, 10' CROWN, 50' APRON	SECTION 3 1V:6H US, 1V:6H DS, 20' CROWN, 50' APRON	SECTION 4 1V:6H US, 1V:6H DS, 10' CROWN, 50' APRON	SECTION 5 1V:1.5H US, 1V:1.5H DS, 20' CROWN, 50' APRON
t = 4'					
t = 6'					
t = 8'					

AREAS (sf)

			OPTION 1		OPTION 2		OPTION 3		OPTION 4		OPTION 5	
			w/key	w/o key	w/key	w/o key	w/key	w/o key	w/key	w/o key	w/key	w/o key
RIPRAP THICKNESS	4'	Area (sf)	1780	1479	1665	1321	1711	972	1595	858	1175	629
	6'	Area (sf)	2358	2032	2208	1860	1998	1300	1862	1161	1319	815
	8'	Area (sf)	2898	2585	2810	2966	2313	1628	2181	1528	1391	1002

LOWER CACHE WEIR OPTIONS - COST

Q=2,250 cfs

02 Sept 08

EMBEDDED RIPRAP THICKNESS			OPTION 1		OPTION 2		OPTION 3		OPTION 4		OPTION 5	
			w/key	w/o key	w/key	w/o key	w/key	w/o key	w/key	w/o key	w/key	w/o key
	4'	Volume (cy)	16,785	13,760	15,695	12,161	16,215	8,983	15,125	7,965	9,992	5,846
		Weight (tn)	25,178	20,640	23,543	18,242	24,322	13,475	22,688	11,947	14,988	8,769
		COST (MIL)	$0.88	$0.72	$0.82	$0.64	$0.85	$0.47	$0.79	$0.42	$0.52	$0.31
	6'	Volume (cy)	20,269	16,867	18,883	17,091	17,946	11,336	16,663	10,022	11,621	7,690
		Weight (tn)	30,403	25,300	28,325	25,636	26,919	17,004	24,994	15,033	17,432	11,535
		COST (MIL)	$1.06	$0.89	$0.99	$0.90	$0.94	$0.60	$0.87	$0.53	$0.61	$0.40
	8'	Volume (cy)	27,123	23,436	25,942	22,642	21,694	14,504	20,330	13,383	12,518	9,523
		Weight (tn)	40,685	35,154	38,913	33,963	32,542	21,756	30,494	20,075	18,776	14,285
		COST (MIL)	$1.42	$1.23	$1.36	$1.19	$1.14	$0.76	$1.07	$0.70	$0.66	$0.50

Parameters:

Design Q =	2,250	cfs
Width of Cache River =	275	ft
Height of Weir =	7	ft
Rock =	1.5	tn/cy
Cost of rock =	35	$/tn

OPTION 1: 20' Crown, 1V:6H US, 1V:20H DS, 50' DS Apron
OPTION 2: 10' Crown, 1V:6H US, 1V:20H DS, 50' DS Apron
OPTION 3: 20' Crown, 1V:6H US, 1V:6H DS, 50' DS Apron
OPTION 4: 10' Crown, 1V:6H US, 1V:6H DS, 50' DS Apron
OPTION 5: 20' Crown, 1V:1.5H US, 1V:1.5H DS, 50' DS Apron

See W:\Shared\CivilDesign\10_Projects\Lower Cache - CAP\Drawings\quantities.dgn for area calculation

VOLUME OF R2200

LOWER CACHE WEIR OPTIONS - COST

Q=3,000 cfs

02 Sept 08

EMBEDDED RIPRAP THICKNESS			OPTION 1		OPTION 2		OPTION 3		OPTION 4		OPTION 5	
			w/key	w/o key	w/key	w/o key	w/key	w/o key	w/key	w/o key	w/key	w/o key
	4'	Volume (cy)	18,130	15,064	16,958	13,455	17,427	9,900	16,245	8,739	11,968	6,406
		Weight (tn)	27,194	22,596	25,438	20,182	26,140	14,850	24,368	13,108	17,951	9,610
		COST (MIL)	$0.95	$0.79	$0.89	$0.71	$0.91	$0.52	$0.85	$0.46	$0.63	$0.34
	6'	Volume (cy)	24,017	20,696	22,489	18,944	20,350	13,241	18,965	11,825	13,434	8,301
		Weight (tn)	36,025	31,044	33,733	28,417	30,525	19,861	28,447	17,738	20,151	12,451
		COST (MIL)	$1.26	$1.09	$1.18	$0.99	$1.07	$0.70	$1.00	$0.62	$0.71	$0.44
	8'	Volume (cy)	29,517	26,329	28,620	30,209	23,558	16,581	22,214	15,563	14,168	10,206
		Weight (tn)	44,275	39,493	42,931	45,314	35,338	24,872	33,321	23,344	21,251	15,308
		COST (MIL)	$1.55	$1.38	$1.50	$1.59	$1.24	$0.87	$1.17	$0.82	$0.74	$0.54

