RECLAMATION

Managing Water in the West

Auburn-Folsom South Unit
Update of Cost

U.S. Department of the Interior
Bureau of Reclamation
Central California Area Office
7794 Folsom Dam Road
Folsom, CA 95630

June 2006

Appendix B
Cost Estimate Calculation Work Sheets

Table 2. Impacts to Habitat Types and Anticipated Mitigation.

Habitat type	Impacted Acres	Unit Cost/ Acre	Mitigation Acres	Remarks	Total
Evergreen Hardwood Forest	4129	$50,000	8258	2:1 off site preservation	$412,900,000
Evergreen Hardwood Woodland	4206	$50,000	8412	2:1 off site preservation	$420,600,000
Conifer Forest	741	$50,000	1482	2:1 ratio off site preservation	$74,100,000
Chaparral	695	$40,000	1390	2:1 ratio off site preservation	$55,600,000
Grassland/ Savannah	218	$40,000	436	2:1 ratio offsite preservation	$17,440,000
Freshwater Marsh	14	$55,000	42	3:1 ratio off site creation	$2,310,000
Montane Riparian	1552	$65,000	3104	2:1 ratio off site preservation	$201,760,000
Total	11555		23124		$1,184,710,000
With Contingency (25%)					$1,480,887,500

EXHIBIT 4.7-2

CALCULATION COVER SHEET

Client: USBR

Project Name: Auburn Dam

Project/Calculation Number: 18600819.04000

Title: Plan View Foundation Area

Total Number of Pages (including cover sheet): 6

Total Number of Computer Runs: N/A

Prepared By: Eric Schlosser **Date:** 4/24/06

Checked By: [signature] **Date:** 4/25/06

Description and Purpose To estimate the concrete volume for the CG-3 dam.

Design Basis/References/Assumptions Drawing 859-D-2731 and 859-D-2732 (both attached to this calc package) of the USBR Auburn Dam Feasibility drawings utilized used to determine concrete volume estimate.

Dam broken into 4 typical sections and applied to sections of dam plan view. Section areas and section locations are indicated in green pen on sheet 859-D-2731.

Remarks/Conclusions/Results Approximate concrete volume of the CG-3 Dam: 13,757,958 cubic yards.

Calculation Approved By: _____

Project Manager/Date

Revision No.:	Revision Description:	Approved By:

Project Manager/Date

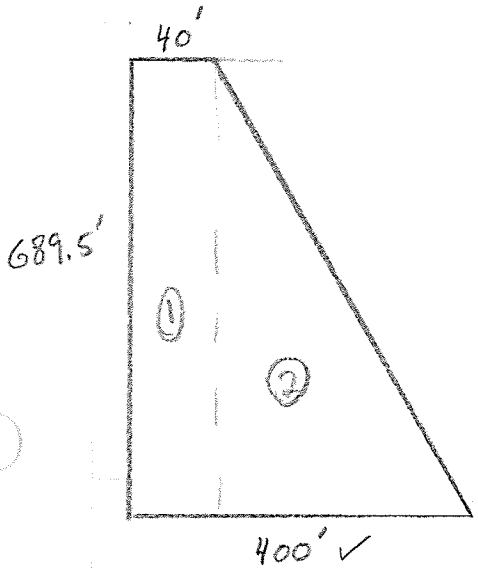
URS

Job Auburn Dam | Project No. 18600819.04000 | Page ___ of ___
Description Mass Conc. Vol. | Computed by ES | Sheet 4 of 6
Checked by ___ | Date 4/24/06 | Date ___
Reference

A-A

see sht 859-D-2732

B-B

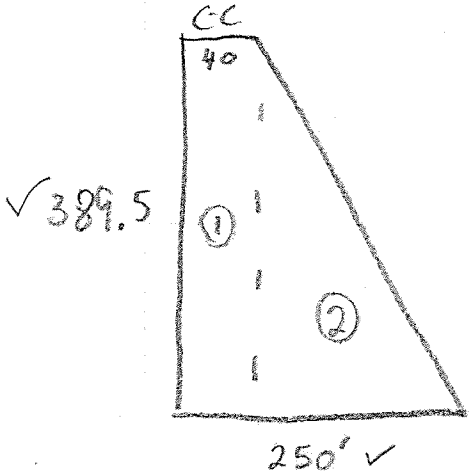


① $40(689.5') = 27\,580\ ft^2$ ✓

② $\frac{1}{2}(689.5')(360') = 124{,}110\ ft^2$ ✓

$T = 151{,}690\ ft^2$ ✓

C-C

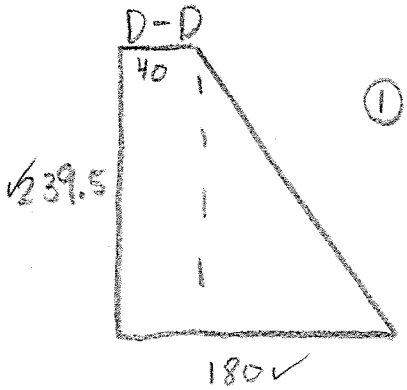


① $40(389.5) = 15580\ ft^2$ ✓

② $\frac{1}{2}(210)(389.5) = 40{,}898\ ft^2$ ✓

$T = 56\,477.5\ ft^2$ ✓

D-D



① $40(239.5) = 9580\ ft^2$ ✓

② $\frac{1}{2}(140)(239.5) = 16765\ ft^2$ ✓

$T = 26{,}345\ ft^2$ ✓

URS

Job Auburn Dam | Project No. 18600819.04000 | Page ___ of ___ | Sheet 5 of 6

Description Mass Conc. Vol | Computed by ES | Date 4/24/06

Checked by ___ | Date ___

Reference

A-A

230 + 250 = 480'

480'(192 500 ft²) = 92,400,000 ft³ or 3,422,222.2 yd³ ✓

B-B

[280 + 350 (L) + 260 + 300 (R)] 151,690 = 18051111 00 ft³ or 6,685,597 yd³

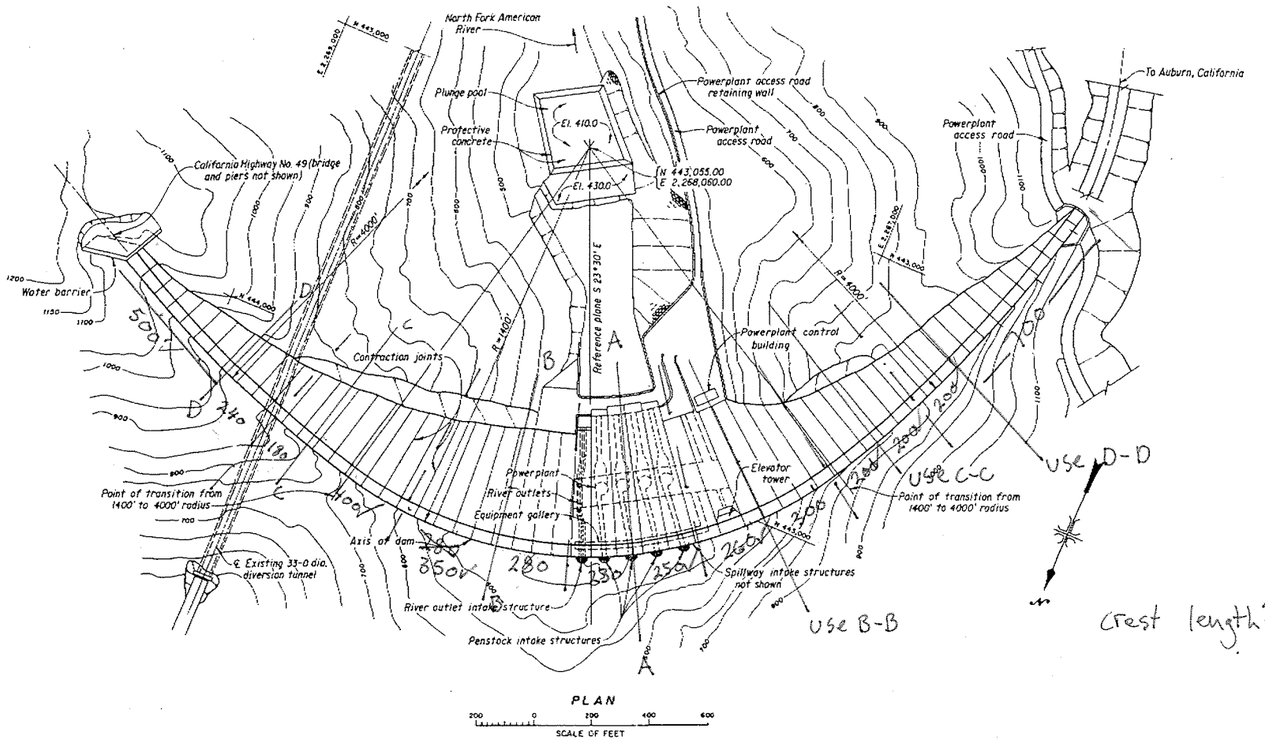
C-C

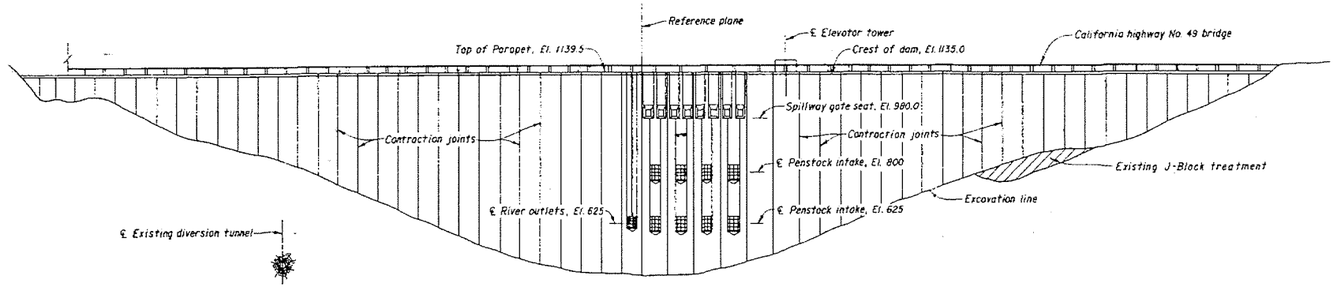
[400' + 180 (140) (L) + 400 (R)] 56,477.5 = 55,347,950 or 2,049,924.1 yd³

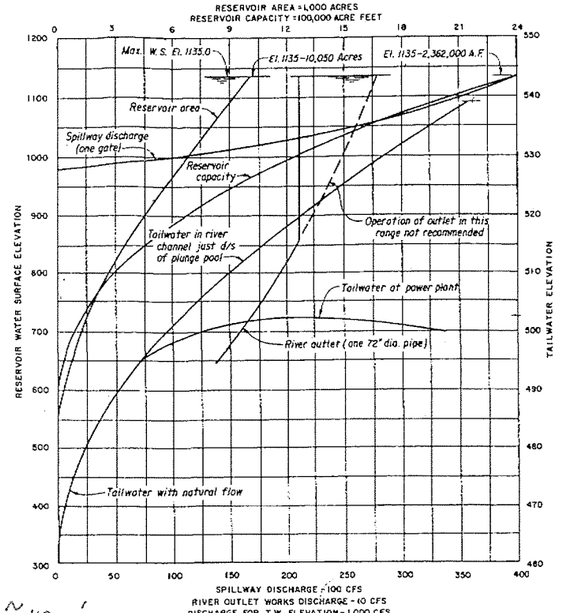
D-D

[740 (720) + 900] 26,345 ft² = 43205800 or 1,600,214.8 yd³

T = 13,757,958.1 yd³







TAILWATER, AREA, CAPACITY AND DISCHARGE CURVES

RESERVOIR CAPACITY ALLOCATIONS

PURPOSE	ELEVATIONS	CAPACITY ACRE-FEET
Surcharge	1131.4 to 1135	36,000
Joint use	1083.1 to 1131.4	450,000*
Active conservation	816.5 to 1083.1	1,516,000
Inactive	616.5 to 816.5	331,000
Dead	Streambed to 616.5	29,000
Total reservoir		2,326,000**

A surcharge of 36,000 a.f. (Maximum W.S. El. 1135) plus 450,000 a.f. in joint use capacity in combination with a spillway discharge of 327,000 c.f.s. is provided to protect against the inflow design flood which has a peak of 300,000 c.f.s. and a 5 day volume of 1,700,000 a.f. .

*Maximum flood control space. Minimum flood control space is 325,000 a.f. with bottom of control pool at El. 1097.2 . 125,000 a.f. "floating" pool can be shifted to Folsom Reservoir.

**Includes 25,800 a.f. allowance for 100 year sediment deposition between stream and El. 1131.4 , but excludes 36,000 a.f. surcharge and 1,300 a.f. sediment above El. 1131.4 .

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
WATER AND POWER RESOURCES SERVICE
CENTRAL VALLEY PROJECT
AUBURN-FOLSOM SOUTH UNIT - CALIFORNIA

AUBURN DAM FEASIBILITY

CONCRETE CURVED GRAVITY DAM (GG-3) - MILE 20.

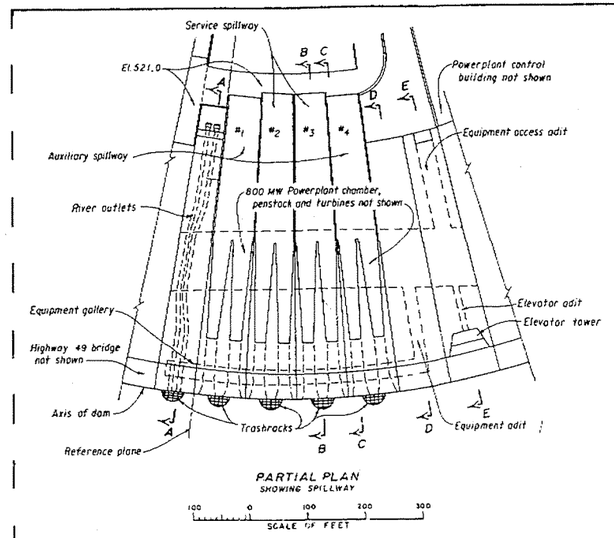
PLAN AND ELEVATION

DESIGNED [illegible] SUBMITTED [illegible]
DRAWN [illegible] RECOMMENDED [illegible]
CHECKED [illegible] APPROVED [illegible]
(CHIEF, CONSTRUCTION AND DESIGN)

DENVER, COLORADO AUG. 4, 1960

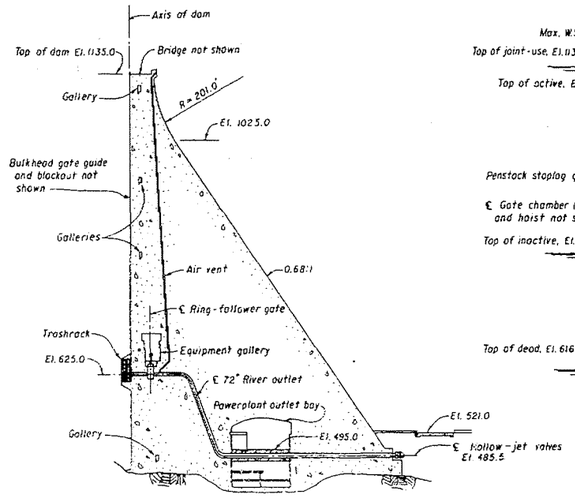
SHEET 1 OF 2

859-D-2731

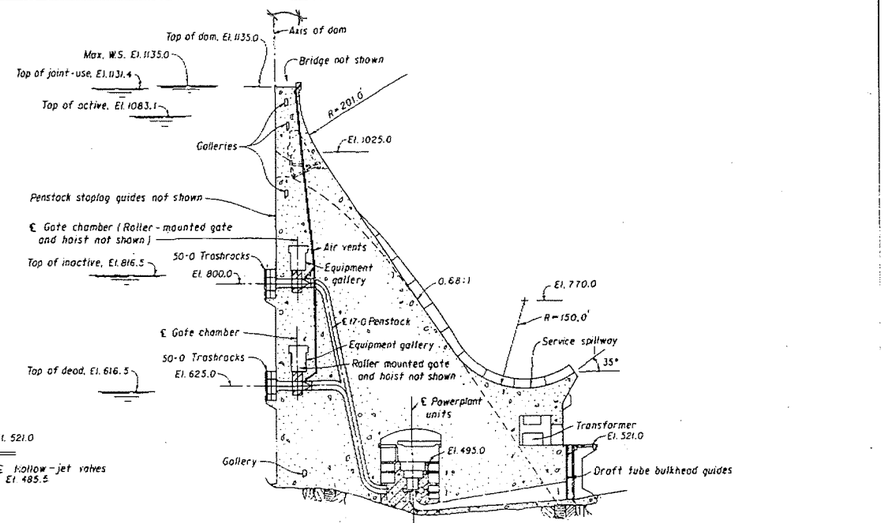


PARTIAL PLAN
SHOWING SPILLWAY

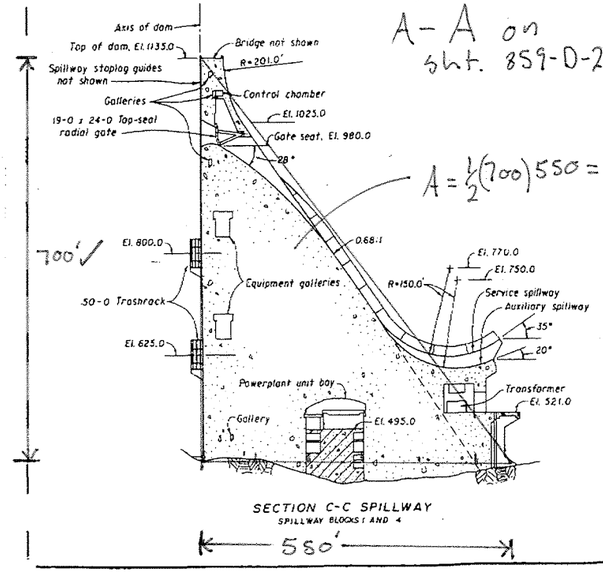
100 0 100 200 300
SCALE OF FEET



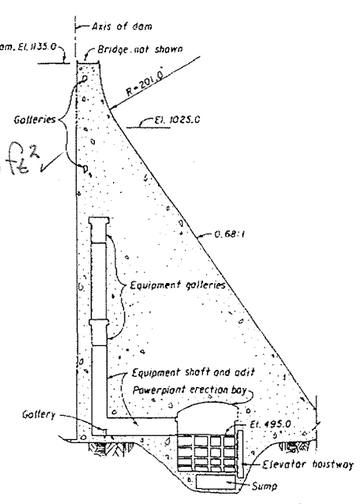
SECTION A-A RIVER OUTLETS



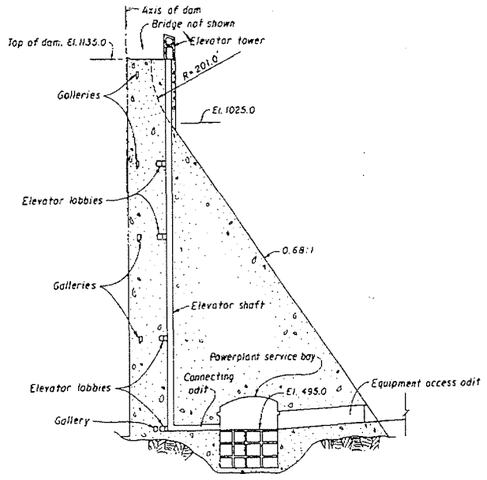
SECTION B-B PENSTOCKS
SPILLWAY BLOCKS 2 AND 3



SECTION C-C SPILLWAY
SPILLWAY BLOCKS 1 AND 4



SECTION D-D EQUIPMENT SHAFT



SECTION E-E ELEVATOR

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
WATER AND POWER RESOURCES SERVICE
CENTRAL VALLEY PROJECT
AUBURN-FOLSOM SOUTH UNIT-CALIFORNIA

AUBURN DAM FEASIBILITY

CONCRETE CURVED GRAVITY DAM (GG-3)-MILE 20.1
PARTIAL PLAN AND SECTIONS

DESIGNED [illegible] DRAWN [illegible] CHECKED [illegible]
SUBMITTED [illegible]
RECOMMENDED [illegible]
APPROVED [illegible]
for REGIONAL DIRECTOR - ENGINEERING AND RESEARCH

DENVER, COLORADO AUGUST 1, 1980
SHEET 2 OF 2

859-D-2732

URS

RECORD OF TELEPHONE CONVERSATION

DATE & TIME:	5/11/06	**JOB NUMBER:**	18600819.04000
CALL TYPE:	☒ Incoming ☐ Outgoing	**JOB NAME:**	Auburn-Folsom South Unit
PERSON SPOKEN TO:	Gerard Hoppa	**TITLE:**	Sales
REPRESENTING:	California Portland Cement	**PHONE NUMBER:**	cell - 415-254-6039 office - 626-852-6200
NOTES RECORDED BY:	EKS	**REPRESENTING:**	URS-Denver
ADDRESS:	8181 East Tufts Avenue Denver, CO 80237		

SUBJECT:

Concrete cement pricing and availability

SUMMARY OF CONVERSATION:

Gerard stated that, if given ample lead time, and if the entire cement amount of approximately 1.75 million tons would be spread out over time, they could provide cement from various souces.

California Portland Cement has a location in Stockton, CA, and one in Long Beach, CA. Rail service is readily available from either location, with Stockton being the closest.

A rough price today for cement (not delivered) would be $115/ton. Gerard stated that given the huge volume needed, a discount would be likely.

Shipping today, from Stockton to the Sacramento area is around $12/ton, and is subject to change with many factors including fuel prices.

California Portland Cement will give bids for long term projects, and can be expected to stick to the projected pricing.

cc:

URS

RECORD OF TELEPHONE CONVERSATION

DATE & TIME:	5/10/06	**JOB NUMBER:**	18600819.04000
CALL TYPE:	☒ Incoming ☐ Outgoing	**JOB NAME:**	Auburn-Folsom South Unit

PERSON SPOKEN TO:		**TITLE:**	
REPRESENTING:	Boral Materials Technologoes	**PHONE NUMBER:**	1-800-255-0663
NOTES RECORDED BY:	EKS	**REPRESENTING:**	URS-Denver
ADDRESS:	8181 East Tufts Avenue Denver, CO 80237		

SUBJECT:

Type C Fly Ash availability in northern California

SUMMARY OF CONVERSATION:

Boral has two sources in the general area. One in Stockton, CA which produces 100 tons of per day, and one in northern Oregon (near the Washington border) which produces close to 200 tons per day.

Pricing ranges from $45/ton to $80/ton, shipping not included. The variance in price is due to competition to oprocure fly ash. Some of their clients will pay $80/ton to assure they get all the fly ash they need. There is rail accessability at the northern Oregon location.

Boral also stated that, due to the movement away from coal burning in California, getting large volumes of fly ash will be very difficult.

cc:

EXHIBIT 4.7-2

CALCULATION COVER SHEET

Client: *USBR*

Project Name: *Auburn Dam*

Project/Calculation Number: *18600819.04000*

Title: *Highway Materials Quantities*

Total Number of Pages (including cover sheet): *6*

Total Number of Computer Runs: *N/A*

Prepared By: *Eric Schlosser* **Date:** *5/2/06*

Checked By: **Date:**

Description and Purpose *To determine the materials quantities for roadways.*

Design Basis/References/Assumptions

Assume 12 miles of 2-lane highway. Assume 4 miles of 4-lane highway. Cut and fill will be balanced. Assume 6" thickness of Asphalt, and 12" thickness of roadbase. Assume unit weight of asphalt to be 150 pcf placed. Asphalt unit weight supporting calculation can be found on page 2 of this calc package.