Parameters:

Design Q =	3,000	cfs
Width of Cache River =	275	ft
Height of Weir =	8	ft
Rock =	1.5	tn/cy
Cost of rock =	35	$/tn

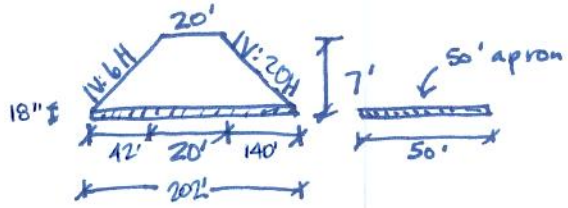
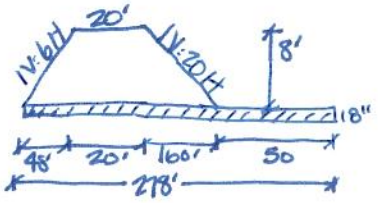
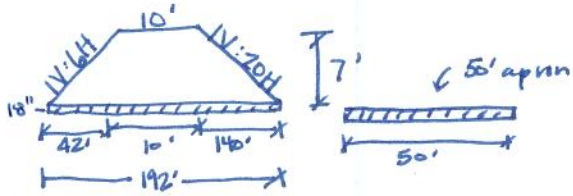
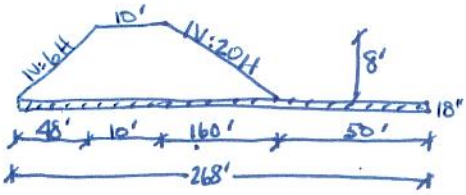
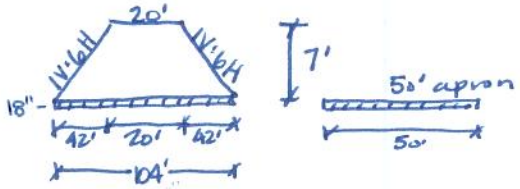
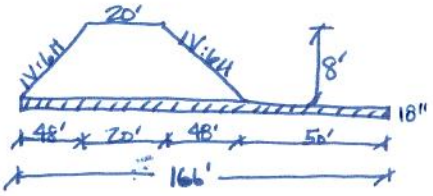
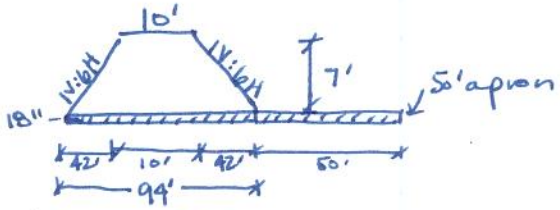
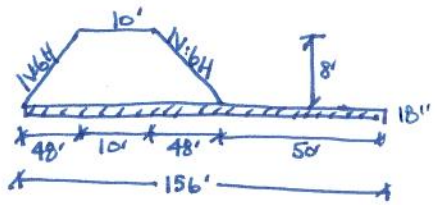
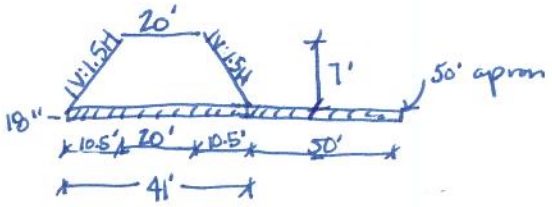
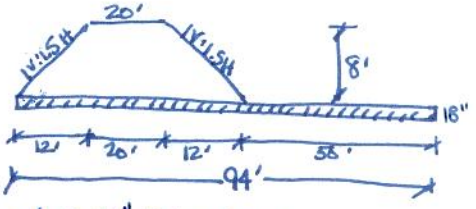
OPTION 1: 20' Crown, 1V:6H US, 1V:20H DS, 50' DS Apron
OPTION 2: 10' Crown, 1V:6H US, 1V:20H DS, 50' DS Apron
OPTION 3: 20' Crown, 1V:6H US, 1V:6H DS, 50' DS Apron
OPTION 4: 10' Crown, 1V:6H US, 1V:6H DS, 50' DS Apron
OPTION 5: 20' Crown, 1V:1.5H US, 1V:1.5H DS, 50' DS Apron

see W:\Shared\CivilDesign\10_Projects\Lower Cache - CAP\Drawings\quantities.dgn for area calcuation

VOLUME OF R2200

chosen alternative

SUBJECT: R_{90} quantities under weir ROUGH ESTIMATE	COMPUTED BY:	DATE:	FILE NO.
	CHECKED BY:	DATE:	SHEET NO.

	If Q = 2,250 cfs (h = 7')	If Q = 3,000 cfs (h = 8')
OPTION 1	 V = (202+50)(18"/12)(275)/27 = 3,850 cy	 V = (278)(18"/12)(275)/27 = 4,247 cy
OPTION 2	 V = (192+50)(18"/12)(275)/27 = 3,697 cy	 V = (268)(18"/12)(275)/27 = 4,094 cy
OPTION 3	 V = (104+50)(18"/12)(275)/27 = 2,353 cy	 V = (166)(18"/12)(275)/27 = 2,536 cy
OPTION 4	 V = (94+50)(18"/12)(275)/27 = 2,200 cy	 V = (156)(18"/12)(275)/27 = 2,383 cy
OPTION 5	 V = (41+50)(18"/12)(275)/27 = 1,390 cy	 V = (94)(18"/12)(275)/27 = 1,436 cy

∴ Width of Pacho River ≈ 775'

chosen alternative

SUBJECT: Filter Material Quantities under Weir Structures	COMPUTED BY: / CHECKED BY:	DATE: / DATE:	FILE NO. / SHEET NO.

∴ Place filter material at same locations as R_{90}

R_{90} = 18" thickness F.M. = 9" thickness

½ R_{90} quantity = FM quantity

	If Q = 2,250 cfs (h=7')	If Q = 3,000 cfs (ht=8')
OPTION 1	V = 1925 cy	V = 2,124 cy
OPTION 2	V = 1,849 cy	V = 2,047 cy
OPTION 3	V = 1,177 cy	V = 1,268 cy
OPTION 4	V = 1,100 cy	V = 1,192 cy
OPTION 5	V = 695 cy	V = 718 cy

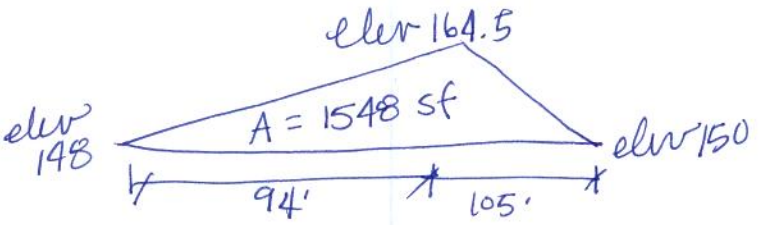
BANK PROTECTION CALCULATIONS

(VEGETATIVE DIKE, BANK PROTECTION RIPRAP, KEY EXCAVATION)

BANK PROTECTION COSTS

SUBJECT:	COMPUTED BY:	DATE:	FILE NO.
BANK PROTECTION QUANTITIES	Audrey Lewis	9/10/08	
	CHECKED BY:	DATE:	SHEET NO. 1/2

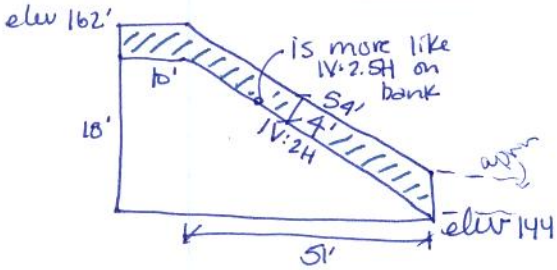
PLUG REMOVAL ELEVATIONS TAKEN FROM DTM of end of Meander 3