Remarks/Conclusions/Results

2-lane highway, 12 miles long:
Division 2 -02300 –315 and –335: 1,425,600 yd³ of cut and 1,425,600 yd³ of fill.
Division 2 -02700 –740: 142,560 tons of placed asphalt required.
Division 2 -02700 –720: 211,200 yd³ of placed roadbase required.

PLACER ELDORADO

4-lane highway, 4 miles long:
Division 2 -02300 –315 and –335: 782,496 yd³ of cut and 782,496 yd³ of fill.
Division 2 -02700 –740: 110,880 tons of placed asphalt required.
Division 2 -02700 –720: 133,056 yd³ of roadbase required.

HWY 49

Calculation Approved By: _____
Project Manager/Date

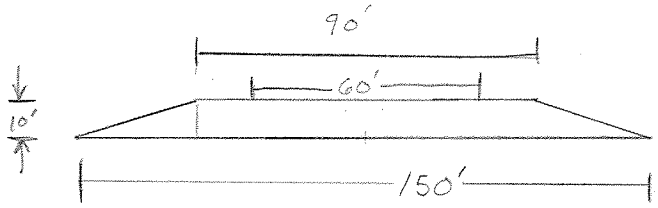
Revision No.:	Revision Description:	Approved By:

Project Manager/Date

URS

Job Auburn Dam | Project No. 18600819.04000 | Page 1 of ____
Description Highway Materials | Computed by EKS | Date 5/2/06 | Sheet ____ of ____
Quantity of 2-lane Highway | Checked by ____ | Date ____
Reference

2-lane highway typical section



For 1 linear ft of highway: $(90 \times 10 \times 1) + \frac{1}{2}(10)(30)2 = 1200\ ft^3$
or
45 cubic yards

Division 2 – 02300 Earthwork

-315 22.5 yd^3 cut per lineal ft of road

-335 22.5 yd^3 fill per lineal ft of road

$22.5\ yd^3/ft \left(\frac{5280\ ft}{mile}\right)(12\ miles) = 1{,}425{,}600\ yd^3$ cut for 12 miles

1,425,600 yd^3 fill for 12 miles

02700 Bases, Ballasts, Pavements, and Appurtenances

-740 Asphalt

Flexible Pavement

Assume 6" thick asphalt, assume placed density = 150 pcf
Assume 60' asphalted width.
Per linear foot: .5' thick, 60 feet wide

$.5(60)(1) = 30\ ft^3$

$30\ ft^3 \left(150\ lb/ft^3\right) = 4500\ lb$ or $2.25\ tons/ft$

$2.25\ tons/ft \left(\frac{5280\ ft}{mi}\right)(12\ mi) = 142{,}560\ tons$ total

Using Asphalt Calculator: (attached)
100 ft^2, 1" thick requires ~.62 tons

$100\ ft^2\left(\frac{1}{12}\ ft\right) = 8.33\ ft^3$
$.62\ tons\left(\frac{2000\ lb}{t}\right) = 1240\ lb$

$\frac{1240\ lb}{8.33\ ft^3} = 148.9\ pcf$

Job Auburn Dam Project No. 18600819.04000 Sheet ___ of ___

Description Highway Materials Computed by EKS Date ___

Quantity of 2 lane Highway Checked by ___ Date ___

Reference

-720

02780 continued

Road base per linear foot:

90' wide, 1' deep

$90 \times 1 \times 1 = 90\ ft^3$ per linear ft of road

$90\ ft^3 = 3.33\ yd^3$

$3.33\ yd^3/ft \left(\frac{5280\ ft}{mi}\right)(12\ mi) = 211{,}200\ yd^3$ of ABC

URS

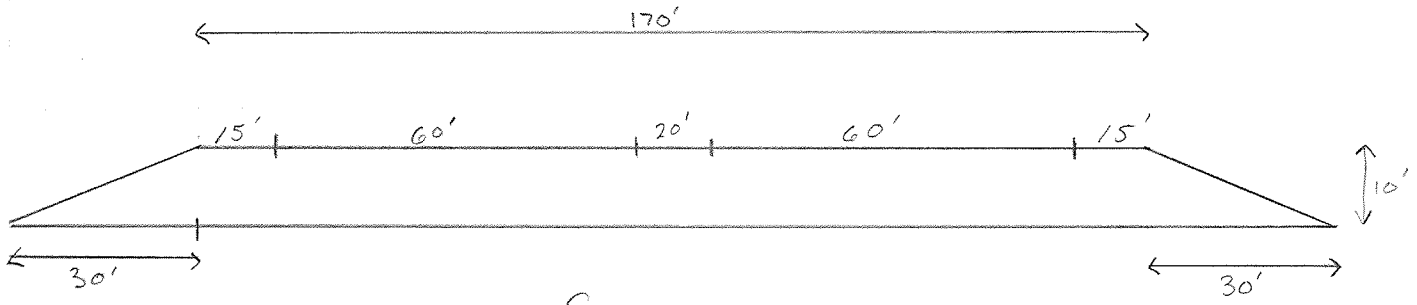
Page 3 of ____

Job Auburn Dam | Project No. ____ | Sheet ____ of ____

Description Highway Materials | Computed by ____ | Date ____

Quantity of 4-lane Highway | Checked by ____ | Date ____

Reference



For 1 linear ft:

Division 2 - 02300 Earthwork

$170'(1')(10') + \frac{1}{2}(2)(30')(10') = 2000\ ft^3/ft$ or $74.1\ yd^3/ft$

*Assume balance cut & fill

-315 $37.05\ yd^3$ cut per linear ft

-335 $37.05\ yd^3$ fill per linear ft

$37.05\ yd^3/ft \left(\frac{5280\ ft}{mi}\right)(4\ mi) = 782{,}496\ yd^3$ cut per 12 miles

$782{,}496\ yd^3$ fill per 12 miles

Asphalt -02700 Bases, Ballasts, ...

-740 * assume 6" thick asphalt, placed density $150\ lb/ft^3$

* assume 140 ft asphalt width

Per linear ft of road:

$140\ ft(.5\ ft)1\ ft = 70\ ft^3/ft$

$70\ ft^3\left(\frac{150\ lb}{ft^3}\right) = 10{,}500\ lb$ per linear ft or $5.25\ ton/ft$

$5.25\ ton/ft\left(\frac{5280\ ft}{mi}\right)(4\ mi) = 110{,}880$ tons required

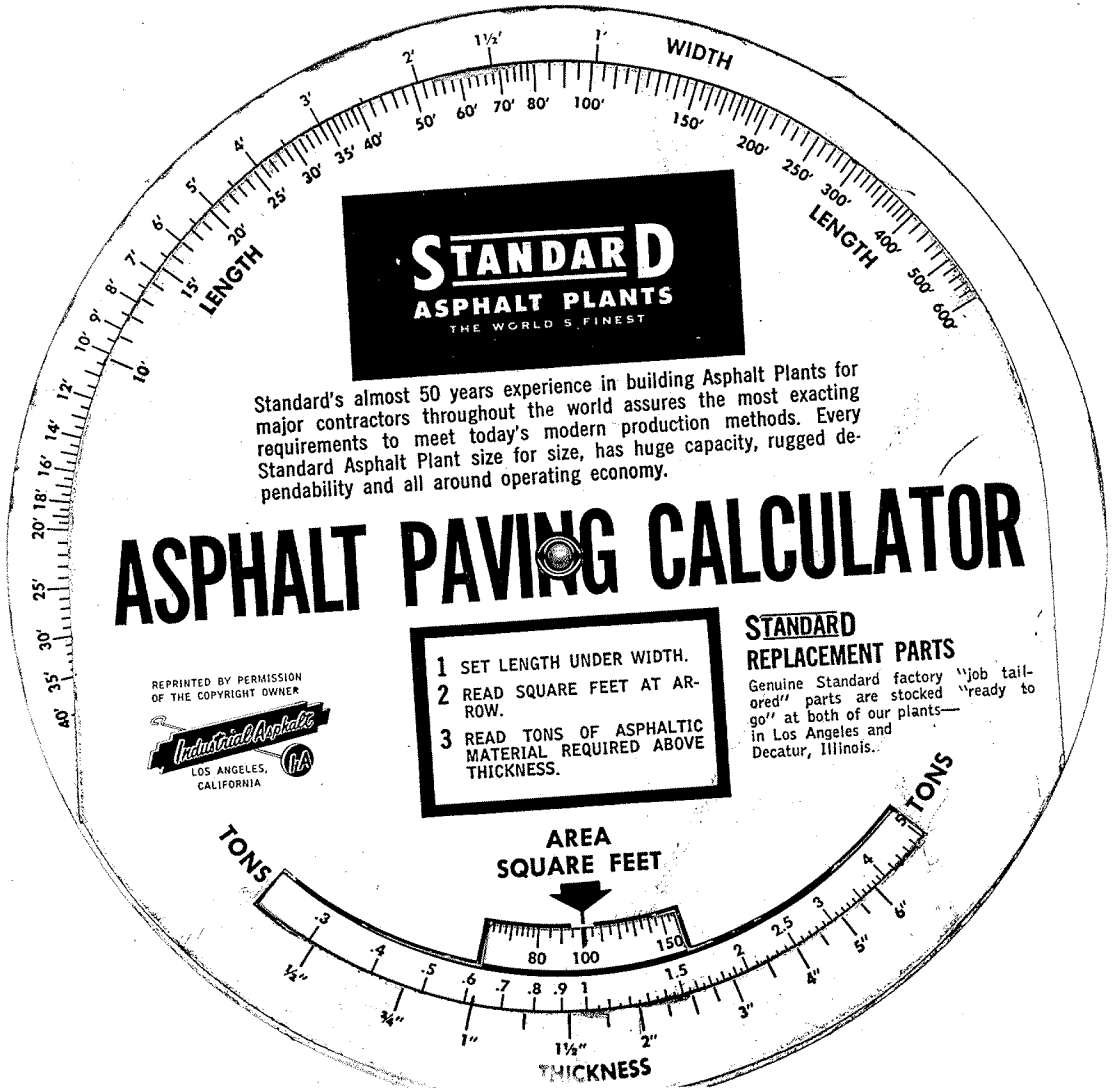
-720 Roadbase: 02700 continued

* assume 12" thick

* assume 170 ft of roadbase width

Per linear foot: $170\ ft(1')(1') = 170\ ft^3$ per linear ft or $6.3\ yd^3/$linear ft

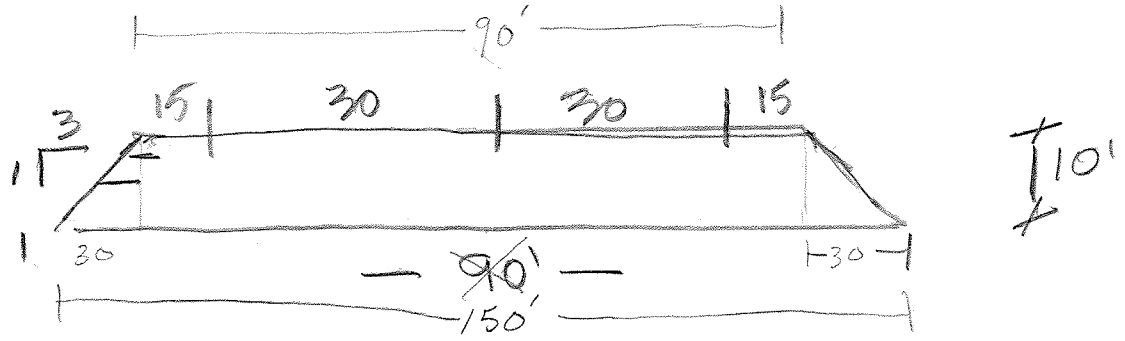
$6.3\ yd^3/ft\left(\frac{5280\ ft}{mi}\right)(4\ mi) = 133{,}056\ yd^3$ total required


WIDTH
1½'
2'
1'
3'
50' 60' 70' 80' 100'
150'
200' 250' 300' 400' 500' 600'
LENGTH
4'
5'
6'
7'
8'
9'
10'
15' 20' 25' 30' 35' 40'
LENGTH
10' 12' 14' 16' 18' 20' 25' 30' 35' 40'
STANDARD
ASPHALT PLANTS
THE WORLD'S FINEST
Standard's almost 50 years experience in building Asphalt Plants for major contractors throughout the world assures the most exacting requirements to meet today's modern production methods. Every Standard Asphalt Plant size for size, has huge capacity, rugged dependability and all around operating economy.
ASPHALT PAVING CALCULATOR
REPRINTED BY PERMISSION OF THE COPYRIGHT OWNER
Industrial Asphalt
LOS ANGELES, CALIFORNIA
1 SET LENGTH UNDER WIDTH.
2 READ SQUARE FEET AT ARROW.
3 READ TONS OF ASPHALTIC MATERIAL REQUIRED ABOVE THICKNESS.
STANDARD
REPLACEMENT PARTS
Genuine Standard factory "job tailored" parts are stocked "ready to go" at both of our plants—in Los Angeles and Decatur, Illinois.
TONS
AREA
SQUARE FEET
80 100 150
.3 .4 .5 .6 .7 .8 .9 1 1.5 2 2.5 3 4 5 6
TONS
¼" ¾" 1" 1½" 2" 3" 4" 5" 6"
THICKNESS

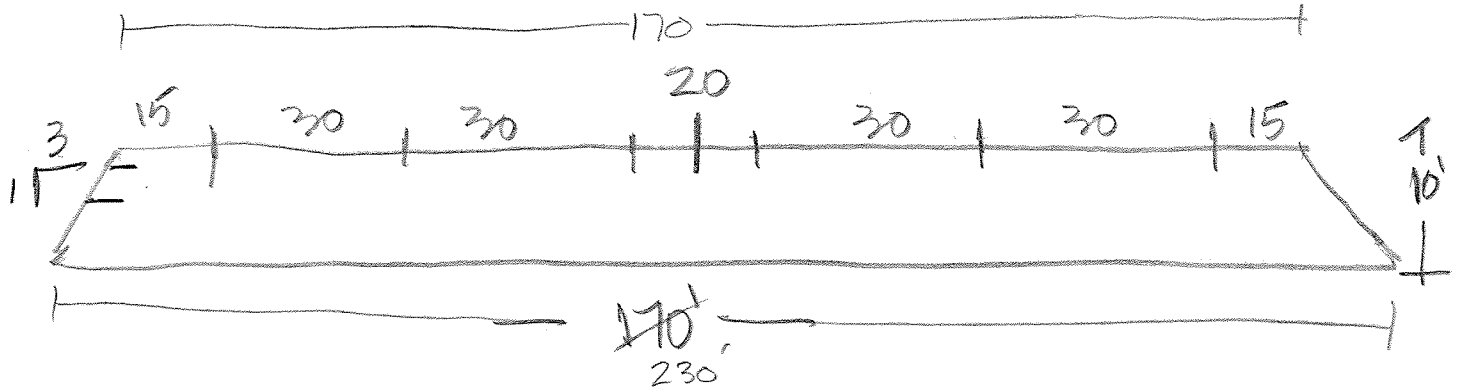
URS

Job AUBURN DAM | Project No. | Page ___ of ___
Description ~~HIGHWAY~~ PRISM TYPICAL | Computed by | Sheet ___ of ___
Checked by | Date 05/01/06
Reference

2 LANE
12 MILES



4 LANE
4 MILES



ASSUME- 12" ABC y^3
11 6" HBP TON

CALCULATE: CUT & FILL BALANCE y^3
ABC y^3
HBP TON

EXHIBIT 4.7-2

CALCULATION COVER SHEET

Client: USBR

Project Name: Auburn Dam

Project/Calculation Number: 18600819.04000

Title: Plan View Foundation Area

Total Number of Pages (including cover sheet): 4

Total Number of Computer Runs: N/A

Prepared By: Eric Schlosser **Date:** 4/24/06

Checked By: Julie Christensen **Date:** 4/25/06

Description and Purpose To determine the plan view area of the CG-3 dam foundation.

Design Basis/References/Assumptions Drawing 859-D-2731 (attached to this calc package) of the USBR Auburn Dam Feasibility drawings utilized used to determine the foundation area.

Dam broken into areas, which are indicated in green pen on sheet 859-D-2731. Areas tabulated on following sheets 2 and 3.

Remarks/Conclusions/Results Dam foundation is approximately 26.834 acres

Calculation Approved By: _____

Project Manager/Date

Revision No.:	Revision Description:	Approved By:

Project Manager/Date

URS

Job Auburn Dam — Project No. 18600819.04000 — Page 2 of 4

Description Dam Plan Foundation Area — Computed by EKS — Date 4/24/06

Checked by _____ — Date _____

Section #	Length	width	Area	Total
1)	75'	75'	5625	
2)	80'	↓	6000	
✓3)	95'		7125	
4)	100		7500	
5)	140		10500	
6)	150	all	11250	
7)	165		12375	
8)	175		13125	
9)	195		14625	
10)	200		15000	
11)	225		16875	
12)	250		18750	
13)	260		19500	
14)	290		21750	
15)	300		22500	
16)	315		23625	
17)	335		25125	
18)	355		26625	
19)	370		27750	
20)	395		29625	
21)	400		30000	
✓22)	400		30000	
23)	415		31125	
				426 375

Section #	L	W	A	Reference
24	420	75 ↓ all	31500	
✓25	420		31500	
26	420		31500	
27	430		32250	
28	500		37500	
29	520		39000	
30	520		39000	
31	520		39000	
32	510		38250	
33	430		32250	
34	430		32250	
✓35	420		31500	
36	420		31500	
37	390		29250	
38	340		25500	
39	300		22500	
40	280		21000	
41	260		19500	
42	250		18750	
43	240		18000	
44	210		15750	
45	200		15000	
✓46	190		14250	
				646500 Ft²

URS

Job Auburn Dam — Project No. 18605819.04000 — Page 3 of 4

Description Dam Plan Found. Area — Computed by EKS — Date 4/24/06 — Sheet ___ of ___

Checked by ___ — Date ___ — Reference

Section #	L	W	A	T
47	180	75	13500	
48	175	↓	13125	
49	165	↓	12375	
50	155	all	11625	
51	145		10875	
52	105		7875	
53	100		7500	
54	80		6000	
55	75		5625	
56	50		3750	
✓57	50		3750	

96,000 ft²

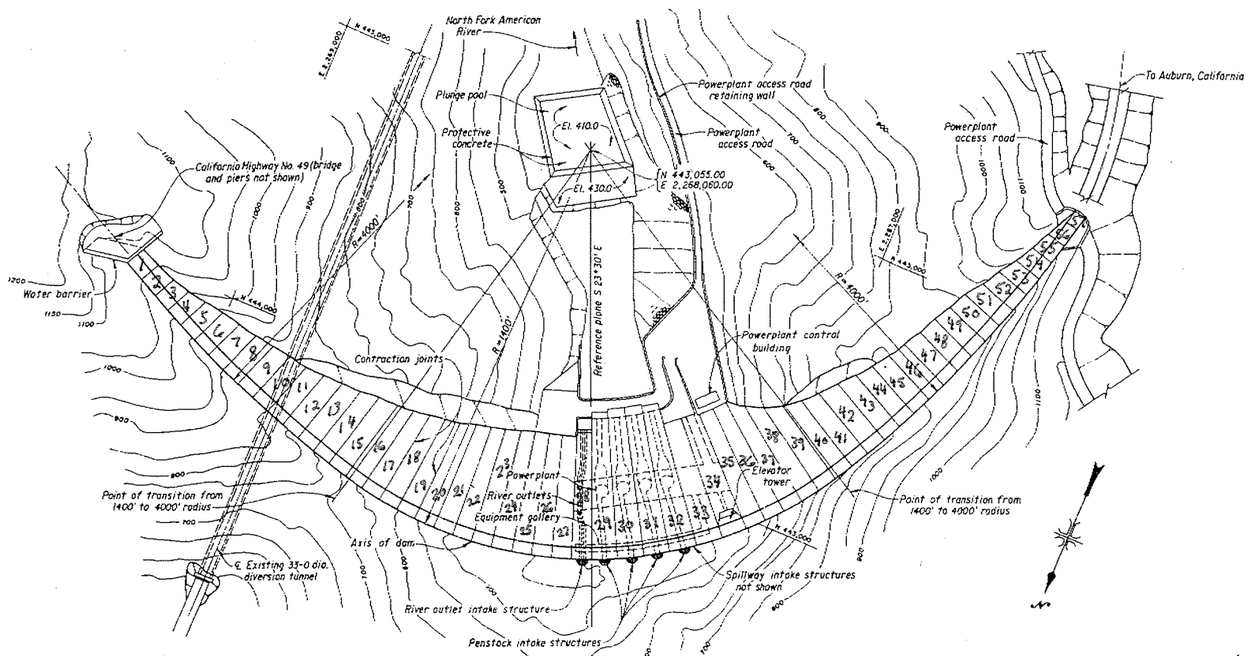
Grand Total: 1,168,875 ft²

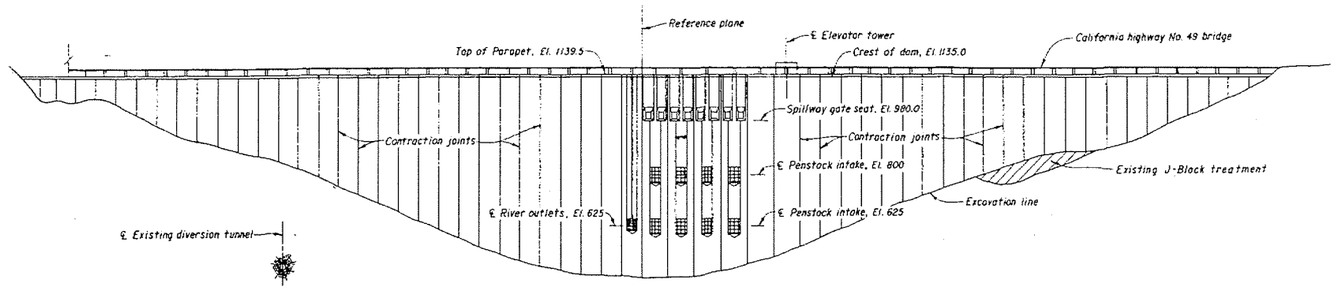
or

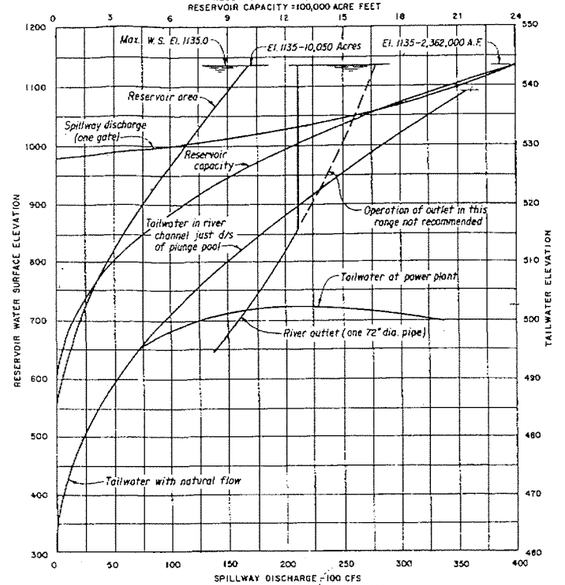
26.834 acres ✓

Segment	Length	Width	Area	Total
1	75	75	5625	
2	80	75	6000	
3	95	75	7125	
4	100	75	7500	
5	140	75	10500	
6	150	75	11250	
7	165	75	12375	
8	175	75	13125	
9	195	75	14625	
10	200	75	15000	
11	225	75	16875	
12	250	75	18750	
13	260	75	19500	
14	290	75	21750	
15	300	75	22500	
16	315	75	23625	
17	335	75	25125	
18	355	75	26625	
19	370	75	27750	
20	395	75	29625	
21	400	75	30000	
22	400	75	30000	
23	415	75	31125	
24	420	75	31500	
25	420	75	31500	
26	420	75	31500	
27	430	75	32250	
28	500	75	37500	
29	520	75	39000	
30	520	75	39000	
31	520	75	39000	
32	510	75	38250	
33	430	75	32250	
34	430	75	32250	
35	420	75	31500	
36	420	75	31500	
37	390	75	29250	
38	340	75	25500	
39	300	75	22500	
40	280	75	21000	
41	260	75	19500	
42	250	75	18750	
43	240	75	18000	
44	210	75	15750	
45	200	75	15000	
46	190	75	14250	
47	180	75	13500	
48	175	75	13125	
49	165	75	12375	
50	155	75	11625	
51	145	75	10875	
52	105	75	7875	
53	100	75	7500	
54	80	75	6000	
55	75	75	5625	
56	50	75	3750	
57	50	75	3750	
				1,168,875 ft2
				26.83 acres

Segment	Length	Width	Area	Total
1	75	60	4500	
2	80	60	4800	
3	95	60	5700	
4	100	60	6000	
5	140	60	8400	
6	150	60	9000	
7	165	60	9900	
8	175	60	10500	
9	195	60	11700	
10	200	60	12000	
11	225	60	13500	
12	250	60	15000	
13	260	60	15600	
14	290	60	17400	
15	300	60	18000	
16	315	60	18900	
17	335	60	20100	
18	355	60	21300	
19	370	60	22200	
20	395	60	23700	
21	400	60	24000	
22	400	60	24000	
23	415	60	24900	
24	420	60	25200	
25	420	60	25200	
26	420	60	25200	
27	430	60	25800	
28	500	60	30000	
29	520	60	31200	
30	520	60	31200	
31	520	60	31200	
32	510	60	30600	
33	430	60	25800	
34	430	60	25800	
35	420	60	25200	
36	420	60	25200	
37	390	60	23400	
38	340	60	20400	
39	300	60	18000	
40	280	60	16800	
41	260	60	15600	
42	250	60	15000	
43	240	60	14400	
44	210	60	12600	
45	200	60	12000	
46	190	60	11400	
47	180	60	10800	
48	175	60	10500	
49	165	60	9900	
50	155	60	9300	
51	145	60	8700	
52	105	60	6300	
53	100	60	6000	
54	80	60	4800	
55	75	60	4500	
56	50	60	3000	
57	50	60	3000	
				935,100 ft2
				21.47 acres







TAILWATER, AREA, CAPACITY AND DISCHARGE CURVES

RESERVOIR CAPACITY ALLOCATIONS

PURPOSE	ELEVATIONS	CAPACITY ACRE-FEET
Surcharge	1131.4 to 1135	36,000
Joint use	1083.1 to 1131.4	450,000*
Active conservation	816.5 to 1083.1	1,516,000
Inactive	616.5 to 816.5	331,000
Dead	Streambed to 616.5	29,000
Total reservoir		2,326,000**

A surcharge of 36,000 a.f. (Maximum W.S. El. 1135) plus 450,000 a.f. in joint use capacity in combination with a spillway discharge of 327,000 c.f.s. is provided to protect against the inflow design flood which has a peak of 500,000 c.f.s. and a 5 day volume of 1,700,000 a.f..