L = 115'
V = 6,594 CY

BANK WORK ht of weir → 8'

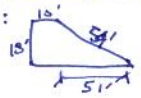
ROCK ALONG DS APRON (same for all options):



A = (54+10)(4) = 256 sf
L = 50'
V = 474 CY

OPTION 1 - 20' CROWN, 1:6 US, ~~1:6 DS~~, 1:20 DS, 50' APRON

Key excavation:



A = 180 + .5(51)(18) = 639 sf
L = 10'
V = 237 CY

Key rock = $[(16)(10)+(.5)(16)(51)10 + (54+10)(6)(10)]/27$ = 352 cy

6' thickness: A = 64(6) = 384 sf
L = 160 + 48 + 10 = 218'
V = 3100 CY rock

US & DS slopes + part of crown not in the key

OPTION 2 - 10' crown, 1:6 US, 1:20 DS, 5s APRON

Key excavation: A = 639 sf
L = 5'
V = 119 CY

Key rock = $[((16)(10)+(.5)(16)(51))(5) + (54+10)(6)(5)]/27$ = 176 cy

6' thickness: A = 384 sf
L = 48 + 160 + 5 = 213'
V = 3030 CY

key length = 1/2 length of crown

NOTE:

Rock along crown & slopes = 6' depth

Rock along apron = 4' depth

SUBJECT:	COMPUTED BY:	DATE:	FILE NO.
	CHECKED BY:	DATE:	SHEET NO. 2/2

* OPTION 3 - 20' crown, 1:6 DS, 1:6 US, 50' Apron

Key excavation: A = 639 sf, L = 10', V = 237 cy

Key rock: ~~V~~ = same as option 1 = 352 cy

6" thickness: A = 384 sf
L = 48 + 48 + 10 = 106'
V = 1508 cy

OPTION 4 - 10' crown, 1:6 US, 1:6 DS, 50' apron

Key excavation: V = (639)(5)/27 = 119 cy

Key rock: V = same as option 2 = 176 cy

6" thickness: A = 384 sf
L = 48 + 48 + 5 = 101'
V = 1436 cy

* OPTION 5 - 20' CROWN, 1V:1.5H US, 1V:1.5H DS, 50' APRON

Key excavation: V = 639(10)/27 = 237 cy

Key rock: V = same as options 1 & 3 = 352 cy

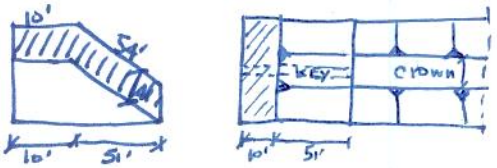
6" thickness: A = 384 sf
L = 12 + 12 + 10 = 34'
V = 484 cy

rock → 1.5 tn/cy ; $35/cy

∴ NOTE: All these quantities must be multiplied by 2 since it will be on both left and right side banks.

chosen alternative

SUBJECT: R_{90} along bank protection	COMPUTED BY:	DATE:	FILE NO.
	CHECKED BY:	DATE:	SHEET NO.

	If Q = 2,250 cfs (ht = 7')	If Q = 3,000 cfs (ht = 8')
OPTION 1	 $V = \frac{[(54+10)(18/12)(242) + (51+10)(18/12)(10)]}{27}$ (½ crown dist) = 894 cy (length of structure (–) ½ crown dist)	$V = \frac{(64)(18/12)(268) + (61)(18/12)(10)}{27}$ = 987 cy
OPTION 2	$V = \frac{(64)(18/12)(231) + (61)(18/12)(5)}{27}$ = 860 cy	$V = \frac{(64)(18/12)(263) + (61)(18/12)(5)}{27}$ = 952 cy
OPTION 3	$V = \frac{(64)(18/12)(144) + (61)(18/12)(10)}{27}$ = 546 cy	$V = \frac{(64)(18/12)(156) + (61)(18/12)(10)}{27}$ = 589 cy
OPTION 4	$V = \frac{(64)(18/12)(139) + (61)(18/12)(5)}{27}$ = 511 cy	$V = \frac{(64)(18/12)(151) + (61)(18/12)(5)}{27}$ = 554 cy
OPTION 5	$V = \frac{(64)(18/12)(81) + (61)(18/12)(10)}{27}$ = 322 cy	$V = \frac{(64)(18/12)(84) + (61)(18/12)(10)}{27}$ = 333 cy

chosen alternative

SUBJECT: Filter Material along Bank Protection	COMPUTED BY:	DATE:	FILE NO.
	CHECKED BY:	DATE:	SHEET NO.

∴ Place filter material at same locations as R_{90}

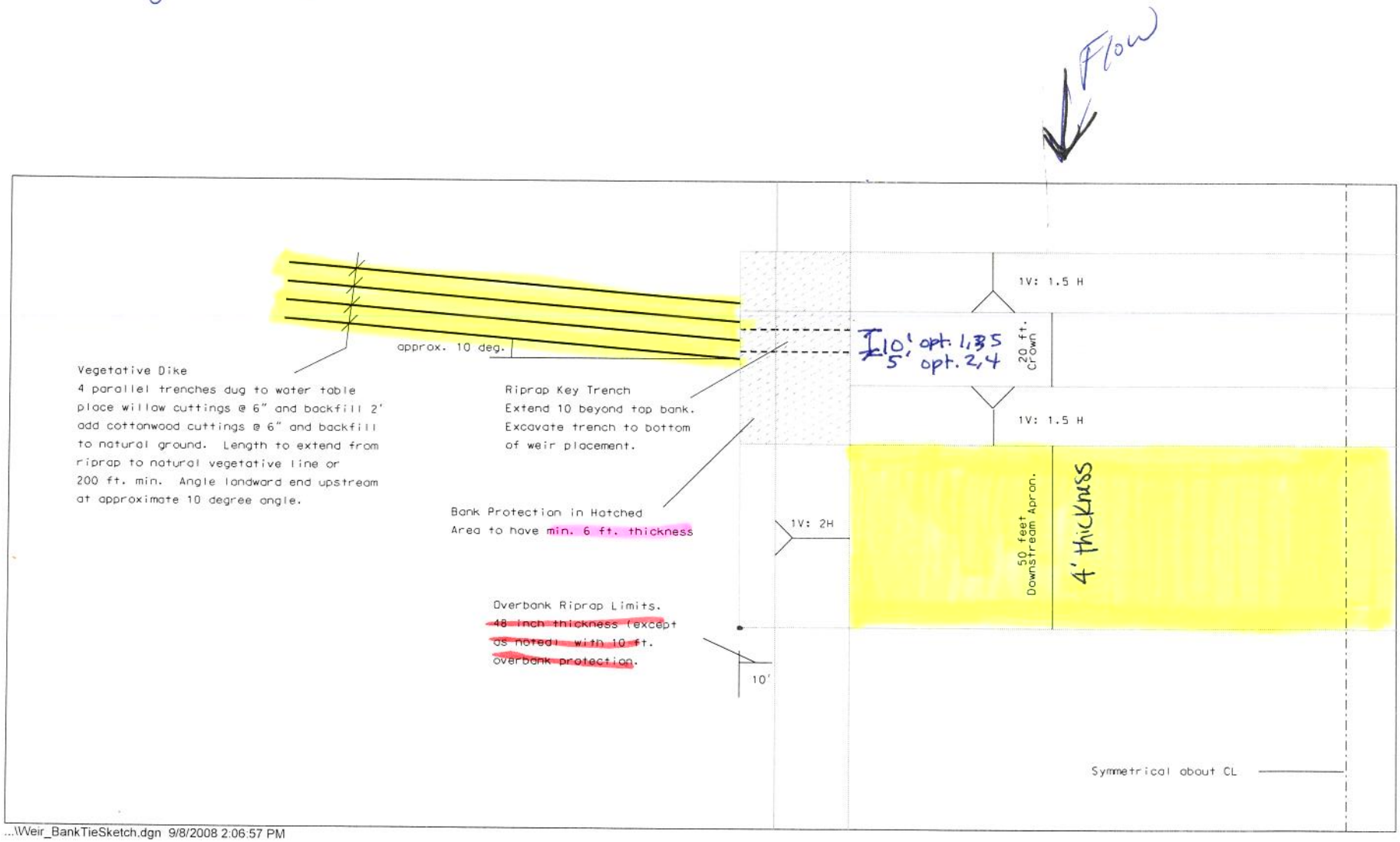
R_{90} = 18" thickness

Use FM = 6" thickness along bank protection

1/3 R_{90} quantity = FM quantity

	If Q = 2,250 cfs (ht = 7')	If Q = 3,000 cfs (ht = 8')
OPTION 1	V = 298 cy	V = 329 cy
OPTION 2	V = 287 cy	V = 317 cy
OPTION 3	V = 182 cy	V = 196 cy
OPTION 4	V = 170 cy	V = 185 cy
OPTION 5	V = 107 cy	V = 111 cy

cost items that are the same for each option



hatched area will be longer for some options b/c of US + DS slopes

BANK PROTECTION

Cost Items of Each Option:

- Vegetation along Vegetative Dike ---> same for each option
- Rock along apron (4' thickness) ---> same for each option
- Rock along US & DS slopes & part of crown not in key (6' thickness)
- Rock in key (6' thickness & in excavated area)
- Excavation of key

Rock		
Weight =	1.5	tn/cy
Cost =	35	$/tn

Vegetation along Vegetative Dike

4 parallel trenches dug to water table; place willow cuttings @ 6" and backfill 2'. Add cottonwood cuttings @ 6" and backfill to natural ground. Length to extend from riprap to natural vegetative line or 200 ft min. Angle landward end upstream at approximate 10 degree angle.

Assumptions: 200' trench with trees every 6";
400 trees per trench, 4 trenches --> 1,600 trees per dike
Use 1/2 cottonwood cuttings and 1/2 Willow Cuttings
-- 800 cottonwood cuttings
-- 800 willow cuttings
Need two trenches per weir (left and right bank):
-- 1,600 cottonwood cuttings
-- 1,600 willow cuttings

Plug Removal