*Maximum flood control space. Minimum flood control space is 325,000 a.f. with bottom of control pool at El. 1097.2 . 125,000 a.f. "floating" pool can be shifted to Folsom Reservoir.

**Includes 25,800 a.f. allowance for 100 year sediment deposition between stream and El. 1131.4 , but excludes 36,000 a.f. surcharge and 1,300 a.f. sediment above El. 1131.4 .

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
WATER AND POWER RESOURCES SERVICE
CENTRAL VALLEY PROJECT
AUBURN-FOLSOM SOUTH UNIT - CALIFORNIA

AUBURN DAM FEASIBILITY

CONCRETE CURVED GRAVITY DAM (CG-3) - MILE 20.

PLAN AND ELEVATION

DESIGNED ... SUBMITTED ...
DRAWN ... RECOMMENDED ...
CHECKED ... APPROVED ...
ASSISTANT COMMISSIONER AND CHIEF ENGINEER

DENVER, COLORADO — SHEET 1 OF 2 — AUG. 4, 1960 — 859-D-2731

EXHIBIT 4.7-2

CALCULATION COVER SHEET

Client: *USBR*

Project Name: *Auburn Dam*

Project/Calculation Number: *18600819.04000*

Title: Bridge Materials Quantities

Total Number of Pages (including cover sheet): *18*

Total Number of Computer Runs: *N/A*

Prepared By: *Eric Schlosser* **Date:** *5/3/06*

Checked By: **Date:**

Description and Purpose *To determine the materials quantities for 1-1000 ft long bridge.*

Design Basis/References/Assumptions
See following page

Remarks/Conclusions/Results
Division 2: One Bridge Abutment Excavation: 28,059 yd^3
Division 2:One Bridge Abutment Fill: 19,750 yd^3
Division 3:One Bridge Abutment Concrete: 8,488 yd^3
Division 3:One Bridge Abutment Reinforcing Steel: 2,122,000 lb

Division 2: One Bridge Pier Excavation:6296 yd^3
Division 2: One Bridge Pier Fill: 3467 yd^3
Division 3: One Bridge Pier Concrete: 15,329 yd^3
Division 3: One Bridge Pier Reinforcing Steel: 3,832,250 lb

Division 2:Total Asphalt Paving:3267tons ✓
Division5: Total Steel Road Decking:2,252,875 lb
Division 5: Total Structural Steel: 1,505,375 lb ← low ?

Division 2: Total Galvanized Guard Rail:37,074 lb
Division 2: Total Guard Rail Posts: 19,847 lb

Calculation Approved By:
Project Manager/Date

Revision No.:	Revision Description:	Approved By:

Project Manager/Date

Design Basis/ References/Assumptions:

Abutment layout based on sketch from Roy Watts (attached on page 9 of this calc package)

All reinforcement steel calculated using the factor: 250 lb steel per each cubic yard of concrete (factor suggested by Roy Watts)

Bridge Pier layout based on sketch from Roy Watts (attached on page 8 of this calc package)

Structural steel members sizes assumed. Steel Weights All From LRFD manual (excerpts attached). Steel members selected by reviewing sizes and weights, and selecting heavier weight members which appear adequate.
Bottom Cord: L8"x8"x1 1/8"
Top Cord: W30x391
Diagonals: L8"x8"x1 1/8"
Verticals: L5"x5"x7/8"
Internal Diagonal Truss Bracing: L5"x5"x7/8"

Bridge Decking Gage and Weight per square foot from "Big R Manufacturing" web page. Excerpt attached on page 15 of this calc package.

Paving Assumed to be 8" thick to account for bridge decking corrugations.

Guard Rail and post Weights taken from Vestil Manufacturing Corporation web page. Excerpt attaché don page 17 of this calc package.

Bridge configuration based on digital photo of existing bridge located on the American River. Photo attached on page 13 of this calc package. Google Earth web site used to establish scale in digital photo. Google Earth excerpt attached on page 14 of this calc package.

Division 2 02300 -315 Excavation & Fill

Bridge Abutment Excavation & Fill

Abutment Excavation

$120' \times 46' \times 40' = 220{,}800\ ft^3$

$\frac{1}{2}(46' \times 46' \times (120 + 2(46))2 + \frac{1}{2}(46 \times 46 \times 40')2 = 533{,}232\ ft^3$

Caisson: $\frac{\pi}{4}(3^2)(50) = 354\ ft^3$ 10 piers: $3540\ ft^3$ or $132\ yd^3$

$3540 ft^3 + 220{,}800\ ft^3 + 533{,}232\ ft^3 = 757{,}572 ft^3$ or $28{,}059 yd^3$

Abutment Fill

$754{,}032\ ft^3 - 46' \times 40' \times 120' = 533{,}232 ft^3$ or $19749.33 yd^3$

Division 3 03300 CIP Concrete -310 structural concrete.

Abutment

$46 \times 40 \times 120 = 220{,}800\ ft^3$

$4 \times 10 \times 120 = 4800 ft^3$ → $8356\ yd^3$

Caissons 10 piers @ $354 ft^3$ per pier : $132 yd^3$ → $8488 yd^3$

Division 3 03200 concrete Reinforcement -210 steel

*assume $250 lb/yd^3$

$8488 yd^3 \left(\frac{250 lb}{yd^3}\right) = 2{,}122{,}000\ lb$ steel

URS

Page 4 of 18

Job Auburn Dam | Project No. 18600819.04000 | Sheet ___ of ___

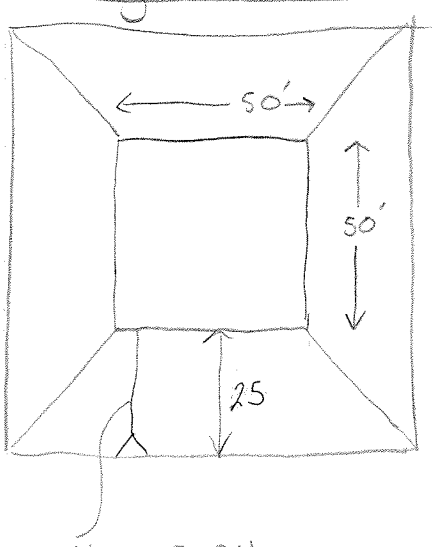
Description Bridge Quantity Calcs | Computed by EKS | Date 5/2/06

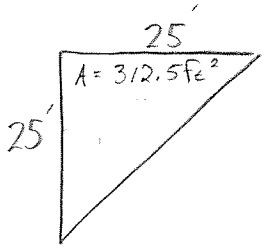
Checked by ___ | Date ___

Reference

Division 2 02300 -315 Excavation & Fill

Bridge Pier Excavation





$V_{Ex} = 50' \times 50' \times 25' + 312ft^2(100')2 + 312ft^2(50')2$

$V_{Ex} = 156,100\ ft^3$ or $5781.5\ yd^3$

$V_{fill} = 156,100\ ft^3 - 50' \times 50' \times 25' = 93,600\ ft^3$ or $3467\ yd^3$

Caisson Excavation:

$A_c = \frac{\pi}{4}(4')^2 = 12.6\ ft^2$

$L_c = 100'$

$V_c = 12.6ft^2(100ft) = 1260\ ft^3/1\ caisson$ or $46.7\ yd^3/1\ Caisson$

11 Caissons per pier ∴ $11(46.7yd^3) = 514\ yd^3$ Excavation

Total: $5782yd^3 + 514yd^3 = 6296yd^3$

Division 3 03300 CIP Concrete -310, structural Reference

Bridge Pier Concrete

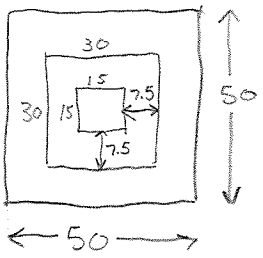
Caisson Concrete:

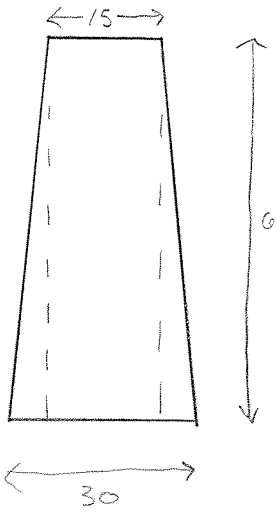
Vol (from Excavation Calc) = 46.7 yd^3/caisson

11 Caissons ∴ total Caisson conc. = 514 yd^3

Pier Base: 25'x50'x50' = 62,500 ft^3 or 2315 yd^3

Pier Stem:





600'x15'x15' = 135,000 ft^3

$\frac{1}{2}(600 \times 7.5 \times 30)2 + \frac{1}{2}(600 \times 7.5 \times 15)2 =$

= 202,500 ft^3

Stem Total: 337,500 ft^3 or 12,500 yd^3

Division 3 03200 Concrete Reinforcement

Total conc Vol: 514 yd^3 + 12,500 yd^3 + 2315 yd^3 = 15,329 yd^3

*assume factor of 250 lb of rebar for each cubic yard of conc.

$15{,}329\ yd^3 \left(\frac{250\ lb}{yd^3}\right) = 3{,}832{,}250$ lb of steel

URS

Page 6 of 18

Job Auburn Dam | Project No. 18600819.04000 | Sheet ___ of ___

Description Bridge Quantities | Computed by EKS | Date 5/3/06

Checked by ___ | Date ___

Division 5 — 05100 Structural Metal Framing — Reference

Bridge Steel — -120 Structural Steel

1000' length

bHm cord - assume L 8x8x 1⅛ (57.2 lb/ft)

1000'(57.2 lb/ft) = 57,200 lb per side, 114,400 lb total

top cord - assume W30x391 (391 lb/ft)

2000'(391 lb/ft) = 782,000 lb total

15/100 = x/1000

x = 20

Diagonals - assume 20 - 100' long per side

-assume L 8x8x1⅛ (57.2 lb/ft)

40 diagonals (100' per diagonal)(57.2 lb/ft) = 228,800 lb total

Verticals - assume 20 - 95' long per side

-assume L 5x5x⅞ (27.3 lb/ft)

40 verts (95' per vert)(27.3 lb/ft) = 103,740 lb

Internal truss members (within diagonals)

* Assume L5x5x⅞ (27.3 lb/ft)
* Assume 375' of Diagonal bracing, per 2 diagonals

20 diagonal pairs (375' bracing/pair)(27.3 lb/ft) = 204,750 lb

Bridge Decking

Area: 1000'(65') = 65,000 ft²

* assume .179" thick (7 gauge) steel (11.5 lb/ft²)

65,000 ft² (11.5 lb/ft²) = 747,500 lb decking steel

Steel: 114,400 + 782,000 + 228,800 + 103,740 + 204,750 = 1,433,690 lb

Add 5% for possible missed steel: 1,505,374.5 lb

Steel + Decking: 2,252,874.5 lb

Division 2 02700 Bases, Ballasts, Pavements Reference

-740 Flexible Pavement

Bridge Paving

* assume 8" thick asphalt, 65,000 ft² area

* assume asphalt density = 150 lb/ft³

0.67 ft (65,000 ft²) = 43,550 ft³ of Asphalt

$43{,}550\ ft^3 \left(150 \frac{lb}{ft^3}\right) = 6{,}532{,}500\ lb$ asphalt

or

3267 tons

Guard Rail * assume 2, 12" high runs per side

$\frac{2000'}{12'\ lengths} \cong 167$ sections per run,

2 runs ∴ 334 sections

111 lb/section (334 sections) = 37,074 lb of guard rail

* assume 60" tall, tubular posts

$\frac{3\ section}{4\ post} = \frac{167\ sections}{223\ posts}$

223 posts (89 lb/post) = 19,847 lb of posts

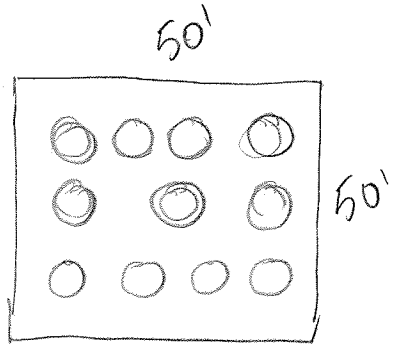
URS

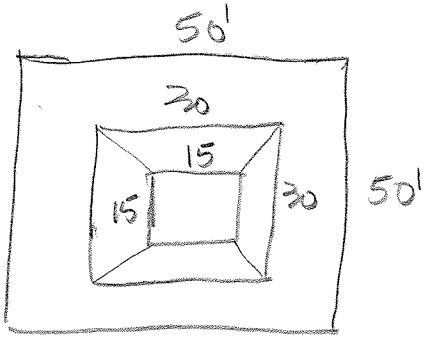
Job AUBURN DAM | Project No. | Page 8 of 18

Description BRIDGE PIERS | Computed by | Sheet ___ of ___

TYPICAL | Checked by | Date 05/01/06

Reference





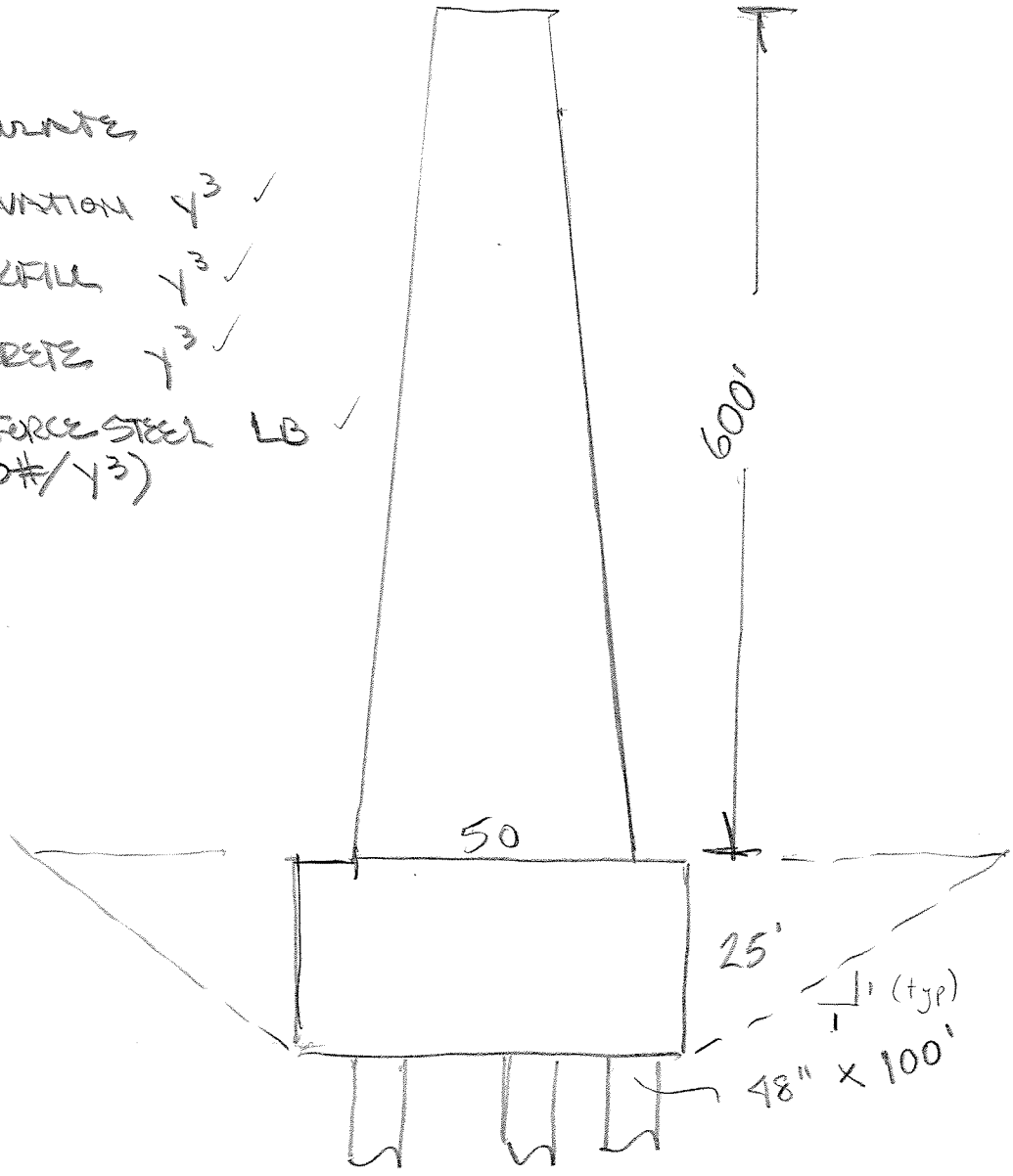
CALCULATE

EXCAVATION Y^3 ✓

BACKFILL Y^3 ✓

CONCRETE Y^3 ✓

REINFORCE STEEL LB ✓
(250#/Y^3)



URS

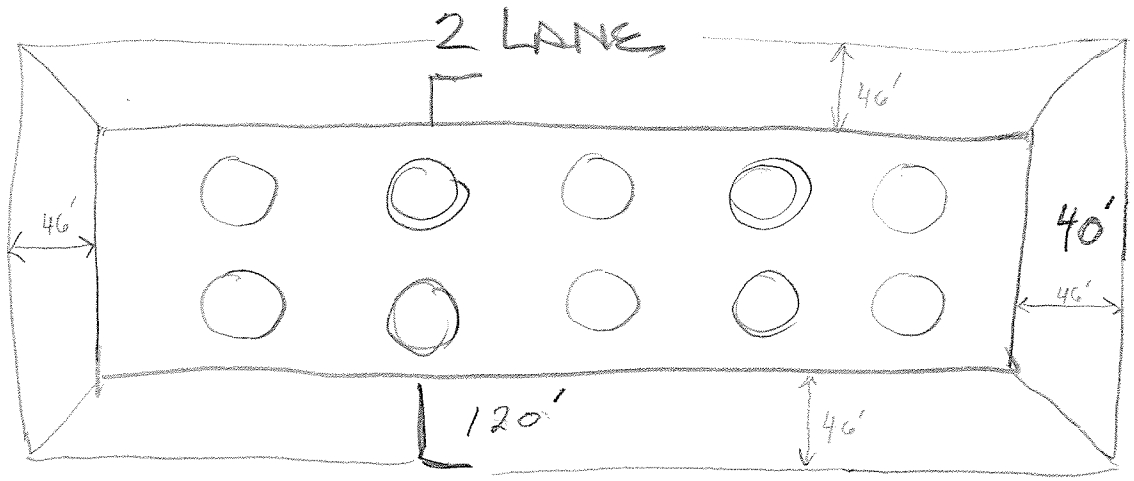
Page 9 of 18

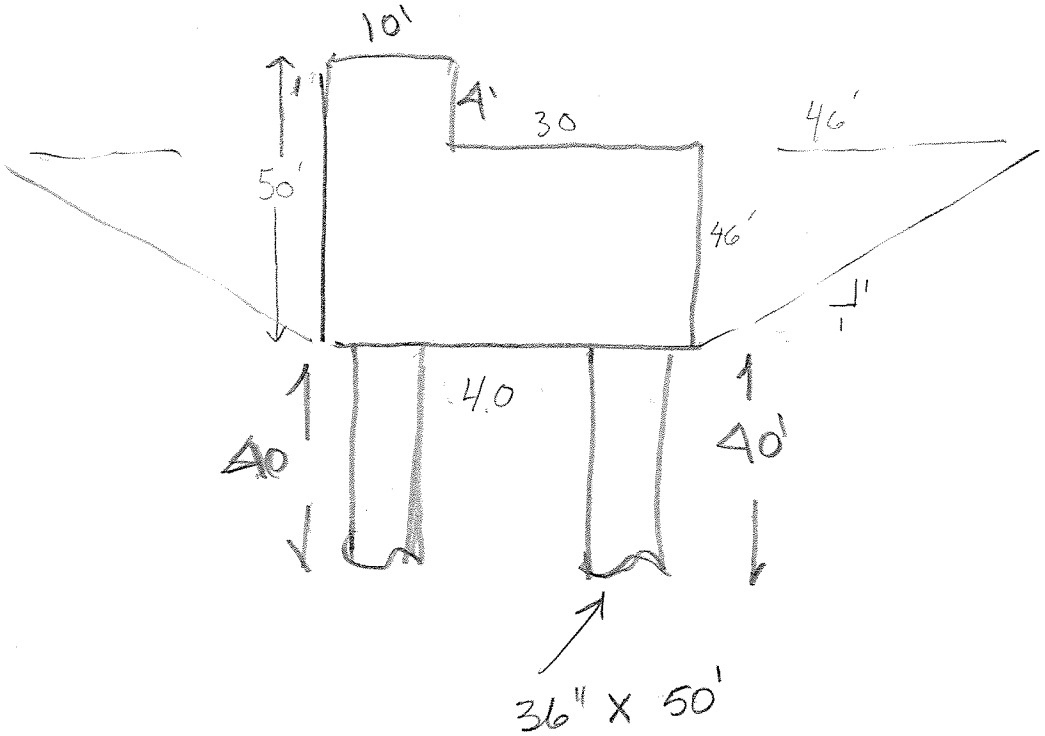
Job AUBURN DAM | Project No. | Sheet | of