A=	1,548	sf
L=	115	ft
V=	6,593	cy

Rock along apron (4' thickness)

A=	256	sf
L=	50	ft
V=	474	cy

EXCAVATION QUANTITIES

Chosen Alternative

SUBJECT: Excavation Quantities	COMPUTED BY:	DATE:	FILE NO.
	CHECKED BY:	DATE:	SHEET NO.

PLUG REMOVAL ≈ 6,594 cy per plug
∴ see bank protection handwritten calcs sheet 1 for volume calc

BANK KEY

(excavation of key; excavation for Rip-Rap; excavation for F.M.; both banks)

OPTION 1 - V = 237 + 987 + 329 = 1,553(2) = 3106 cy ∴ see bank protection handwritten calcs, sheets 1 & 2 for volume calcs
OPTION 2 - V = 119 + 952 + 317 = 1,388(2) = 2,776 cy
OPTION 3 - V = 237 + 589 + 196 = 1,022(2) = 2,044 cy
OPTION 4 - V = 119 + 554 + 185 = 858(2) = 1,716 cy
OPTION 5 - V = 237 + 333 + 111 = 681(2) = 1,362 cy

KEYING IN OF WEIRS (OPTIONS 1-5 w/ Keys):
∴ areas obtained from microstation quantities file cross-sections

Q = 2,250 cfs (ht = 7')

OPTION 1 - V = (1,820)(275)/27 = 18,537 cy
OPTION 2 - V = (1,730)(275)/27 = 17,620 cy
OPTION 3 - V = (1,718)(275)/27 = 17,499 cy
OPTION 4 - V = (1,638)(275)/27 = 16,683 cy
OPTION 5 - V = (1,182)(275)/27 = 12,039 cy

(area)

Q = 3,000 cfs (ht = 8')

OPTION 1 - V = (1540)(275)/27 = 15,685 cy
OPTION 2 - V = (2,010)(275)/27 = 20,472 cy
OPTION 3 - V = (1,878)(275)/27 = 19,128 cy
OPTION 4 - V = (1,806)(275)/27 = 18,394 cy
OPTION 5 - V = (1,312)(275)/27 = 13,363 cy

↑ includes R2200, Rip-Rap & FM excavation

Chosen alternative

SUBJECT: Excavation Quantities (cont.)	COMPUTED BY:	DATE:	FILE NO.
	CHECKED BY:	DATE:	SHEET NO.

Excavation of weirs w/out Key:

∴ areas obtained from microstation quantities file cross-sections

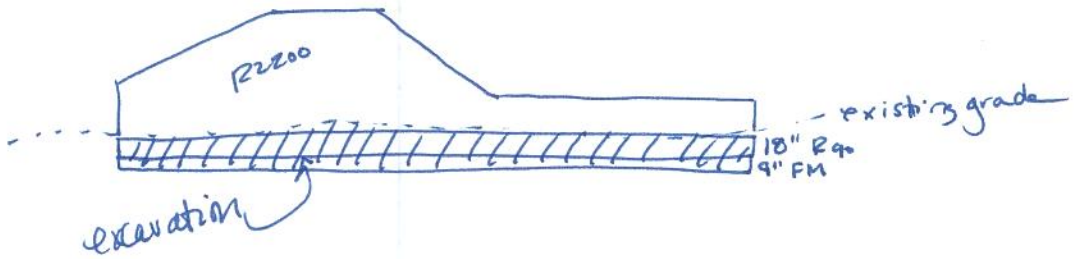
Q = 2,250 cfs
Wt = 7'

OPTION 1 - V = (1,456)(275)/27 = 14,830 cy
2 - V = (1,533)(275)/27 = 15,614 cy
3 - V = (1,041)(275)/27 = 10,603 cy
4 - V = (960)(275)/27 = 9,778 cy
5 - V = (760)(275)/27 = 7,741 cy

Q = 3,000 cfs
Wt = 8'

OPTION 1 - V = (1,708)(275)/27 = 17,396 cy
2 - V = (1,558)(275)/27 = 15,869 cy
3 - V = (1,157)(275)/27 = 11,784 cy
4 - V = (1,073)(275)/27 = 10,929 cy
5 - V = (784)(275)/27 = 7,985 cy

↑ includes R2200, R90 & FM excavation



CLEARING & TURFING

CLEARING AND TURFING ACREAGE

Does not include acreage for working (that needed for rock and trees only)

WEIR HEIGHT = 7'

Option 1:

Vegetative Dike =	1,400	sf			
Area along Apron =	6,100	sf			
Area along Weir =	24,644	sf			
Total C&T =	32,144	sf	=	0.74	acres

Option 2:

Vegetative Dike =	1,400	sf			
Area along Apron =	6,100	sf			
Area along Weir =	23,424	sf			
Total C&T =	30,924	sf	=	0.71	acres

Option 3:

Vegetative Dike =	1,400	sf			
Area along Apron =	6,100	sf			
Area along Weir =	12,688	sf			
Total C&T =	20,188	sf	=	0.46	acres

Option 4:

Vegetative Dike =	1,400	sf			
Area along Apron =	6,100	sf			
Area along Weir =	11,468	sf			
Total C&T =	18,968	sf	=	0.44	acres

Option 5:

Vegetative Dike =	1,400	sf			
Area along Apron =	6,100	sf			
Area along Weir =	5,002	sf			
Total C&T =	12,502	sf	=	0.29	acres

CLEARING AND TURFING ACREAGE

Does not include acreage for working (that needed for rock and trees only)

WEIR HEIGHT = 8'

Option 1:

Vegetative Dike =	22,000	sf			
Area along Weir =	19,080	sf			
Total C&T =	41,080	sf	=	0.94	acres

Option 2:

Vegetative Dike =	22,000	sf			
Area along Weir =	18,480	sf			
Total C&T =	40,480	sf	=	0.93	acres

Option 3:

Vegetative Dike =	22,000	sf			
Area along Weir =	12,360	sf			
Total C&T =	34,360	sf	=	0.79	acres

Option 4:

Vegetative Dike =	22,000	sf			
Area along Weir =	11,760	sf			
Total C&T =	33,760	sf	=	0.78	acres

Option 5:

Vegetative Dike =	22,000	sf			
Area along Weir =	5,368	sf			
Total C&T =	27,368	sf	=	0.63	acres

= Selected Alternative

Notes: - Assume turfing all locations that will be cleared
- Clearing and turfing limits are the limit of the Overbank Riprap Limits & Vegetative Dike