Description BRIDGE ABUTMENTS TYPICAL | Computed by | Date 05/01/06

Checked by | Date

Reference





CALCULATE:

EXCAVATION y^3

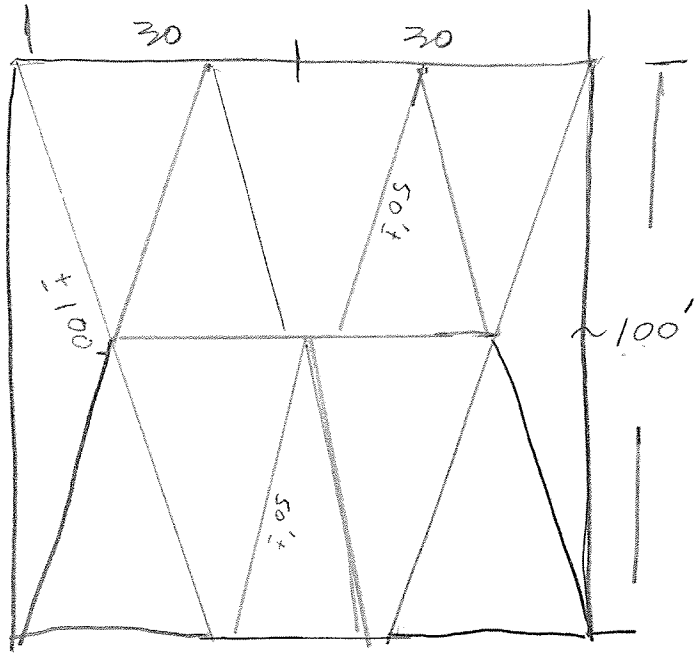
BACKFILL y^3

CONCRETE y^3

REINFORCE STEEL (250#/y^3) LB

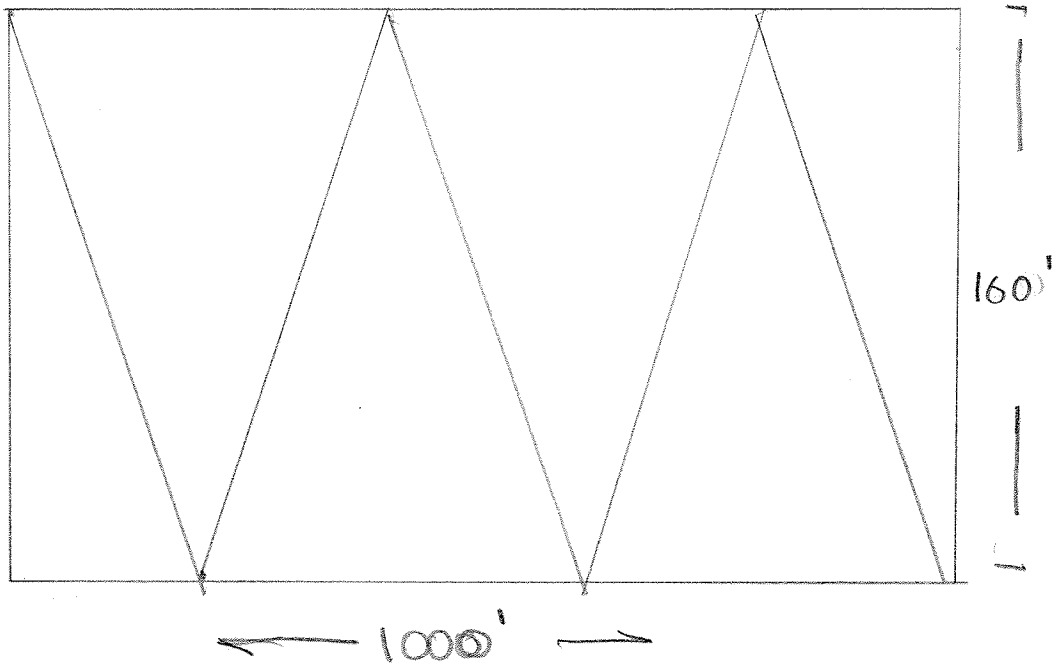
ASSUME 11

2 LANE DECK W/ HBP



CALCULATE LB/LF

TYPICAL



11/18

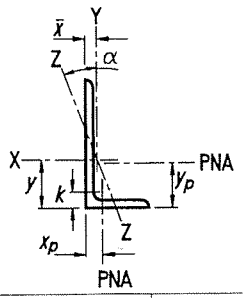


Table 1-7. Angles (L-Shapes) Properties

Shape	k	Wt.	Area, A	Axis X-X					
				I	S	r	$\bar{y}$	Z	y_p
	in.	lb/ft	in.^{2}	in.^{4}	in.^{3}	in.	in.	in.^{3}	in.
L8×8×1 1/8	1 3/4	57.2	16.8	98.1	17.5	2.41	2.40	31.6	1.05
×1	1 5/8	51.3	15.1	89.1	15.8	2.43	2.36	28.5	0.943
×7/8	1 1/2	45.3	13.3	79.7	14.0	2.45	2.31	25.3	0.832
×3/4	1 3/8	39.2	11.5	69.9	12.2	2.46	2.26	22.0	0.720
×5/8	1 1/4	33.0	9.69	59.6	10.3	2.48	2.21	18.6	0.606
×9/16	1 3/16	29.8	8.77	54.2	9.33	2.49	2.19	16.8	0.548
×1/2	1 1/8	26.7	7.84	48.8	8.36	2.49	2.17	15.1	0.490
L8×6×1	1 1/2	44.4	13.1	80.9	15.1	2.49	2.65	27.3	1.47
×7/8	1 3/8	39.3	11.5	72.4	13.4	2.50	2.60	24.3	1.41
×3/4	1 1/4	34.0	9.99	63.5	11.7	2.52	2.55	21.1	1.34
×5/8	1 1/8	28.6	8.41	54.2	9.86	2.54	2.50	17.9	1.27
×9/16	1 1/16	25.9	7.61	49.4	8.94	2.55	2.48	16.2	1.23
×1/2	1	23.2	6.80	44.4	8.01	2.55	2.46	14.6	1.20
×7/16	15/16	20.4	5.99	39.3	7.06	2.56	2.43	12.9	1.16
L8×4×1	1 1/2	37.6	11.1	69.7	14.0	2.51	3.03	24.3	2.47
×7/8	1 3/8	33.3	9.79	62.6	12.5	2.53	2.99	21.7	2.41
×3/4	1 1/4	28.9	8.49	55.0	10.9	2.55	2.94	18.9	2.34
×5/8	1 1/8	24.4	7.16	47.0	9.20	2.56	2.89	16.1	2.27
×9/16	1 1/16	22.1	6.49	42.9	8.34	2.57	2.86	14.6	2.23
×1/2	1	19.7	5.80	38.6	7.48	2.58	2.84	13.1	2.20
×7/16	15/16	17.4	5.11	34.2	6.59	2.59	2.81	11.6	2.16
L7×4×3/4	1 1/4	26.2	7.70	37.8	8.39	2.21	2.50	14.8	1.87
×5/8	1 1/8	22.1	6.50	32.4	7.12	2.23	2.45	12.5	1.80
×1/2	1	17.9	5.26	26.6	5.79	2.25	2.40	10.2	1.74
×7/16	15/16	15.8	4.63	23.6	5.11	2.26	2.38	9.0	1.70
×3/8	7/8	13.6	4.00	20.5	4.42	2.27	2.35	7.8	1.67
L6×6×1	1 1/2	37.5	11.0	35.4	8.55	1.79	1.86	15.4	0.918
×7/8	1 3/8	33.2	9.75	31.9	7.61	1.81	1.81	13.7	0.813
×3/4	1 1/4	28.8	8.46	28.1	6.64	1.82	1.77	11.9	0.705
×5/8	1 1/8	24.3	7.13	24.1	5.64	1.84	1.72	10.1	0.594
×9/16	1 1/16	22.0	6.45	22.0	5.12	1.85	1.70	9.18	0.538
×1/2	1	19.6	5.77	19.9	4.59	1.86	1.67	8.22	0.481
×7/16	15/16	17.3	5.08	17.6	4.06	1.86	1.65	7.25	0.423
×3/8	7/8	14.9	4.38	15.4	3.51	1.87	1.62	6.27	0.365
×5/16	13/16	12.5	3.67	13.0	2.95	1.88	1.60	5.26	0.306
L6×4×7/8	1 3/8	27.1	7.95	27.6	7.13	1.86	2.12	12.7	1.46
×3/4	1 1/4	23.5	6.90	24.4	6.23	1.88	2.08	11.1	1.40
×5/8	1 1/8	19.8	5.83	21.0	5.29	1.90	2.03	9.42	1.34
×9/16	1 1/16	17.9	5.27	19.2	4.81	1.91	2.01	8.57	1.31
×1/2	1	16.0	4.72	17.3	4.31	1.92	1.99	7.69	1.28
×7/16	15/16	14.1	4.15	15.4	3.81	1.92	1.97	6.79	1.26
×3/8	7/8	12.2	3.58	13.4	3.3	1.93	1.94	5.87	1.23
×5/16	13/16	10.2	2.99	11.3	2.77	1.94	1.92	4.93	1.21
L6×3 1/2×1/2	1	15.3	4.48	16.6	4.23	1.92	2.08	7.46	1.52
×3/8	7/8	11.6	3.41	12.8	3.24	1.94	2.04	5.71	1.46
×5/16	13/16	9.72	2.86	10.9	2.72	1.95	2.02	4.81	1.43
L5×5×7/8	1 3/8	27.3	8.02	17.8	5.16	1.49	1.56	9.31	0.802
×3/4	1 1/4	23.7	6.98	15.7	4.52	1.50	1.52	8.14	0.698
×5/8	1 1/8	20.1	5.90	13.6	3.85	1.52	1.47	6.93	0.590
×1/2	1	16.3	4.79	11.3	3.15	1.53	1.42	5.66	0.479
×7/16	15/16	14.4	4.22	10.0	2.78	1.54	1.40	5.00	0.422
×3/8	7/8	12.4	3.65	8.76	2.41	1.55	1.37	4.33	0.365
×5/16	13/16	10.4	3.07	7.44	2.04	1.56	1.35	3.65	0.307

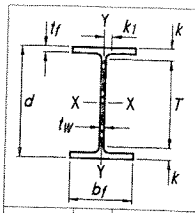
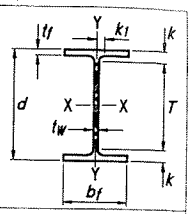


Table 1-1 (cont.). W-Shapes Dimensions

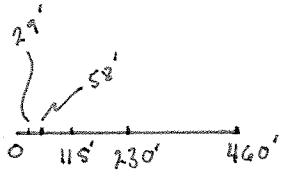
Shape	Area, A	Depth, d	Web		Flange		Distance				Workable Gage[1]
			Thickness, t_w	$\frac{t_w}{2}$	Width, b_f	Thickness, t_f	k		k_1	T	
	in.²	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
W33×387*	114	36.0	36	1.26	1 1/4	5/8	16.2	16 1/4	2.28	2 1/4	3.07	3 3/16	1 7/16	29 5/8	5 1/2
×354*	104	35.6	35 1/2	1.16	1 3/16	5/8	16.1	16 1/8	2.09	2 1/16	2.88	2 15/16	1 3/8		
×318*	93.6	35.2	35 1/8	1.04	1 1/16	9/16	16.0	16	1.89	1 7/8	2.68	2 3/4	1 5/16		
×291	85.7	34.8	34 7/8	0.960	15/16	1/2	15.9	15 7/8	1.73	1 3/4	2.52	2 5/8	1 5/16		
×263	77.5	34.5	34 1/2	0.870	7/8	7/16	15.8	15 3/4	1.57	1 9/16	2.36	2 7/16	1 1/4		
×241	71.0	34.2	34 1/8	0.830	13/16	7/16	15.9	15 7/8	1.40	1 3/8	2.19	2 1/4	1 1/4		
×221	65.2	33.9	33 7/8	0.775	3/4	3/8	15.8	15 3/4	1.27	1 1/4	2.06	2 1/8	1 3/16		
×201	59.2	33.7	33 5/8	0.715	11/16	3/8	15.7	15 3/4	1.15	1 1/8	1.94	2	1 3/16		
W33×169	49.5	33.8	33 7/8	0.670	11/16	3/8	11.5	11 1/2	1.22	1 1/4	1.92	2 1/8	1 3/16	29 5/8	5 1/2
×152	44.8	33.5	33 1/2	0.635	5/8	5/16	11.6	11 5/8	1.06	1 1/16	1.76	1 15/16	1 1/8		
×141	41.6	33.3	33 1/4	0.605	5/8	5/16	11.5	11 1/2	0.960	15/16	1.66	1 13/16	1 1/8		
×130	38.3	33.1	33 1/8	0.580	9/16	5/16	11.5	11 1/2	0.855	7/8	1.56	1 3/4	1 1/8		
×118	34.7	32.9	32 7/8	0.550	9/16	5/16	11.5	11 1/2	0.740	3/4	1.44	1 5/8	1 1/8		
W30×391*	115	33.2	33 1/4	1.36	1 3/8	11/16	15.6	15 5/8	2.44	2 7/16	3.23	3 3/8	1 1/2	26 1/2	5 1/2
×357*	105	32.8	32 3/4	1.24	1 1/4	5/8	15.5	15 1/2	2.24	2 1/4	3.03	3 1/8	1 7/16		
×326*	95.8	32.4	32 3/8	1.14	1 1/8	9/16	15.4	15 3/8	2.05	2 1/16	2.84	2 15/16	1 3/8		
×292*	85.9	32.0	32	1.02	1	1/2	15.3	15 1/4	1.85	1 7/8	2.64	2 3/4	1 5/16		
×261	76.9	31.6	31 5/8	0.930	15/16	1/2	15.2	15 1/8	1.65	1 5/8	2.44	2 9/16	1 5/16		
×235	69.2	31.3	31 1/4	0.830	13/16	7/16	15.1	15	1.50	1 1/2	2.29	2 3/8	1 1/4		
×211	62.2	30.9	31	0.775	3/4	3/8	15.1	15 1/8	1.32	1 5/16	2.10	2 1/4	1 3/16		
×191	56.3	30.7	30 5/8	0.710	11/16	3/8	15.0	15	1.19	1 3/16	1.97	2 1/16	1 3/16		
×173	51.0	30.4	30 1/2	0.655	5/8	5/16	15.0	15	1.07	1 1/16	1.85	2	1 1/8		
W30×148	43.5	30.7	30 5/8	0.650	5/8	5/16	10.5	10 1/2	1.18	1 3/16	1.83	2 1/16	1 1/8	26 1/2	5 1/2
×132	38.9	30.3	30 1/4	0.615	5/8	5/16	10.5	10 1/2	1.00	1	1.65	1 7/8	1 1/8		
×124	36.5	30.2	30 1/8	0.585	9/16	5/16	10.5	10 1/2	0.930	15/16	1.58	1 13/16	1 1/8		
×116	34.2	30.0	30	0.565	9/16	5/16	10.5	10 1/2	0.850	7/8	1.50	1 3/4	1 1/8		
×108	31.7	29.8	29 7/8	0.545	9/16	5/16	10.5	10 1/2	0.760	3/4	1.41	1 11/16	1 1/8		
×99	29.1	29.7	29 5/8	0.520	1/2	1/4	10.5	10 1/2	0.670	11/16	1.32	1 9/16	1 1/16		
×90	26.4	29.5	29 1/2	0.470	1/2	1/4	10.4	10 3/8	0.610	5/8	1.26	1 1/2	1 1/16		
W27×539*	159	32.5	32 1/2	1.97	2	1	15.3	15 1/4	3.54	3 9/16	4.33	4 7/16	1 13/16	23 5/8	5 1/2
×368*	108	30.4	30 3/8	1.38	1 3/8	11/16	14.7	14 5/8	2.48	2 1/2	3.27	3 3/8	1 1/2		5 1/2
×336*	98.9	30.0	30	1.26	1 1/4	5/8	14.6	14 1/2	2.28	2 1/4	3.07	3 3/16	1 7/16		
×307*	90.4	29.6	29 5/8	1.16	1 3/16	5/8	14.4	14 1/2	2.09	2 1/16	2.88	3	1 7/16		
×281*	82.9	29.3	29 1/4	1.06	1 1/16	9/16	14.4	14 3/8	1.93	1 15/16	2.72	2 13/16	1 3/8		
×258	76.0	29.0	29	0.980	1	1/2	14.3	14 1/4	1.77	1 3/4	2.56	2 11/16	1 5/16		
×235	69.4	28.7	28 5/8	0.910	15/16	1/2	14.2	14 1/4	1.61	1 5/8	2.40	2 1/2	1 5/16		
×217	64.0	28.4	28 3/8	0.830	13/16	7/16	14.1	14 1/8	1.50	1 1/2	2.29	2 3/8	1 1/4		
×194	57.2	28.1	28 1/8	0.750	3/4	3/8	14.0	14	1.34	1 5/16	2.13	2 1/4	1 3/16		
×178	52.5	27.8	27 3/4	0.725	3/4	3/8	14.1	14 1/8	1.19	1 3/16	1.98	2 1/16	1 3/16		
×161	47.6	27.6	27 5/8	0.660	11/16	3/8	14.0	14	1.08	1 1/16	1.87	2	1 3/16		
×146	43.1	27.4	27 3/8	0.605	5/8	5/16	14.0	14	0.975	1	1.76	1 7/8	1 1/8		
W27×129	37.8	27.6	27 5/8	0.610	5/8	5/16	10.0	10	1.10	1 1/8	1.70	2	1 1/8	23 5/8	5 1/2
×114	33.5	27.3	27 1/4	0.570	9/16	5/16	10.1	10 1/8	0.930	15/16	1.53	1 13/16	1 1/8		
×102	30.0	27.1	27 1/8	0.515	1/2	1/4	10.0	10	0.830	13/16	1.43	1 3/4	1 1/16		
×94	27.7	26.9	26 7/8	0.490	1/2	1/4	9.99	10	0.745	3/4	1.34	1 5/8	1 1/16		
×84	24.8	26.7	26 3/4	0.460	7/16	1/4	9.96	10	0.640	5/8	1.24	1 9/16	1 1/16		

ASTM A6 tensile group 4 or 5 shape. Special requirements may apply. [illegible]

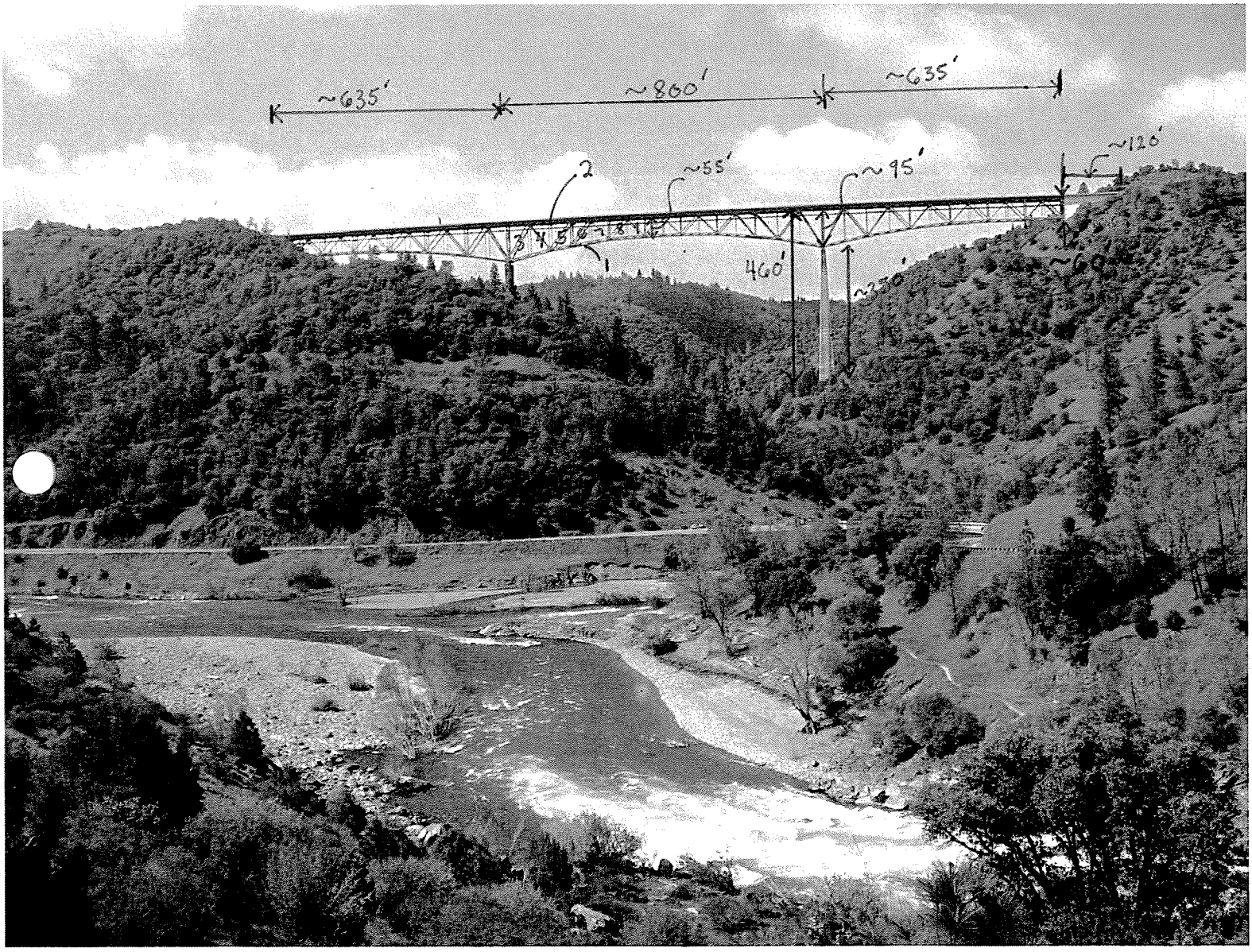
Table 1-1 (cont.). W-Shapes Properties



Nominal Wt.	Compact Section Criteria			X_1	$X_2 \times 10^6$	Axis X-X				Axis Y-Y			
	$\frac{b_f}{2t_f}$	$\frac{h}{t_w}$	F_y'''			I	S	r	Z	I	S	r	Z
lb/ft			ksi	ksi	(1/ksi)²	in.⁴	in.³	in.	in.³	in.⁴	in.³	in.	in.³
387	3.55	23.7	–	3850	752	24300	1350	14.6	1560	1620	200	3.77	312
354	3.85	25.7	–	3530	1040	22000	1240	14.5	1420	1460	181	3.74	282
318	4.23	28.7	–	3210	1530	19500	1110	14.5	1270	1290	161	3.71	250
291	4.60	31.0	–	2930	2150	17700	1020	14.4	1160	1160	146	3.68	226
263	5.03	34.3	54.8	2680	3080	15900	919	14.3	1040	1040	131	3.66	202
241	5.66	35.9	49.9	2440	4510	14200	831	14.1	940	933	118	3.62	182
221	6.20	38.5	43.5	2250	6340	12900	759	14.1	857	840	106	3.59	164
201	6.85	41.7	37.0	2050	9180	11600	686	14.0	773	749	95.2	3.56	147
169	4.71	44.7	32.2	2160	8150	9290	549	13.7	629	310	53.9	2.50	84.4
152	5.48	47.2	28.9	1940	12900	8160	487	13.5	559	273	47.2	2.47	73.9
141	6.01	49.6	26.2	1800	17800	7450	448	13.4	514	246	42.7	2.43	66.9
130	6.73	51.7	24.1	1660	25100	6710	406	13.2	467	218	37.9	2.39	59.5
118	7.76	54.5	21.7	1510	37700	5900	359	13.0	415	187	32.6	2.32	51.3
391	3.19	19.7	–	4520	394	20700	1250	13.4	1450	1550	198	3.67	310
357	3.45	21.6	–	4170	539	18700	1140	13.3	1320	1390	179	3.64	279
326	3.75	23.4	–	3820	749	16800	1040	13.2	1190	1240	162	3.60	252
292	4.12	26.2	–	3460	1110	14900	930	13.2	1060	1100	144	3.58	223
261	4.59	28.7	–	3110	1680	13100	829	13.1	943	959	127	3.53	196
235	5.02	32.2	62.1	2830	2440	11700	748	13.0	847	855	114	3.51	175
211	5.74	34.5	54.1	2530	3840	10300	665	12.9	751	757	100	3.49	155
191	6.35	37.7	45.4	2290	5660	9200	600	12.8	675	673	89.5	3.46	138
173	7.04	40.8	38.6	2090	8270	8230	541	12.7	607	598	79.8	3.42	123
148	4.44	41.6	37.3	2310	6270	6680	436	12.4	500	227	43.3	2.28	68.0
132	5.27	43.9	33.4	2050	10500	5770	380	12.2	437	196	37.2	2.25	58.4
124	5.65	46.2	30.2	1930	13500	5360	355	12.1	408	181	34.4	2.23	54.0
116	6.17	47.8	28.2	1800	17700	4930	329	12.0	378	164	31.3	2.19	49.2
108	6.89	49.6	26.2	1680	24200	4470	299	11.9	346	146	27.9	2.15	43.9
99	7.80	51.9	23.9	1560	34100	3990	269	11.7	312	128	24.5	2.10	38.6
90	8.52	57.5	19.5	1410	49600	3610	245	11.7	283	115	22.1	2.09	34.7
539	2.15	12.1	–	7160	67.1	25600	1570	12.7	1890	2110	277	3.65	437
368	2.96	17.3	–	5120	241	16200	1060	12.2	1240	1310	179	3.48	279
336	3.19	18.9	–	4690	337	14600	972	12.1	1130	1180	162	3.45	252
307	3.46	20.6	–	4310	466	13100	887	12.0	1030	1050	146	3.41	227
281	3.72	22.5	–	3990	626	11900	814	12.0	936	953	133	3.39	206
258	4.03	24.4	–	3680	863	10800	745	11.9	852	859	120	3.36	187
235	4.41	26.2	–	3380	1210	9700	677	11.8	772	769	108	3.33	168
217	4.71	28.7	–	3130	1610	8910	627	11.8	711	704	99.8	3.32	154
194	5.24	31.8	63.6	2820	2430	7860	559	11.7	631	619	88.1	3.29	136
178	5.92	32.9	59.5	2580	3570	7020	505	11.6	570	555	78.8	3.25	122
161	6.49	36.1	49.3	2340	5150	6310	458	11.5	515	497	70.9	3.23	109
146	7.16	39.4	41.4	2130	7460	5660	414	11.5	464	443	63.5	3.20	97.7
129	4.55	39.7	40.8	2380	5420	4760	345	11.2	395	184	36.8	2.21	57.6
114	5.41	42.5	35.6	2100	9220	4080	299	11.0	343	159	31.5	2.18	49.3
102	6.03	47.1	29.1	1890	14100	3620	267	11.0	305	139	27.8	2.15	43.4
94	6.70	49.5	26.3	1740	19900	3270	243	10.9	278	124	24.8	2.12	38.8
84	7.78	52.7	23.2	1570	31100	2850	213	10.7	244	106	21.2	2.07	33.2



(scale derived from Google earth)



1 ⇝ bttm cord

2 ⇝ top cord

3 ⇝ diagonal, length of 3 → ~100'

14/18


Abutment
EL. 1280'
Pier Shadow
Δ EL = 460'
EL. ~820'
EL. ~560'
River
Foresthill Rd
Pier Shadow
Abutment
± El. 1280'
Old Foresthill Rd
© 2006 Europa Technologies
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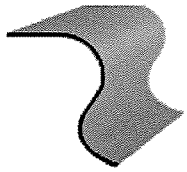

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Steel Bridge Decking

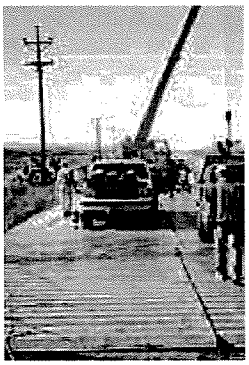
Big R Manufacturing roll forms 4 1/4"-deep bridge flooring using Grade 50 steel in either pre-galvanized or bare steel. If the latter is used, it can be prime painted.

Steel decked bridges can be built in any weather conditions. The steel deck is used in new construction or to rehabilitate existing structures.

Welding steel deck in fabrication plant.

Bridge Deck Fastening

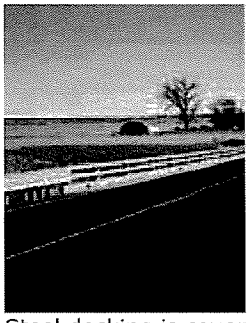
- Weld each piece to stringer with deck thickness x 3" fillet welds.
- Weld between stringers at overlap with 3" fillet weld every 30"± or between stringers.
- End splices are to be staggered and located over stringers. Crests of end splices are to be butt welded.



Installation of steel de
Colorado DOT rehabili

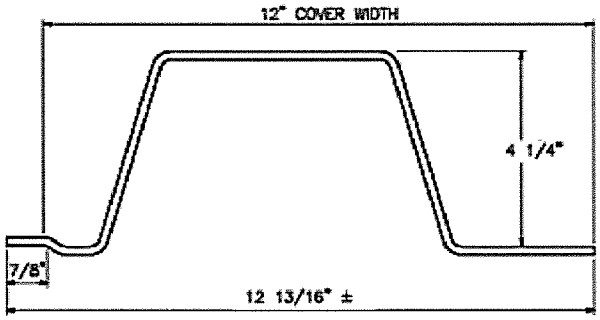
Asphalt Surface Installation Instructions

- Clean metal surfaces of all foreign matter.
- Apply tack coat over the deck surface.
- Fill and compact all corrugation troughs with asphalt to the top of the deck.
- Overlay with a leveling course and additional courses as necessary to achieve a final wearing course. Compact to required density.



Steel decking is cover
asphalt surface.

Steel Bridge Deck Profile



16/19

Engineering Data, 12" x 4 1/4" Bridge Decking

Thickness		Yield Point (ksi)	Weight (psf)	Moment of Inertia ($in.^4/ft$)	Section Modulus ($in.^3/ft$)	Allowable Net Span*		
Gauge	Inches					HS-20 Span	HS-25 Span	HS-30 Span
9	0.149	50	9.6	8.62	3.65	57"	53"	50"
7	0.179	50	11.5	10.34	4.34	65"	60"	56"

*Net span is the clear span between stringer flanges.

Steel decking is neste
shipping.

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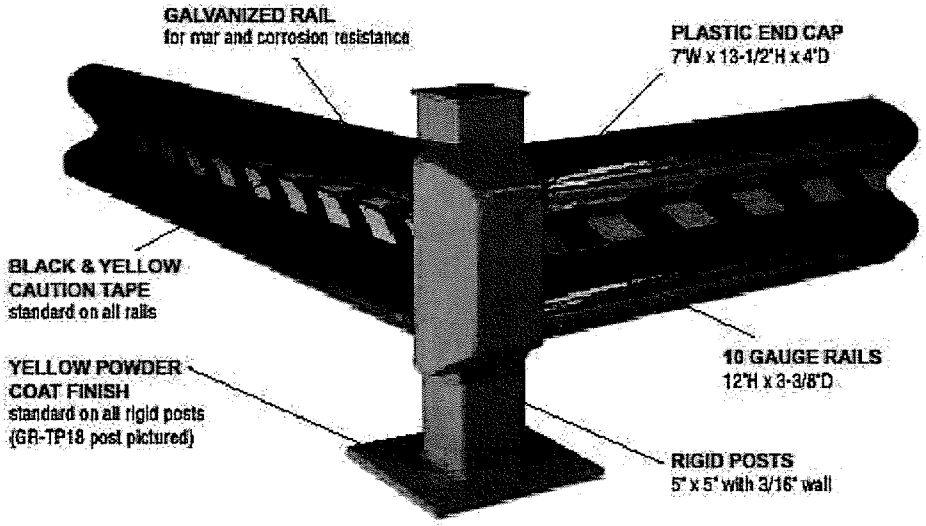
BIG R Manufact

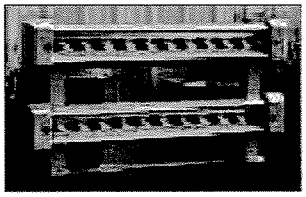
Guard Rail Systems

< Protective Barriers Main Page

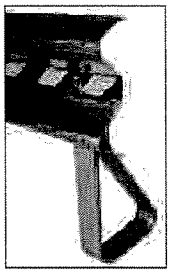
Protect personnel and equipment both visually and physically with our *Guard Rail Systems*. Choose our galvanized guard rail or our structural c-channel guard rail, both offer maximum durability and protection. These economical systems can be utilized indoors or outdoors. Choose between one, two, or three rail high systems. Tubular posts are machined for continuous or perpendicular rail mounting. US D.O.T. guardrail mounting and I-beam posts available, contact factory. Post mounting hardware included. Floor mounting kit sold separately.

▶ Galvanized Guard Rail

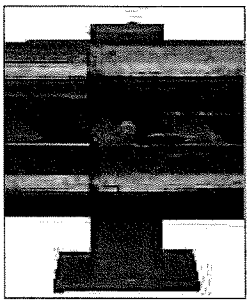




Double Rail
Mount two rails onto a single post to protect a



higher/larger area (GR-TP42 Posts Pictured)



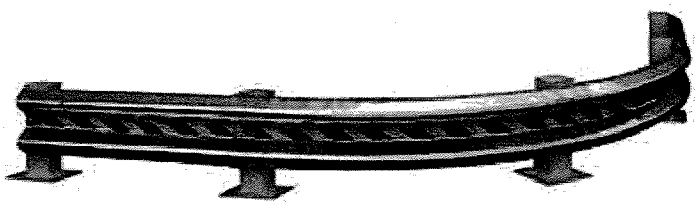
Overlapping Rails
Deduct 5" from length when overlapping rails

Spring Post
Model GR-SP Post flexes when hit

Galvanized Guard Rail				
Model	Description	Height	Length	Net Weight (lbs)
GR-4	Galvanized Guard Rail	12"	48"	37
GR-6	Galvanized Guard Rail	12"	72"	55
GR-8	Galvanized Guard Rail	12"	96"	74
GR-10	Galvanized Guard Rail	12"	120"	93
GR-12	Galvanized Guard Rail	12"	144"	111

Galvanized Guard Rail Options			
Model	Description	Height	Net Weight (lbs)
GR-SP	Spring Post	24"	21
GR-TP18	Tubular Post	18"	41
GR-TP42	Tubular Post	42"	60
GR-TP60	Tubular Post	60"	89
GR-TP72	Tubular Post	72"	109
GR-ABK	Mounting Kit (4) ¾" x 4" Anchor Bolts		2
GR-SPP	Spring Post Mounting Plate (Asphalt)		3

▶ 90° Curved Galvanized Guard Rails



Protect the corners of buildings and walls from damage from fork trucks and vehicles. Also works good at corners of driveways to direct traffic. Features a 90° angle and works with our GR series

Eric Schlosser

Auburn Dam 18600819.04000

5/5/06

Phone Conversation Record

- Call to Jack Web of Steadfast Bridge (Alabama)
  Phone # 1-800-749-7515
- asked Jack, for 1500' span (abutment to abutment)
  1) what is steel weight
  2) what is cost

- Jack stated that, if we used 150' sections, 24' wide, the cost would be approx. $450,000/section & the weight would be approx 170,000 lb/section

5/8/06

- Call Jack Web back to clarify whether a bridge pier is required at each 150' section end, or whether these sections are bolted/welded to create a span.

- Jack stated that: Steadfast Bridge does not provide bridges of these dimensions, nor does he have an idea of weight or cost for this specialized type of bridge.

EXHIBIT 4.7-2

CALCULATION COVER SHEET

Client: *USBR*

Project Name: *Auburn Dam*

Project/Calculation Number: *18600819.04000*

Title: *Recreation Materials Quantities*

Total Number of Pages (including cover sheet): *27*

Total Number of Computer Runs: *N/A*

Prepared By: *Eric Schlosser* **Date:** *5/5/06*

Checked By: **Date:**

Description and Purpose *To determine the Recreation Facilities construction quantities.*

Design Basis/References/Assumptions

Table III-2 of the Auburn Dam and Reservoir Project Description and Considerations was utilized for and overview of the Recreation facilities. (attached)

Assumed standard details for elements of each facility are attached to this calculation package.

Numerous assumptions about elements of the project can be found on pages 20-27 of this calculation package

Remarks/Conclusions/Results

See page 2 of this calculation package.

Calculation Approved By:

Project Manager/Date

Revision No.:	Revision Description:	Approved By:

Project Manager/Date

RECREATION FACILITIES CONSTRUCTION QUANTITIES

	Total	
Division 2		
Earthwork	134045	yd^3
Bases	96853	yd^3
Pavements (includes parking improvements)	66438	tons
Fences and Gates	24434	ft
Signs	943	signs
Division 3		
CIP Concrete	18789	yd^3
Concrete Reinforcement	3382000	lb
Division 4		
Masonry	84700	ft^2
Division 16		
Electrical Service	31	facilities requiring service

Assumptions:

Plan View Area per Capmsite/On Shore Boat Camps	1600	ft^2	
Length of Road per Campsite/Picnic Site	50	ft	
Bathroom Facilities	2	per campground	
Bathrooms Plan Area	900	ft^2	
Entrance Booth	1	per campground	
Plan Area of Entrance Booth	400	ft^2	
Road/Boat Ramp Asphalt	1.2	tons per linear foot of road	
Road/Boat Ramp Roadbase	1.2	yd^3 per linear foot of road	
Road/Boat Ramp Excavation	1.7	yd^3 per linear foot of road	
Boat Ramp Length	60	ft per ramp	
Boat Ramp Signs	2	signs per ramp	
Concrete Reinforcement	180	lb/yd^3 of concrete	
All Buildings Slab Thickness	1.5	ft	
Building Excavation	0.06	yd^3 per square foot of building	
Building Utility Excavation	.520	yd^3 per building	
Entrance Booth Masonry	700	ft^2 per building	
Admin Bldg Masonry	7500	ft^2 per building	
Bathroom Masonry	600	ft^2 per building	
Admin /Boat Rental/ etc Facilities Plan Area	40000	ft^2	
Bike Path Excavation	0.5	yd^3 per linear foot of path	
Bike Path Asphalt	0.2	yd^3 per linear foot of path	
Bike Path Roadbase	0.3	yd^3 per linear foot of path	
Bike Path Fencing	0.04	ft per ft of bike path	(200 ft per mile)
Plan Area Parking Lots and Staging Areas/Historic Vistas	570	ft^2 per parking space	(includes roadway within parking area)
Parking Area Excavation	32	yd^3 per 1 total parking space area	
Parking Area Roadbase	21	yd^3 per 1 total parking space area	
Parking Area Pavement	11	yd^3 per 1 total parking space area	
Parking Area signs	5	per parking area	
Parking Area fencing	300	ft per parking area	
Trail (dirt) excavation	0.1	yd^3 per linear foot of trail	
Trail Signs	0.00020	signs per ft	(1 sign per mile)
Trail Camp Excavation	0.5	yd^3 per trail camp	
Trail Camp Signs	2.0	signs per camp	
Signs	0.006	signs per linear foot of road	(4 signs per mile of roadway)
Campground Signs	15	per campground/picnic area	
Fencing	600	ft per campground/picnic area	

Multi Use Areas Considered Equivalent to Picnic Areas
Marinas equivalent to administrative areas
Four Wheel Road (assumed to exist already)
Vistas considered equivalent to parking areas

Number of Auto Campgrounds	2
Sites per Campground	140
Total Number of Camp Sites	280

Division 2

	Total	
Earthwork	1196	yd^3
Bases	16800	yd^3
Pavements (includes parking improvements)	16800	tons
Fences and Gates	1200	ft
Signs	30	signs

Division 3

CIP Concrete	144	yd^3
Concrete Reinforcement	26000	lb

Division 4

Masonry	5200	ft^2

Division 16

Electrical Service	4	facilities requiring service

Roads Within Campground

Total lengh:	14000	ft
Total ABC	16800	yd^3
Total HBP	16800	tons
Total Excavation	23800	yd^3
Signs	30	signs

Buildings

Number of bathrooms:	2	
Number of entrance booths	2	
Square Footage per bathroom	900	ft^2
Square Footage per entrance booth	400	ft^2
Utility Excavation	1040	yd^3
Building Excavation	156	yd^3
Total Excavation	1196	yd^3
Bathroom Masonry	2400	ft^2
Entrance Booth Masonry	2800	ft^2
Entrance Booth Concrete	22	yd^3
Bathroom Concrete	50	yd^3
Total Concrete	144	yd^3
Bathroom Electric Service	yes	per all
Entrance Booth Electric Service	yes	per all
Entrance Booth Rebar	4000	lb
Bathroom Rebar	9000	lb
Total Rebar	26000	lb

Number of Picnic Areas	10
Sites per Picnic Area	24.5
Total Number of Picnic Areas	245

Division 2

	Total	
Earthwork	5740	yd^3
Bases	14700	yd^3
Pavements (includes parking improvements)	14700	tons
Fences and Gates	6000	ft
Signs	150	signs

Division 3

CIP Concrete	500	yd^3
Concrete Reinforcement	90000	lb

Division 4

Masonry	6000	ft^2

Division 16

Electrical Service	10	facilities requiring service

Roads Within Picnic Area

Total lengh:	12250	ft
Total ABC	14700	yd^3
Total HBP	14700	tons
Total Excavation	20825	yd^3
Signs	150	signs

Buildings

Number of bathrooms:	10	
Square Footage per bathroom	900	ft^2
Utility Excavation	5200	yd^3
Building Excavation	540	yd^3
Total Excavation	5740	yd^3
Total Bathroom Masonry	6000	ft^2
Total Bathroom Concrete	500	yd^3
Total Bathroom Rebar	90000	lb
Bathroom Electric Service	yes	per all

Number of Multi Use Areas	3
Total Number of Sites per area	120

Division 2

	Total	
Earthwork	5362	yd^3
Bases	7200	yd^3
Pavements (includes parking improvements)	7200	tons
Fences and Gates	6000	ft
Signs	45	signs

Division 3

CIP Concrete	150	yd^3
Concrete Reinforcement	27000	lb

Division 4

Masonry	1800	ft^2

Division 16

Electrical Service	3	facilities requiring service

Roads Within Campground

Total lengh:	6000	ft
Total ABC	7200	yd^3
Total HBP	7200	tons
Total Excavation	10200	yd^3
Signs	150	signs

Buildings

Number of bathrooms:	3	
Square Footage per bathroom	900	ft^2
Utility Excavation	5200	yd^3
Building Excavation	162	yd^3
Total Excavation	5362	yd^3
Total Bathroom Masonry	1800	ft^2
Total Bathroom Concrete	150	yd^3
Total Bathroom Rebar	27000	lb
Bathroom Electric Service	yes	per all

Total length of Bike trails	63360 ft

Division 2

	Total
Earthwork	29333 yd^3
Bases	17600 yd^3
Pavements (includes parking improvements)	11722 tons
Fences and Gates	2534 ft
Signs	380 signs

Number of Trail Staging Areas	10
Cars per Staging Area	23
Total Cars	230

Division 2

	Total	
Earthwork	7283.333	yd^3
Bases	4855.556	yd^3
Pavements (includes parking improvements)	2427.778	tons
Fences and Gates	3000	ft
Signs	50	signs

Miles of Trail	633600 ft

Division 2

	Total
Earthwork	35200 yd^3
Signs	127 signs

Number of Trail Camps	5
People per camp	10

Division 2

	Total
Earthwork	3 yd^3
Signs	10 signs

Number of Boat Ramps	3
Lanes per Boat Ramp	5
Total Number of Lanes	15

Division 2

	Total
Earthwork	1530 yd^3
Bases	1080 yd^3
Pavements (includes parking improvements)	1080 tons
Signs	6 signs

Number of Car top boat launch Areas	5
Cars per Area	19
Total Cars	95

Division 2

	Total	
Earthwork	3008	yd^3
Bases	2006	yd^3
Pavements (includes parking improvements)	1003	tons
Fences and Gates	1500	ft
Signs	25	signs

Number of Marina's	1
Parking Capacity	200 Cars

Division 2

	Total
Earthwork	9253 yd^3
Bases	4222 yd^3
Pavements (includes parking improvements)	2111 tons
Signs	5 signs

Division 3

CIP Concrete	2222 yd^3
Concrete Reinforcement	400000 lb

Division 4

Masonry	7500 ft^2

Division 16

Electrical Service	1 facilities requiring service

Roads Within Marina

Number of parking spaces:	200
Total ABC	4222.222 yd^3
Total HBP	2111.111 tons
Total Excavation	6333 yd^3
Signs	5 signs

Building

Number of admin/marina bldg:	1
Square Footage per bldg	40000 ft^2
Utility Excavation	520 yd^3
Building Excavation	2400 yd^3
Total Excavation	2920 yd^3
Admin/Marina Masonry	7500 ft^2
Admin/Marina Concrete	2222 yd^3
Admin/marina Electric Service	yes
Admin/Marina rebar	400000 lb

Number of Boat Campgrounds	3
Sites per Campground	20
Total Number of Camp Sites	60

Division 2

	Total	
Earthwork	1794	yd^3
Bases	16800	yd^3
Pavements (includes parking impro\	3600	tons
Fences and Gates	1200	ft
Signs	30	signs

Division 3

CIP Concrete	217	yd^3
Concrete Reinforcement	39000	lb

Division 4

Masonry	11700	ft^2

Division 16

Electrical Service	6	facilities requiring service

Roads Within Campground

Total lengh:	3000	ft
Total ABC	16800	yd^3
Total HBP	3600	tons
Total Excavation	5100	yd^3
Signs	45	signs

Buildings

Number of bathrooms:	3	
Number of entrance booths	3	
Square Footage per bathroom	900	ft^2
Square Footage per entrance booth	400	ft^2
Utility Excavation	1560	yd^3
Building Excavation	234	yd^3
Total Excavation	1794	yd^3
Bathroom Masonry	5400	ft^2
Entrance Booth Masonry	6300	ft^2
Entrance Booth Concrete	22	yd^3
Bathroom Concrete	50	yd^3
Total Concrete	217	yd^3
Bathroom Electric Service	yes	per all
Entrance Booth Electric Service	yes	per all
Entrance Booth Rebar	4000	lb
Bathroom Rebar	9000	lb
Total Rebar	39000	lb