CLEARING AND TURFING ACREAGE

Does not include acreage for working (that needed for rock and trees only)

Assumptions:

Vegetative Dike:

10' spacing b/w trees

10' working area outside of tree lines

L = 200' + 10' + 10' = 220'

W = 10'+10'+10'+10'+10' = 50'

A = 11,000 sf

along both banks

Total A = 22,000 sf

Option 3:

20' working area outisde of riprap along bank

L = 20' + 166' + 20' = 206'

W = 10' + 20' = 30'

A = 6,180 sf

along both banks

Total A = 12,360 sf

Option 5:

20' working area outisde of riprap along bank

L = 20' + 94' + 20' = 134'

W = 10' + 20' = 30'

A = 4,020 sf

along both banks

Total A = 8,040 sf

ALTERNATIVE 2b.

~~RECOMMENDED~~ PLAN

QUANTITIES SUMMARY

ALTERNATIVE 2b.

FORMER ~~RECOMMENDED PLAN:~~

5 WEIRS AND 4 PLUGS
MEANDERS 1, 3, 5, & 6

4 WEIRS - WEIR OPTION 5 (without key)
1 WEIR - WEIR OPTION 3 (with key)
Q = 3,000 cfs (ht = 8')

COST ITEMS:

- R2200 (for weir, along bank of downstream apron of weir, along bank slopes of weir, bank key at crown of weir)
- R90 (under weir riprap, under bank protection riprap)
- Filter Material (under weir riprap, under bank protection riprap)
- Excavation (plug removal, bank key, upstream and downstream key of weir)
- Clearing and Turfing
- Vegetative Dike

R2200:

Weir Option 5 (x4)	Vol Each (cy)	Vol x4 (cy)	
Weir Structure	8,301	33,204	
Along bank of downstream apron	948	3,792	
Along bank slopes of weir	968	3,872	
Bank key at crown of weir	704	2,816	
	Total =	43,684	cy

Weir Option 3 (x1)	Vol Each (cy)		
Weir Structure	20,350		
Along bank of downstream apron	948		
Along bank slopes of weir	3,016		
Bank key at crown of weir	704		
	Total =	25,018	cy
	Total R2200 =	**68,702**	**cy**

R90:

Weir Option 5 (x4)	Vol Each (cy)	Vol x4 (cy)	
Under weir riprap	1,436	5,744	
Under bank protection riprap	666	2,664	
	Total =	8,408	cy

Weir Option 3 (x1)	Vol Each (cy)		
Under weir riprap	2,536		
Under bank protection riprap	1,178		
	Total =	3,714	cy
	Total R90 =	**12,122**	**cy**

Filter Material:

Weir Option 5 (x4)	Vol Each (cy)	Vol x4 (cy)	
Under weir riprap	718	2,872	
Under bank protection riprap	333	1,332	
	Total =	4,204	cy

Weir Option 3 (x1)	Vol Each (cy)		
Under weir riprap	1,268		
Under bank protection riprap	589		
	Total =	1,857	cy
	Total Filter Material =	**6,061**	**cy**

Excavation:

	Vol Each (cy)	Tot Vol (cy)	
Plug Removal	6,594	26,376	<-- x4
Bank Key			
Option 5	1,362	5,448	<-- x4
Option 3	2,044	2,044	<-- x1
Beneath Weir			
Option 5 (w/out key)	7,985	31,940	<-- x4
Option 3 (w/key)	19,128	19,128	<-- x1
	Total Excavation =	**84,936**	**cy**

Clearing and Turfing:

	Acre (ea)	Total Acre	
Option 5	0.6	2.5	<-- x4
Option 3	0.8	0.8	<-- x1
	Total C&T =	**3.3**	**ac**

Vegetative Dike

	Ea	Total	
Option 5			
Cottonwood Cuttings	1,600	6,400	<-- x4
Willow Cuttings	1,600	6,400	<-- x4
Option 3			
Cottonwood Cuttings	1,600	1,600	<-- x1
Willow Cuttings	1,600	1,600	<-- x1
Total Cottonwood Cuttings =		**8,000**	**ea**
Total Willow Cuttings =		**8,000**	**ea**