Number of Trail Staging Areas	1
Cars per Staging Area	50
Total Cars	50

Division 2

	Total	
Earthwork	1583	yd^3
Bases	1056	yd^3
Pavements (includes parking improvements)	528	tons
Fences and Gates	300	ft
Signs	5	signs

Number of Historic/Vista Areas	9
Cars per Staging Area	21
Total Cars	189

Division 2

	Total
Earthwork	5985 yd^3
Bases	3990 yd^3
Pavements (includes parking improvements)	1995 tons
Fences and Gates	2700 ft
Signs	45 signs

Number of Admin areas	7
Total Parking Capacity	310 Cars

Division 2

	Total
Earthwork	26773 yd^3
Bases	6544 yd^3
Pavements (includes parking improvements)	3272 tons
Signs	35 signs

Division 3

CIP Concrete	15556 yd^3
Concrete Reinforcement	2800000 lb

Division 4

Masonry	52500 ft^2

Division 16

Electrical Service	7 facilities requiring service

Roads Within Marina

Number of parking spaces:	310
Total ABC	6544 yd^3
Total HBP	3272 tons
Total Excavation	6333 yd^3
Signs	35 signs

Building

Number of admin/marina bldg:		7
Square Footage per bldg		40000 ft^2
Utility Excavation		3640 yd^3
Building Excavation		16800 yd^3
Total Excavation		20440 yd^3
Admin/Marina Masonry		52500 ft^2
Admin/Marina Concrete		15556 yd^3
Admin/marina Electric Service	yes	
Admin/Marina rebar		2800000 lb

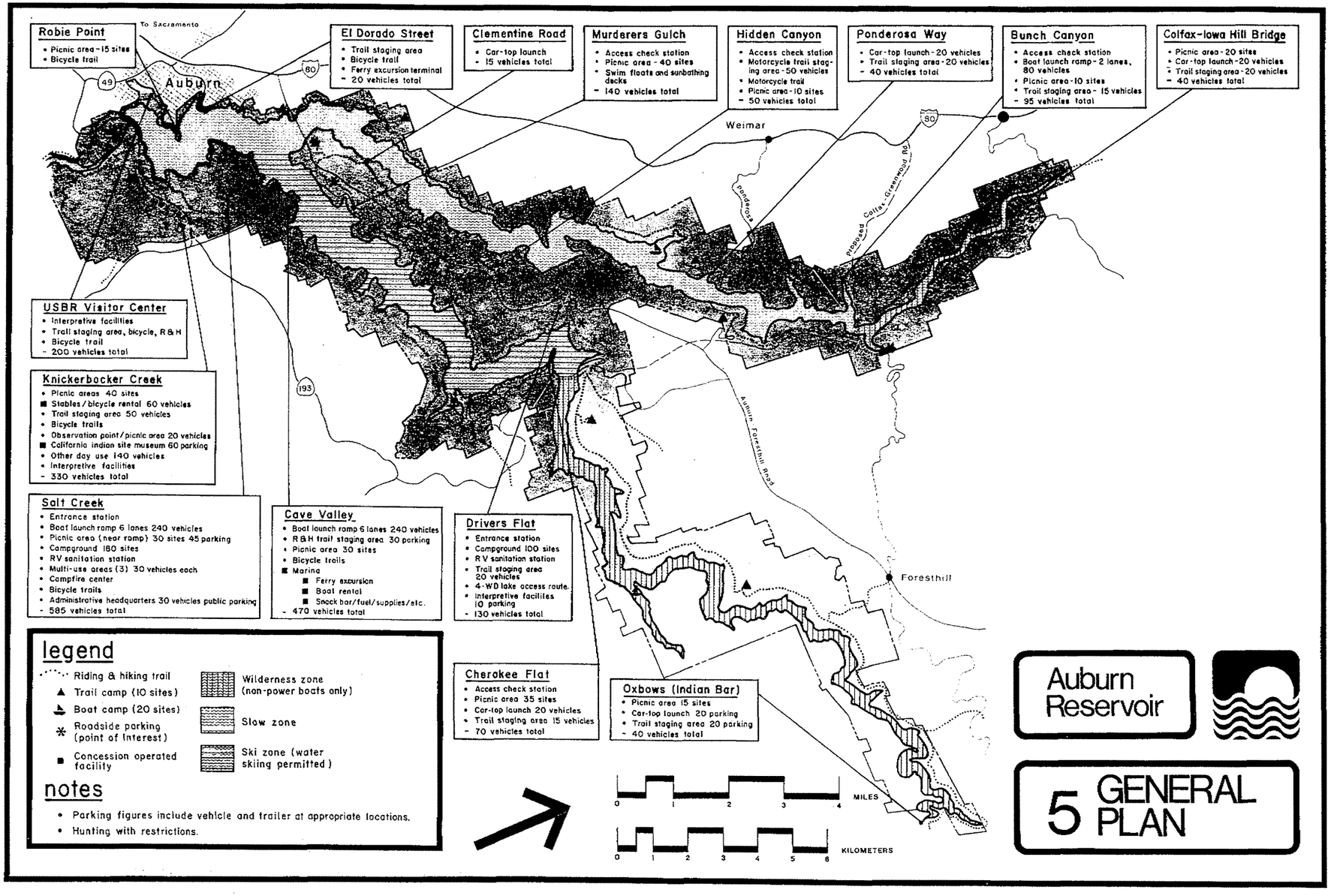

Robie Point
• Picnic area - 15 sites
• Bicycle trail
To Sacramento
49
Auburn
80
El Dorado Street
• Trail staging area
• Bicycle trail
• Ferry excursion terminal
- 20 vehicles total
Clementine Road
• Car-top launch
- 15 vehicles total
Murderers Gulch
• Access check station
• Picnic area - 40 sites
• Swim floats and sunbathing decks
- 140 vehicles total
Hidden Canyon
• Access check station
• Motorcycle trail staging area - 50 vehicles
• Motorcycle trail
• Picnic area - 10 sites
- 50 vehicles total
Ponderosa Way
• Car-top launch - 20 vehicles
• Trail staging area - 20 vehicles
- 40 vehicles total
Bunch Canyon
• Access check station
• Boat launch ramp - 2 lanes, 80 vehicles
• Picnic area - 10 sites
• Trail staging area - 15 vehicles
- 95 vehicles total
Colfax-Iowa Hill Bridge
• Picnic area - 20 sites
• Car-top launch - 20 vehicles
• Trail staging area - 20 vehicles
- 40 vehicles total
Weimar
Ponderosa
Proposed Colfax - Greenwood Rd
Auburn - Foresthill Road
Foresthill
USBR Visitor Center
• Interpretive facilities
• Trail staging area, bicycle, R & H
• Bicycle trail
- 200 vehicles total
Knickerbocker Creek
• Picnic areas 40 sites
■ Stables / bicycle rental 60 vehicles
• Trail staging area 50 vehicles
• Bicycle trails
• Observation point / picnic area 20 vehicles
■ California indian site museum 60 parking
• Other day use 140 vehicles
• Interpretive facilities
- 330 vehicles total
193
Salt Creek
• Entrance station
• Boat launch ramp 6 lanes 240 vehicles
• Picnic area (near ramp) 30 sites 45 parking
• Campground 180 sites
• RV sanitation station
• Multi-use areas (3) 30 vehicles each
• Campfire center
• Bicycle trails
• Administrative headquarters 30 vehicles public parking
- 585 vehicles total
Cave Valley
• Boat launch ramp 6 lanes 240 vehicles
• R & H trail staging area 30 parking
• Picnic area 30 sites
• Bicycle trails
■ Marina
■ Ferry excursion
■ Boat rental
■ Snack bar/fuel/supplies/etc.
- 470 vehicles total
Drivers Flat
• Entrance station
• Campground 100 sites
• RV sanitation station
• Trail staging area 20 vehicles
• 4-WD lake access route.
• Interpretive facilities 10 parking
- 130 vehicles total
Cherokee Flat
• Access check station
• Picnic area 35 sites
• Car-top launch 20 vehicles
• Trail staging area 15 vehicles
- 70 vehicles total
Oxbows (Indian Bar)
• Picnic area 15 sites
• Car-top launch 20 parking
• Trail staging area 20 parking
- 40 vehicles total
legend
Riding & hiking trail
Trail camp (10 sites)
Boat camp (20 sites)
Roadside parking (point of interest)
Concession operated facility
Wilderness zone (non-power boats only)
Slow zone
Ski zone (water skiing permitted)
notes
• Parking figures include vehicle and trailer at appropriate locations.
• Hunting with restrictions.
0 1 2 3 4 MILES
0 1 2 3 4 5 6 KILOMETERS
Auburn Reservoir
5 GENERAL PLAN

TABLE III-2
SUMMARY – RECREATION FACILITIES AT AUBURN RESERVOIR [1]

Facility	Number	Capacity
Auto Campgrounds	2	280 Sites
Picnic Areas	10	245 Sites
Multi-Use Areas	3	360 People
Bicycle Trails	-	12 Miles
Trail Staging Areas – Horseback Riding & Hiking	10	230 Cars
Riding & Hiking Trails	-	120 Miles
Trail Camps	5	50 People
Boat Launching Ramps	3	14 Lanes
Car Top Boat Launch Sites	5	95 Cars
Marina/Boat Rental	1	200 Cars
Boat Camps – On Shore (20 Sites Each)	3	60 Boats
Boat Camps – Off Shore (20 Boats Each)	3	60 Boats
Swimming Area – Floats	1	140 Cars
Motorcycle Trail Staging Areas (Plus Trails)	1	50 Cars
Four-Wheel Drive Route – Lake Access	1	4 Miles
Vista & Historic Sites	9	185 Cars
Interpretive/Orientation & Administrative Areas	**7**	**310 Cars**

1. "Auburn Reservoir Project, Folsom 'Lake Site Recreation Area, Preliminary General Plan," DPR, October 1978.

ENVIRONMENTAL AND RELATED FEATURES

Environmental mitigation and cultural resources are described in this section.

Environmental Mitigation

As described in Reclamation's 1987 Auburn Dam Report (Auburn Dam Alternative Study), wildlife mitigation measures would be necessary to compensate for adverse effects on the wildlife resources of the impoundment area. Through September 1986, abut $400,000 of Federal funds were spent to acquire lands in the Auburn Reservoir area to mitigate for impacts to wildlife resources. These lands are located on the Middle Fork American River near Volcanoville. It was stated that the United States Fish and Wildlife Service would use funds appropriated to protect the habitat in these wildlife areas and restore plantings used by the wildlife for food and shelter.

It is believed, based on the review of detailed resources evaluations by USACE in its studies regarding a flood detention dam at the Auburn Dam site, that the magnitude of mitigation requirements due to direct inundation impacts alone would be significantly larger than anticipated in the authorized project. A multiple-propose reservoir at the Auburn site would result in the total loss of over 10,000 acres of wildlife habitat. Impacts would occur to the endangered species, primarily the valley elderberry beetle, resident fish species, and cultural

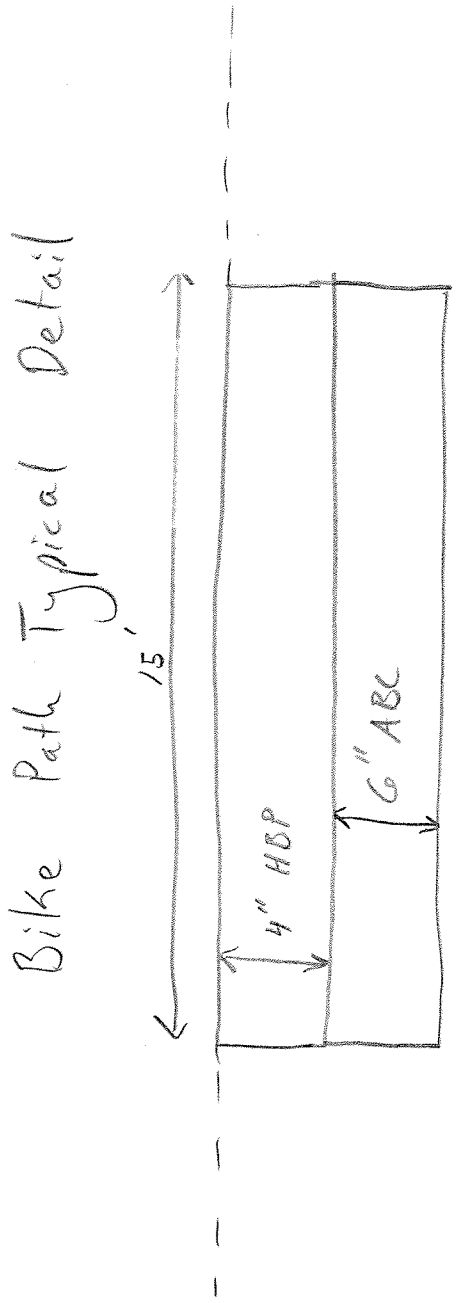
URS

Job Auburn Dam | Project No. 18600819.04003 | Page ____ of ____

Description Recreation | Computed by EKS | Sheet ____ of ____

Checked by ____ | Date ____

Reference



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Job Auburn Dam | Project No. 18600819.04000 | Page ____ of ____

Description Recreation | Computed by FKS | Date ____

Checked by ____ | Date ____

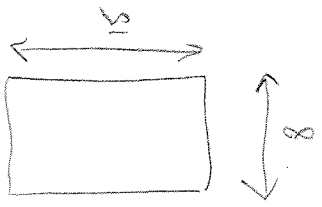
Reference

Parking Areas (see road section detail for component thicknesses)

120 ft² per 1 space

Assume 15' of Road per space, 30' wide road.

∴ total area of pavement to service 1 parking space: 120 ft² + 450 ft² = 570 ft²



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Job Auburn Dam | Project No. 18600819.04000 | Page ____ of ____

Description Recreation | Computed by EKS | Sheet ____ of ____

Checked by ____ | Date ____ | Date ____

Reference

Typical Building Foundation

Existing Grade

Add 5%

Building

concrete

Assume Slab on Grade

18"

Excavation per Square ft: $[1ft \times 1ft \times 1.5ft] + ((1' \times 1' \times 1.5'(.05))) = 0.06 yd^3$

URS

Job Auburn Dam | Project No. 18600819.04000 | Page ____ of ____

Description Recreation | Computed by EKS | Sheet ____ of ____

Checked by ____ | Date ____

Reference

Trail

Assume:
.5' depth excavation
3' wide

Four wheel Drive Roads

Assume very little maintenance (same as trails)

URS

Job: Auburn Dam
Description:
Project No.: 18600819.04000
Computed by: EKS
Checked by:
Page ___ of ___
Sheet ___ of ___
Date:
Date:
Reference

Building Masonry

Bathroom: 40' x 40' x 15' tall

(15x40) 4 = 600 ft^2 masonry / bathroom

Entrance Both 15' x 20' x 10' tall

(15x10)2 + 20(10)(2) = 700 ft^2 masonry / entrance booth

Admin Bldg.: 100 x 150 x 15

(100 x 15)2 + 150(15)2 = 7500 ft^2 of masonry / admin bldg.

URS

Job Auburn Dam — Project No. 18600819.04000 — Page ____ of ____

Description Recreation — Computed by EKS — Date ____

Checked by ____ — Date ____

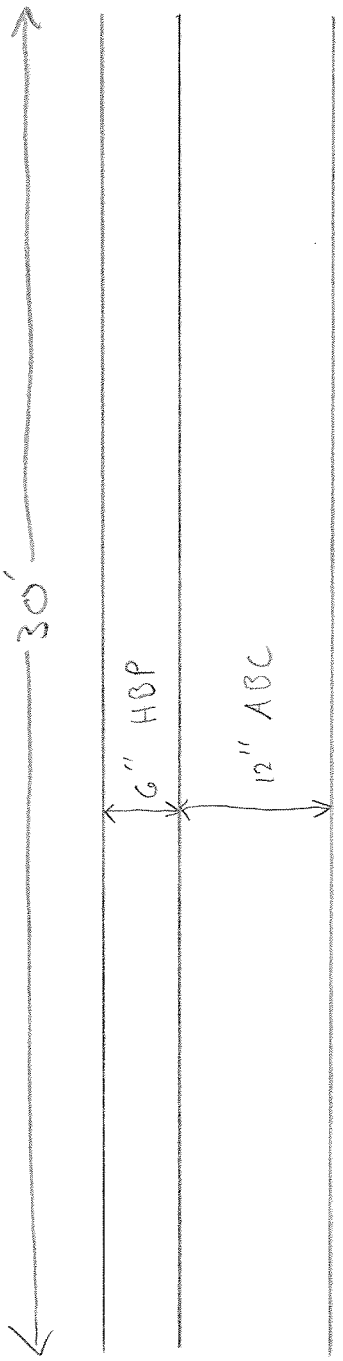
Reference

Typical Recreation Road Section (Parking also)

HBP per linear ft of road: $1'(30')(.5')\left(\frac{150\,lb}{ft^3}\right)\left(\frac{1\,ton}{2000\,lb}\right) = 1.13\,ton$

ABC per linear ft of road: $1'(30')(1')\left(\frac{1\,yd^3}{27\,ft^3}\right) = 1.2\,yd^3$

Excavation per linear ft of Road: $1'(30')1.5'\left(\frac{1\,yd^3}{27\,ft^3}\right) = 1.67\,yd^3$



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Job Auburn Dam | Project No. 18600819.04000 | Page ____ of ____

Description Recreation | Computed by EKS | Sheet ____ of ____

Checked by ____ | Date ____ | Date ____

Reference

Typical Utility Excavations

Total Reg building: 3'x6'x500' + 3.5'x2'x500' + 3'x1'x500' = 14,000 ft³ or ~520 yd³

EXHIBIT 4.7-2

CALCULATION COVER SHEET

Client: *USBR*

Project Name: *Auburn Dam*

Project/Calculation Number: *18600819.04000*

Title: *Pump Station Demolition Quantities*

Total Number of Pages (including cover sheet): *28*

Total Number of Computer Runs: *N/A*

Prepared By: *Eric Schlosser* **Date:** *5/8/06*

Checked By: **Date:**

Description and Purpose *To determine the materials quantities pump station demolition.*

Design Basis/References/Assumptions

Demolition quantities derived from "American River Pump Station, Phase II – River Intake Structures. Selected drawings are attached to this calculation package.

Only major features of the demolition were tabulated, such as concrete, excavation, and grouted riprap.

Remarks/Conclusions/Results *Estimated Quantities to Demo:*

Division 2 – Backfill: 24,000 yd³ mechanical

Division 3 – Concrete: 4,500 yd³ demo

Division 7 – Grouted Riprap: 305 yd³ demo

Calculation By: **Approved**

Project Manager/Date

Revision No.:	Revision Description:	Approved By:

Project Manager/Date

URS

Job Auburn Dam | Project No. 18600819.04008 | Page ___ of ___

Description Demo Quan. | Computed by EKS | Date 5/8/06 | Sheet ___ of ___

Checked by ___ | Date ___ | Reference

Backfill at site after Demolition

Primary Intake

250' long x 50' wide x 13' deep = 162500 ft^3 or 6020 yd^3

Emergency Intake

80' x 55' x 20' = 88,000 ft^3 or 3260 yd^3

channel to emergency & primary intake

~230' x 20' x 8' = 36,800 ft^3 or 1363 yd^3

Emergency intake conduit

63' x 10' x 10' = 6300 ft^3 or 234 yd^3

Intake Vault

45' x 50' x 36' = 81,000 ft^3 or 3000 yd^3

RCP from Primary Intake to Intake Vault

40' x 60' x 24' = 57,600 ft^3 or 2134 yd^3

channel & Road from Primary Intake to Intake Vault

20' x 10' high x 120' = 24000 ft^3 or 890 yd^3

Pump Station (entire, includes vault, 60" ϕ raw water)

180 x 65 x 15' = 175,500 ft^3 or 6500 yd^3

Backfill Total: 23,401 yd^3

URS

Job Auburn Dam | Project No. 18600819.04000 | Page ____ of ____
Description Primary Intake Quant. for Demolition | Computed by EKS | Date 5/1/06
Checked by ____ | Date ____
Reference

South "outside retaining wall" — account for angled walls

length: 10' + 40 + 50 + 73 + 44 + 10 = 227 ft

height: assume constant 15' tall wall

thickness: 1.5'

wall footing: 1.5" thick, assume constant 7' wide, 227 ft long

North "outside retaining wall"

assume same as south

V_{conc}: $227(15)(1.5) + 1.5(7)227 = 7491\ ft^3$ per side
or $\sim 280\ yd^3$ per side

total both sides: $560\ yd^3$

Grouted Riprap

$227'(12')\ 3' = 8172\ ft^3$ per side or $\sim 303\ yd^3$

Channel to Intake Vault

retaining walls: $1.5 \times 150 \times 10 + 1.5 \times 150 \times 6 = 3600\ ft^3$ or $135\ yd^3$
-slab = $15 \times 1.5 \times 150 = 3375\ ft^3$ or $125\ yd^3$

Total conc. This Sht: $685\ yd^3$

Total grouted riprap: $303\ yd^3$

URS

Job Auburn Dam | Project No. 18600819.04000 | Page ____ of ____
Description Primary Intake Quant. for Demolition | Computed by EKS | Date 5/1/06 | Sheet ____ of ____
Checked by ____ | Date ____ | Reference

Major Piping
- 30" ϕ RCP, total length ~ 380' } going to intake vault.
- 8" ϕ DIP/SS total length ~ 400' } & inside primary intake
- 6" ϕ SS inside primary intake: ~300'
- 2" ϕ SS inside primary intake: 8(6')12 = 576'

RCP Excavation, ~10 deep x 40 x 40' + ½(40)(10)30
= 22,000 ft³ or 815 yd³

DIP Excavation, ~16' deep x 10 wide x 90' = 14,400 ft³ or 534 yd³

Primary Intake Structure Concrete

Bottom Slab:
1' thick x 27' x 56' = 1512 ft³ or 56 yd³

Walls:
2(9' x 1' x 56') = 1008 ft³ or 38 yd³

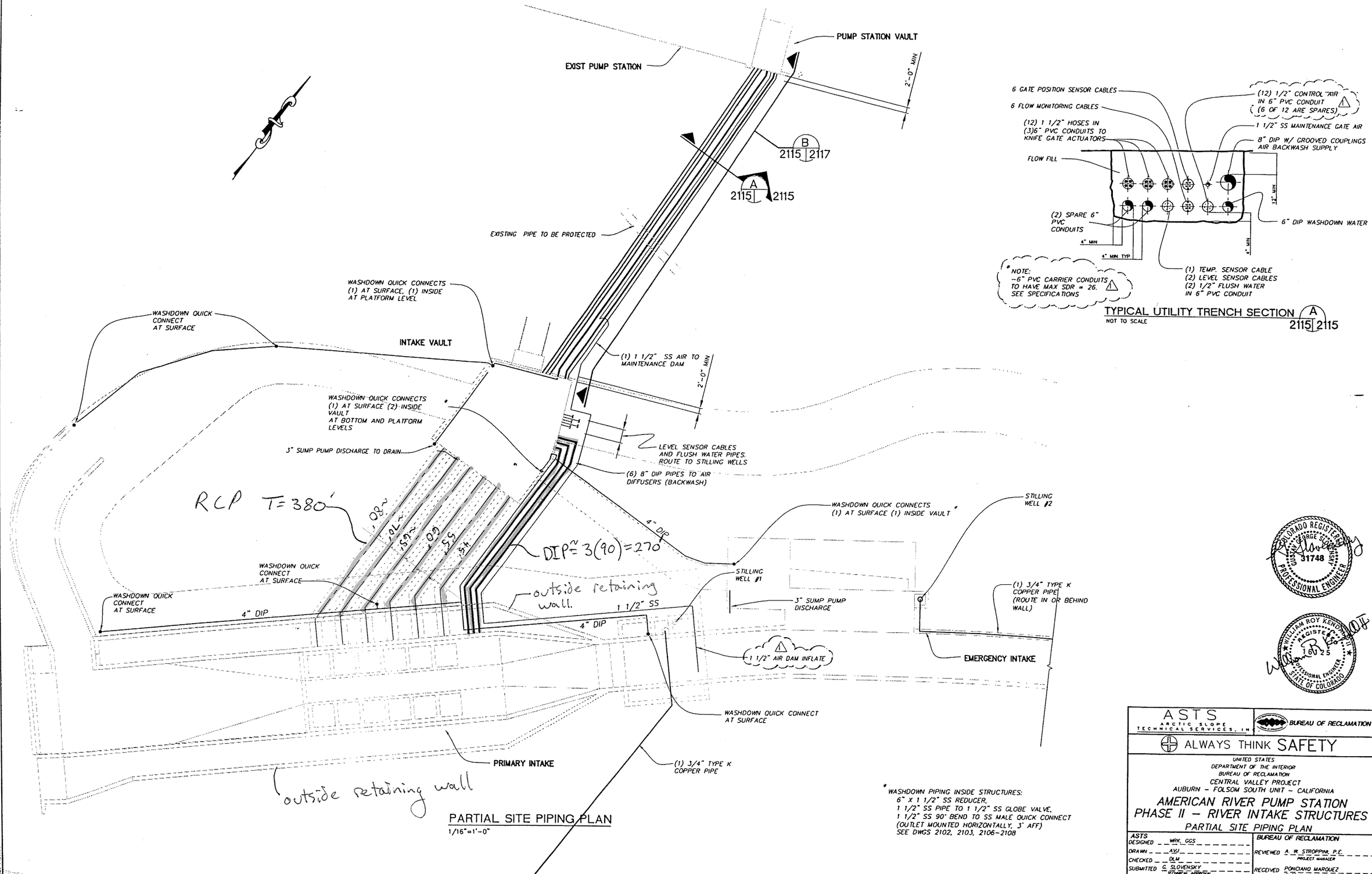
lip
(1.5' x 2' x 56') 2 = 336 ft³ or 12.5 yd³

supporting walls between bays
1.5'(9')(29')(2) + 1.33' x 9' x 29'(5) + 2.5 wide(3' tall)(26)(12) = 4859 ft³ or 180 yd³

center deck
(8+3) x (1.5) x 56 = 924 ft³ or 34.2 yd³

Primary Intake Approach Slabs
1.5' x 25' x 95' = 3562.5 ft³ or 132 yd³

Conc. Total this sheet: 453 yd³



PARTIAL SITE PIPING PLAN
1/16"=1'-0"

TYPICAL UTILITY TRENCH SECTION (A) 2115|2115
NOT TO SCALE

* WASHDOWN PIPING INSIDE STRUCTURES:
6" X 1 1/2" SS REDUCER,
1 1/2" SS PIPE TO 1 1/2" SS GLOBE VALVE,
1 1/2" SS 90° BEND TO SS MALE QUICK CONNECT
(OUTLET MOUNTED HORIZONTALLY, 3' AFF)
SEE DWGS 2102, 2103, 2106-2108

COLORADO REGISTERED GEORGE G. SLOVENSKY 31748 PROFESSIONAL ENGINEER

WILLIAM ROY KENDALL II REGISTERED 16025 PROFESSIONAL ENGINEER STATE OF COLORADO

REV NO	2005-11-01	
1	ASTS-665	REVISED PIPE SIZES, QUANTITY AND CLARIFIED TYPE

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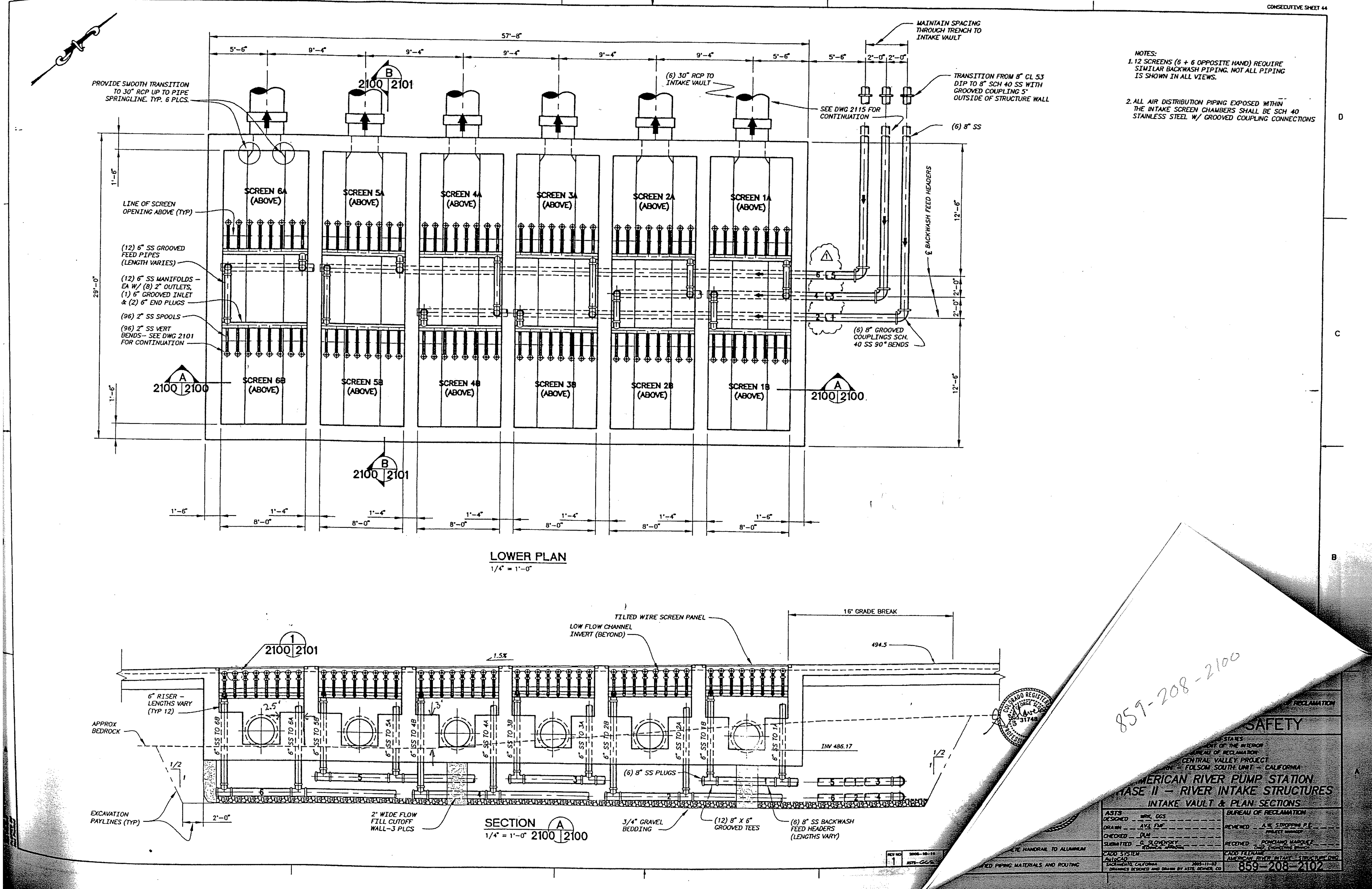
CENTRAL VALLEY PROJECT
AUBURN - FOLSOM SOUTH UNIT - CALIFORNIA

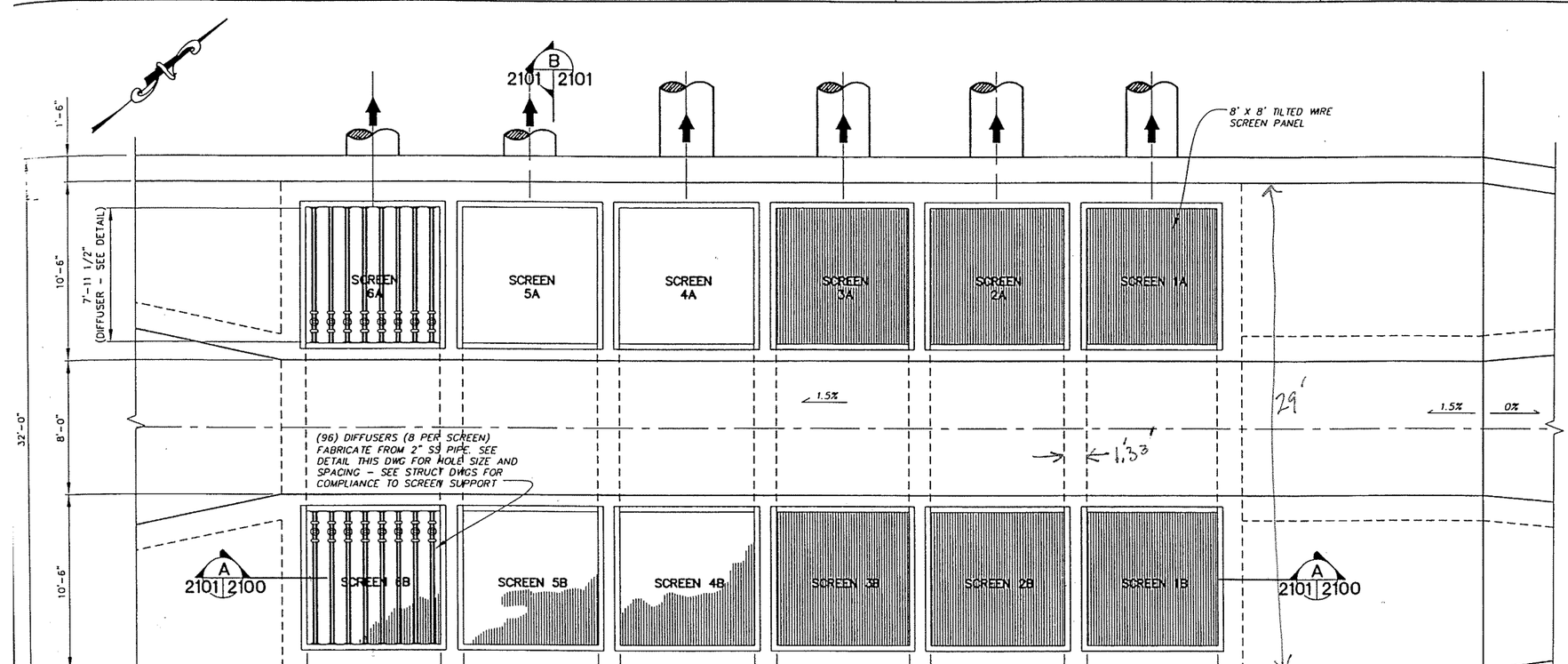
AMERICAN RIVER PUMP STATION
PHASE II - RIVER INTAKE STRUCTURES
PARTIAL SITE PIPING PLAN

ASTS		BUREAU OF RECLAMATION	
DESIGNED	WRK, GGS	REVIEWED	A. W. STROPPINI, P.E. PROJECT MANAGER
DRAWN	AVJ		
CHECKED	DLM		
SUBMITTED	G. SLOVENSKY TECHNICAL APPROVAL	RECEIVED	PONCIANO MARQUEZ CHIEF, ENGINEERING BRANCH
CADD SYSTEM	AutoCAD SACRAMENTO, CALIFORNIA 2005-11-01	CADD FILENAME	AMERICAN_RIVER_PUMP_STATION.DWG
	DRAWINGS DESIGNED AND DRAWN BY ASTS, DENVER, CO		859-208-2115

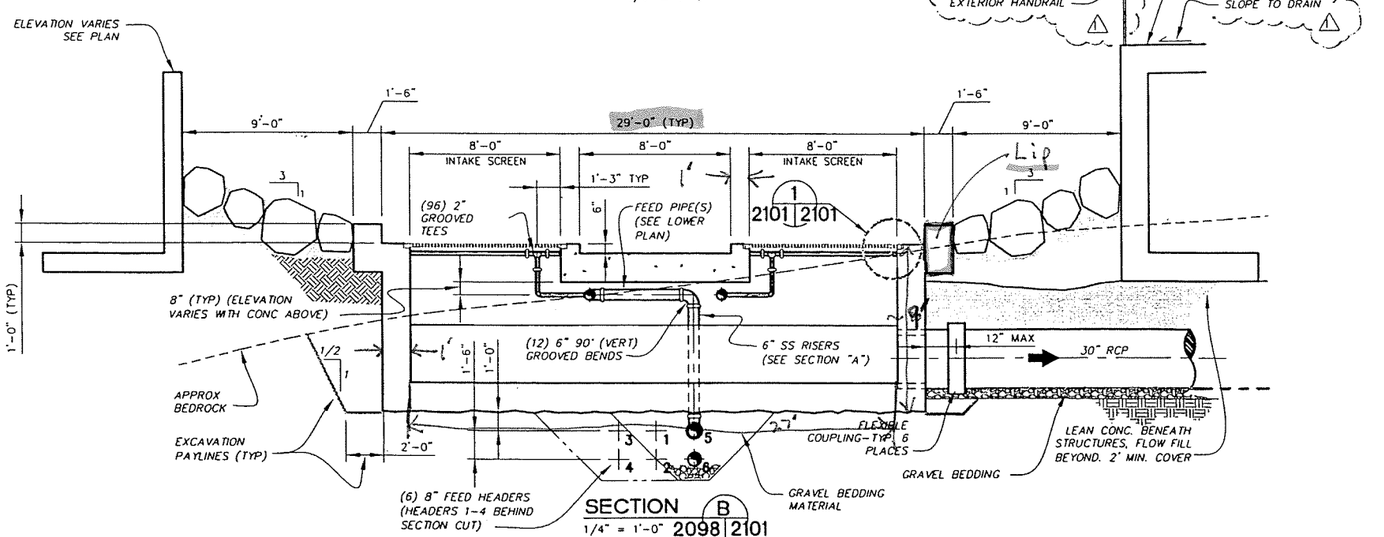


NOTES:
1. 12 SCREENS (6 + 6 OPPOSITE HAND) REQUIRE SIMILAR BACKWASH PIPING. NOT ALL PIPING IS SHOWN IN ALL VIEWS.
2. ALL AIR DISTRIBUTION PIPING EXPOSED WITHIN THE INTAKE SCREEN CHAMBERS SHALL BE SCH 40 STAINLESS STEEL W/ GROOVED COUPLING CONNECTIONS
57'-8"
5'-6"
9'-4"
2'-0"
MAINTAIN SPACING THROUGH TRENCH TO INTAKE VAULT
TRANSITION FROM 8" CL 53 DIP TO 8" SCH 40 SS WITH GROOVED COUPLING 5' OUTSIDE OF STRUCTURE WALL
(6) 30" RCP TO INTAKE VAULT
SEE DWG 2115 FOR CONTINUATION
(6) 8" SS
PROVIDE SMOOTH TRANSITION TO 30" RCP UP TO PIPE SPRINGLINE. TYP. 6 PLCS.
SCREEN 6A (ABOVE)
SCREEN 5A (ABOVE)
SCREEN 4A (ABOVE)
SCREEN 3A (ABOVE)
SCREEN 2A (ABOVE)
SCREEN 1A (ABOVE)
LINE OF SCREEN OPENING ABOVE (TYP)
(12) 6" SS GROOVED FEED PIPES (LENGTH VARIES)
(12) 6" SS MANIFOLDS – EA W/ (8) 2" OUTLETS, (1) 6" GROOVED INLET & (2) 6" END PLUGS
(96) 2" SS SPOOLS
(96) 2" SS VERT BENDS– SEE DWG 2101 FOR CONTINUATION
℄ BACKWASH FEED HEADERS
(6) 8" GROOVED COUPLINGS SCH. 40 SS 90° BENDS
SCREEN 6B (ABOVE)
SCREEN 5B (ABOVE)
SCREEN 4B (ABOVE)
SCREEN 3B (ABOVE)
SCREEN 2B (ABOVE)
SCREEN 1B (ABOVE)
A 2100 2100
B 2100 2101
1'-6"
29'-0"
12'-6"
1'-4"
8'-0"
LOWER PLAN
1/4" = 1'-0"
TILTED WIRE SCREEN PANEL
LOW FLOW CHANNEL INVERT (BEYOND)
16' GRADE BREAK
494.5
1.5%
1 2100 2101
6" RISER – LENGTHS VARY (TYP 12)
APPROX BEDROCK
6" SS TO 6B
6" SS TO 6A
6" SS TO 5B
6" SS TO 5A
6" SS TO 4B
6" SS TO 4A
6" SS TO 3B
6" SS TO 3A
6" SS TO 2B
6" SS TO 2A
6" SS TO 1B
6" SS TO 1A
INV 486.17
(6) 8" SS PLUGS
1/2
EXCAVATION PAYLINES (TYP)
2'-0"
2" WIDE FLOW FILL CUTOFF WALL–3 PLCS
SECTION A
1/4" = 1'-0" 2100 2100
3/4" GRAVEL BEDDING
(12) 8" X 6" GROOVED TEES
(6) 8" SS BACKWASH FEED HEADERS (LENGTHS VARY)
859-208-2100
SAFETY
CENTRAL VALLEY PROJECT
FOLSOM SOUTH UNIT – CALIFORNIA
AMERICAN RIVER PUMP STATION
PHASE II – RIVER INTAKE STRUCTURES
INTAKE VAULT & PLAN SECTIONS
BUREAU OF RECLAMATION
859-208-2102

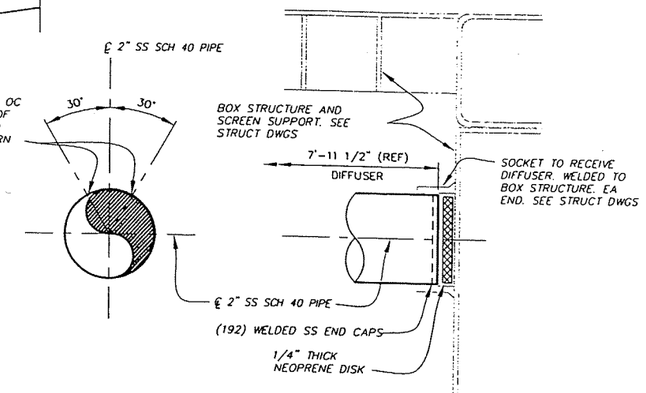
NOTE:
12 SCREENS (6 + 6 OPPOSITE HAND) REQUIRE SIMILAR BACKWASH PIPING. NOT ALL PIPING IS SHOWN IN ALL VIEWS.



UPPER PLAN
1/4" = 1'-0"



SECTION B
1/4" = 1'-0" 2098 | 2101
2100
2101



DETAIL
6" = 1'-0"
1 | 2100 | 2101

COLORADO REGISTERED
GEORGE SLOVENSKY
31748
PROFESSIONAL ENGINEER

WILLIAM ROY KENDALL II
REGISTERED
16125
PROFESSIONAL ENGINEER
STATE OF COLORADO

REV NO	2005-11-01	
1	ASTS GGS	REPLACED CONC HANDRAIL WALL WITH ALUMINUM HANDRAIL & ADDED "SLOPE TO DRAIN" NOTE

ASTS
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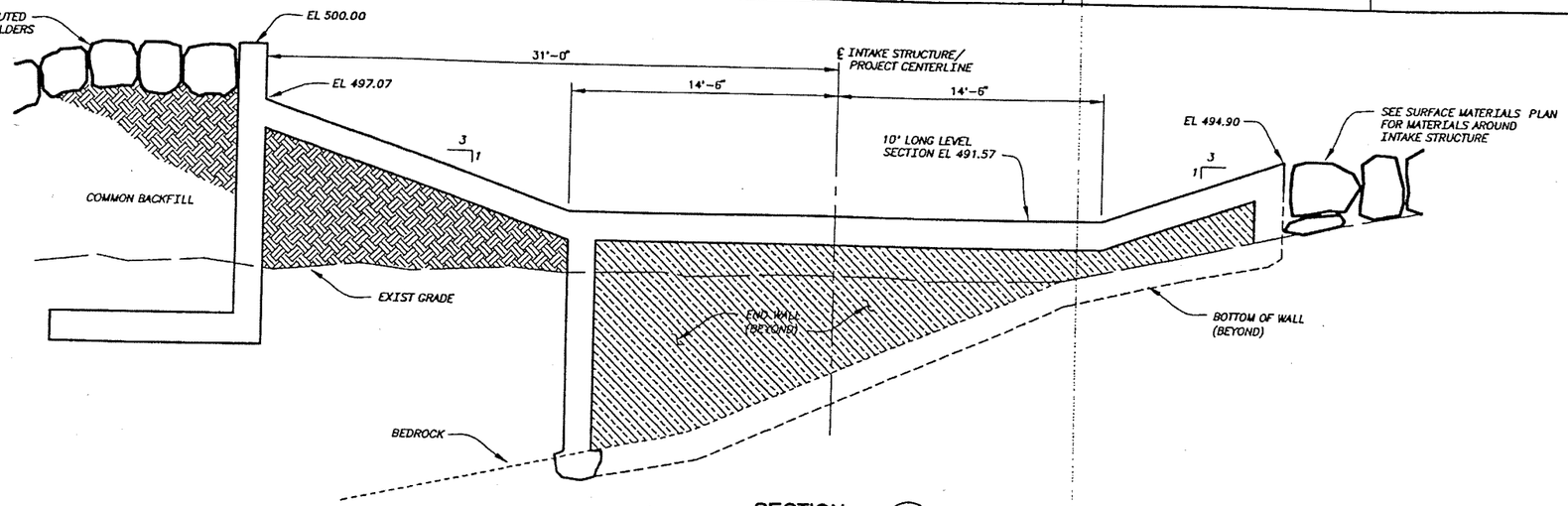
AUBURN - FOLSOM SOUTH UNIT - CALIFORNIA

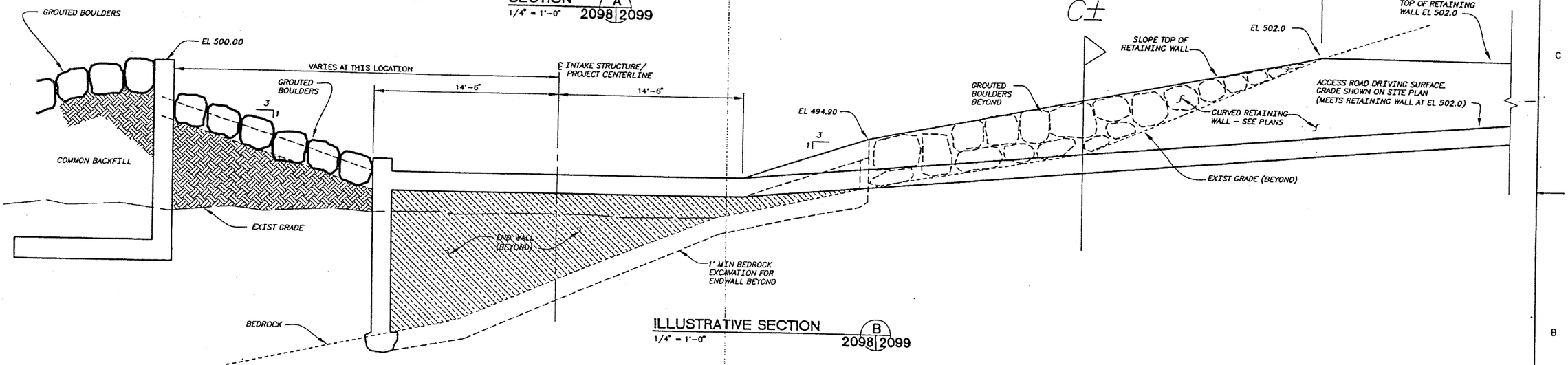
AMERICAN RIVER PUMP STATION
PHASE II - RIVER INTAKE STRUCTURES
PRIMARY INTAKE PLAN AND SECTION

ASTS	BUREAU OF RECLAMATION
DESIGNED GGS, WRK, WCT	
DRAWN AVJ	REVIEWED A. W. STROPPINI, P.E. PROJECT MANAGER
CHECKED DLM	
SUBMITTED G. SLOVENSKY TECHNICAL APPROVAL	RECEIVED PONCIANO MARQUEZ CHIEF, ENGINEERING BRANCH
CADD SYSTEM AutoCAD	CADD FILENAME AMERICAN_RIVER_INTAKE_STRUCTURE.DWG
SACRAMENTO, CALIFORNIA 2005-11-01 DRAWINGS DESIGNED AND DRAWN BY ASTS, DENVER, CO	859-208-2101

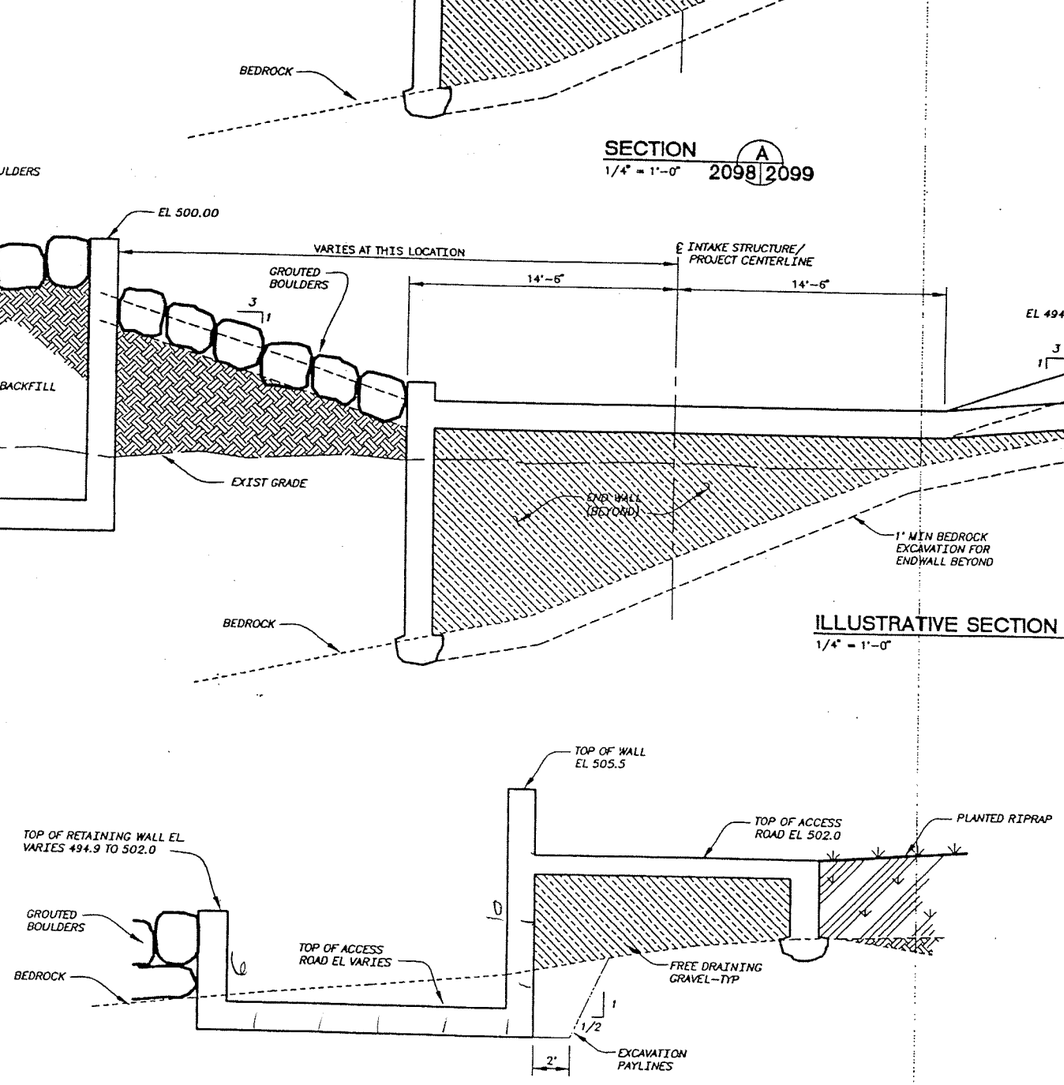
CONSECUTIVE SHEET 43



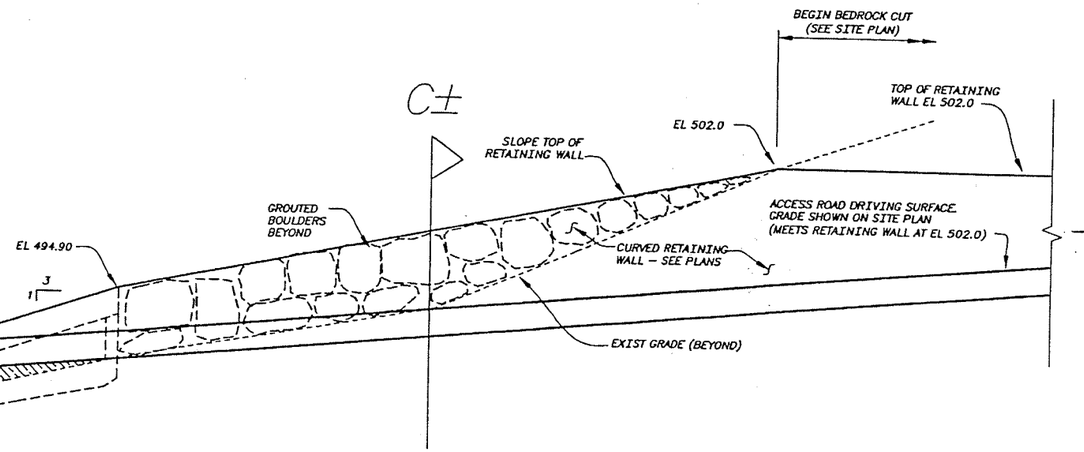
SECTION A
1/4" = 1'-0" 2098|2099



ILLUSTRATIVE SECTION B
1/4" = 1'-0" 2098|2099



SECTION J
1/4" = 1'-0" 2098|2099



COLORADO REGISTERED PROFESSIONAL ENGINEER 31748 9/19/00 PROFESSIONAL ENGINEER

ASTS ARCTIC SLOPE TECHNICAL SERVICES, INC.	BUREAU OF RECLAMATION
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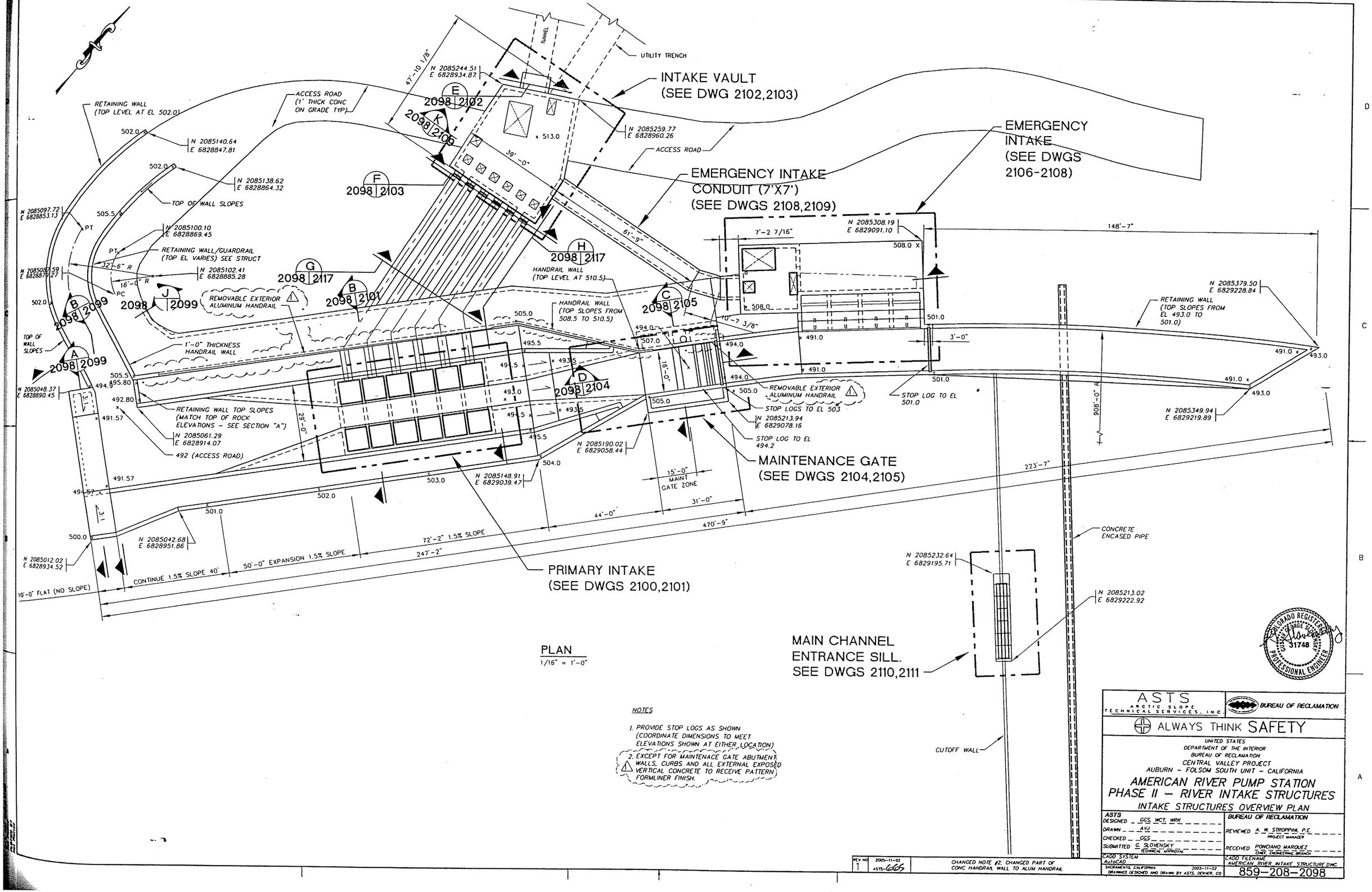
CENTRAL VALLEY PROJECT
AUBURN – FOLSOM SOUTH UNIT – CALIFORNIA

AMERICAN RIVER PUMP STATION
PHASE II – RIVER INTAKE STRUCTURES
INTAKE CHANNEL SECTIONS

ASTS	BUREAU OF RECLAMATION
DESIGNED GGS	REVIEWED PE (PROJECT MANAGER)
DRAWN AWJ	
CHECKED AWJ	RECEIVED (DATE) (ENGINEERING BRANCH)
SUBMITTED (TECHNICAL APPROVAL)	
CADD SYSTEM AutoCAD	CADD FILENAME AMERICAN_RIVER_INTAKE_STRUCTURE_SECTIONS.DWG
SACRAMENTO, CALIFORNIA 2000-08-05 DRAWING DESIGNED AND DRAWN BY ASTS, DENVER, CO	859-208-2099

CONSECUTIVE SHEET 42



NOTES

1. PROVIDE STOP LOGS AS SHOWN (COORDINATE DIMENSIONS TO MEET ELEVATIONS SHOWN AT EITHER LOCATION)
2. ⚠ EXCEPT FOR MAINTENACE GATE ABUTMENT WALLS, CURBS AND ALL EXTERNAL EXPOSED VERTICAL CONCRETE TO RECEIVE PATTERN FORMLINER FINISH.

COLORADO REGISTERED PROFESSIONAL ENGINEER — 31748

REV NO		
1	2005-11-02 ASTS-665	CHANGED NOTE #2, CHANGED PART OF CONC HANDRAIL WALL TO ALUM HANDRAIL

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AUBURN - FOLSOM SOUTH UNIT - CALIFORNIA

AMERICAN RIVER PUMP STATION
PHASE II — RIVER INTAKE STRUCTURES
INTAKE STRUCTURES OVERVIEW PLAN

ASTS	BUREAU OF RECLAMATION
DESIGNED GGS, WCT, WPK	REVIEWED A. W. STROPPINI, P.E. PROJECT MANAGER
DRAWN AVJ	
CHECKED GGS	
SUBMITTED G. SLOVENSKY TECHNICAL APPROVAL	RECEIVED PONCIANO MARQUEZ CHIEF, ENGINEERING BRANCH
CADD SYSTEM AutoCAD	CADD FILENAME AMERICAN_RIVER_INTAKE_STRUCTURE.DWG
SACRAMENTO, CALIFORNIA 2005-11-02 DRAWINGS DESIGNED AND DRAWN BY ASTS, DENVER, CO	859-208-2098

URS

Page ____ of ____

Job Auburn Dam Project No. 18600819.04000 Sheet ____ of ____

Description Pump Sta Computed by EKS Date ____

Quantities for Demo Checked by ____ Date ____

Reference

Concrete

Pump Station Vault

Floors: $2'(10.5')10' + 2'(9')(10') = 390 ft^3$ or $\sim 15 yd^3$

Walls: $(2' \times 5')10' + (2' \times 14' \times 10') + (2 \times 9 \times 10) + 2(9)18) +$

$2 \times 5 \times 18 = 1064 ft^3$ or $39.4 yd^3$

roof: $2' \times 20' \times 18' = 720 ft^3$ or $26.6 yd^3$

Pump station walls

$(130' \times 2' \times 18')2 + (35 \times 2 \times 18)2 = 11880 ft^3$ or $440 yd^3$

Floor

$130' \times 35' \times 2' = 9100 ft^3$ or $340 yd^3$

Total Conc. This Sht: $861 yd^3$

URS

Page ____ of ____

Job ____ Project No. ____ Sheet ____ of ____

Description ____ Computed by ____ Date ____

____ Checked by ____ Date ____

BWg

Reference

Equipment Removal: (*)5 pumps (possibly 7 if "future pump" bays used)

2113 (*) 2 air tank; 190 gal, 1 much larger

2113 (*) 8" SS line: ~48'

2112 (*) 2 air supply compressor

2113 (*) 1 gate control panel, associated equip

(*) 1½" ss piping: ≈100-150'

2112 (*) 6" ss line: ~50'

2112 (*) Pump piping 30" ϕ (125')

2112 (*) 60" Raw water Line ~120'

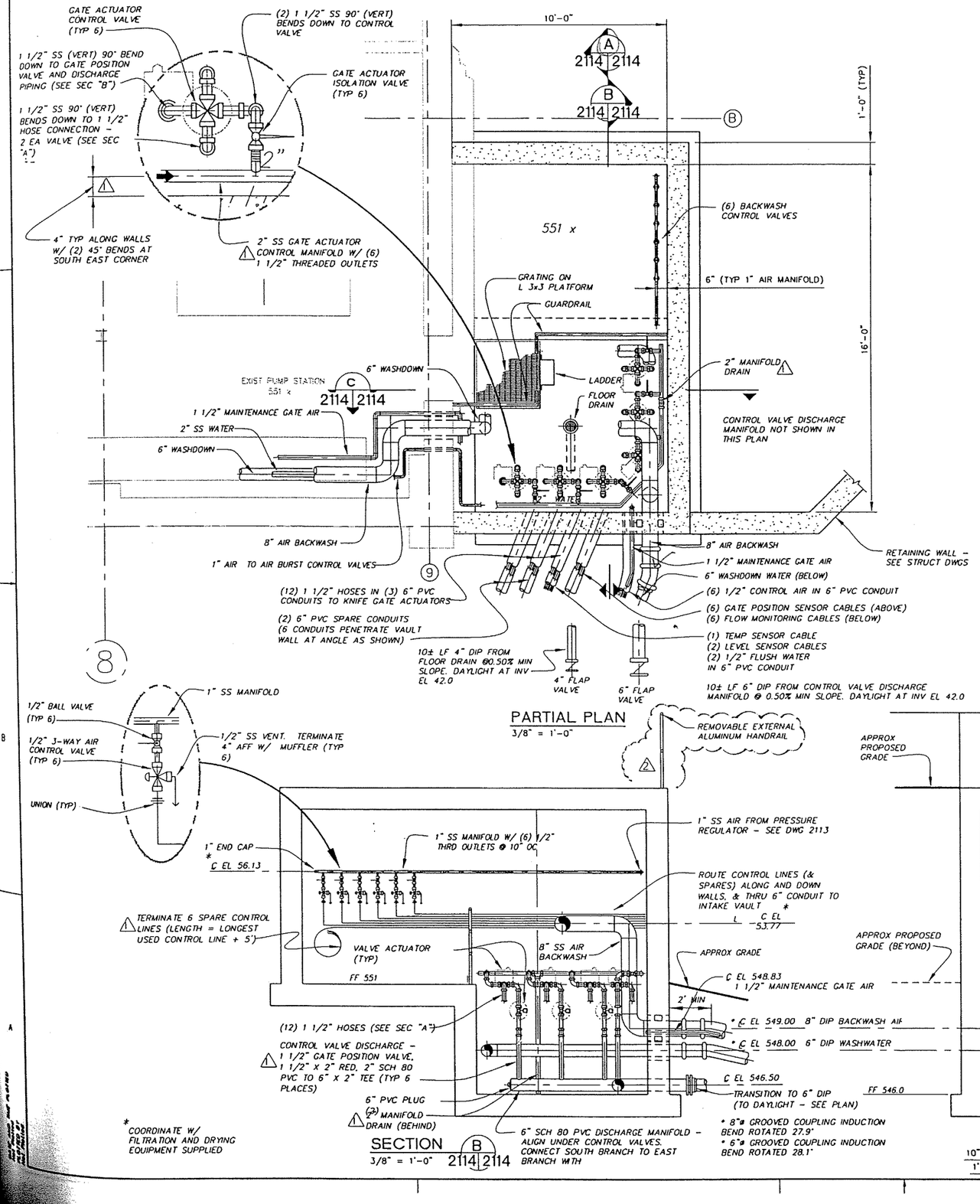
2113 (*) 1 250 gal storage tank

2113 (*) 1 standby pump

2112 (*) 30" drain line (~35')

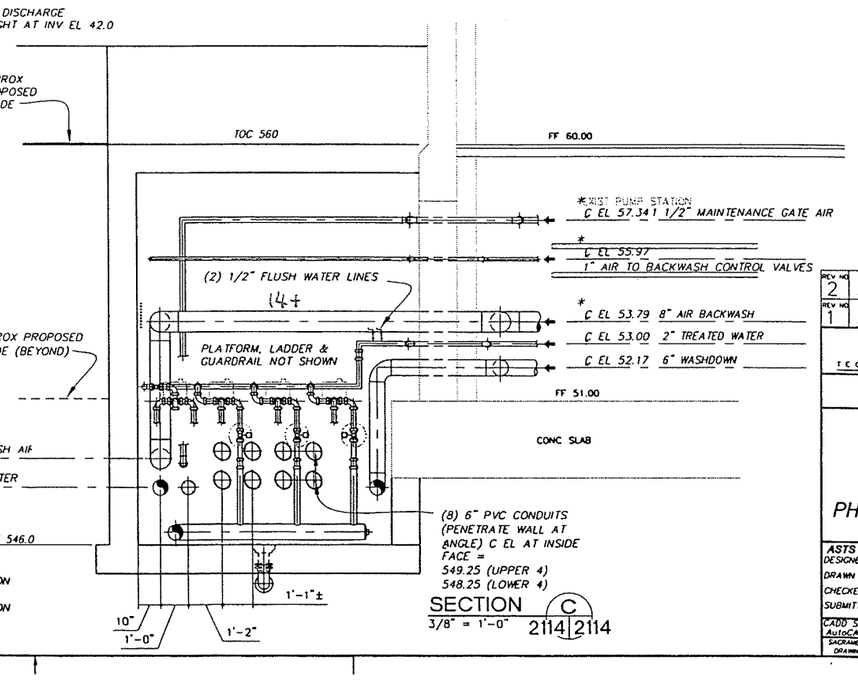
2112 * 30" Raw water line ~40+

2112 42" Raw Water line ~40+

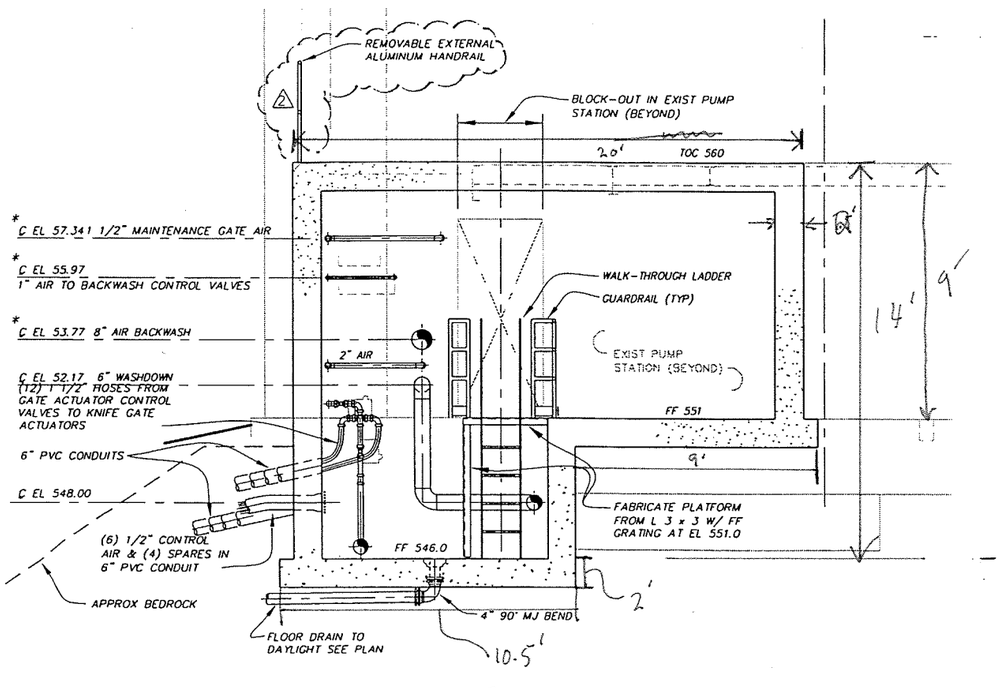


PARTIAL PLAN
3/8" = 1'-0"

SECTION (B)
3/8" = 1'-0" 2114|2114



SECTION (C)
3/8" = 1'-0" 2114|2114



SECTION (A)
3/8" = 1'-0" 2114|2114

COLORADO REGISTERED GUSTAV SLOVENSKY 31748 PROFESSIONAL ENGINEER

WILLIAM ROY KENDRICK REGISTERED 10/25 PROFESSIONAL ENGINEER STATE OF COLORADO

REV NO		
2	2005-11-01 ASTS- 065	CLARIFIED GUARDRAIL/HANDRAIL NOTES AND DRAFTING
1	2005-10-14 ASTS- 065	REVISED NOTES, ADDED 2" MANIFOLD DRAIN

ASTS ARCTIC SLOPE TECHNICAL SERVICES, INC.

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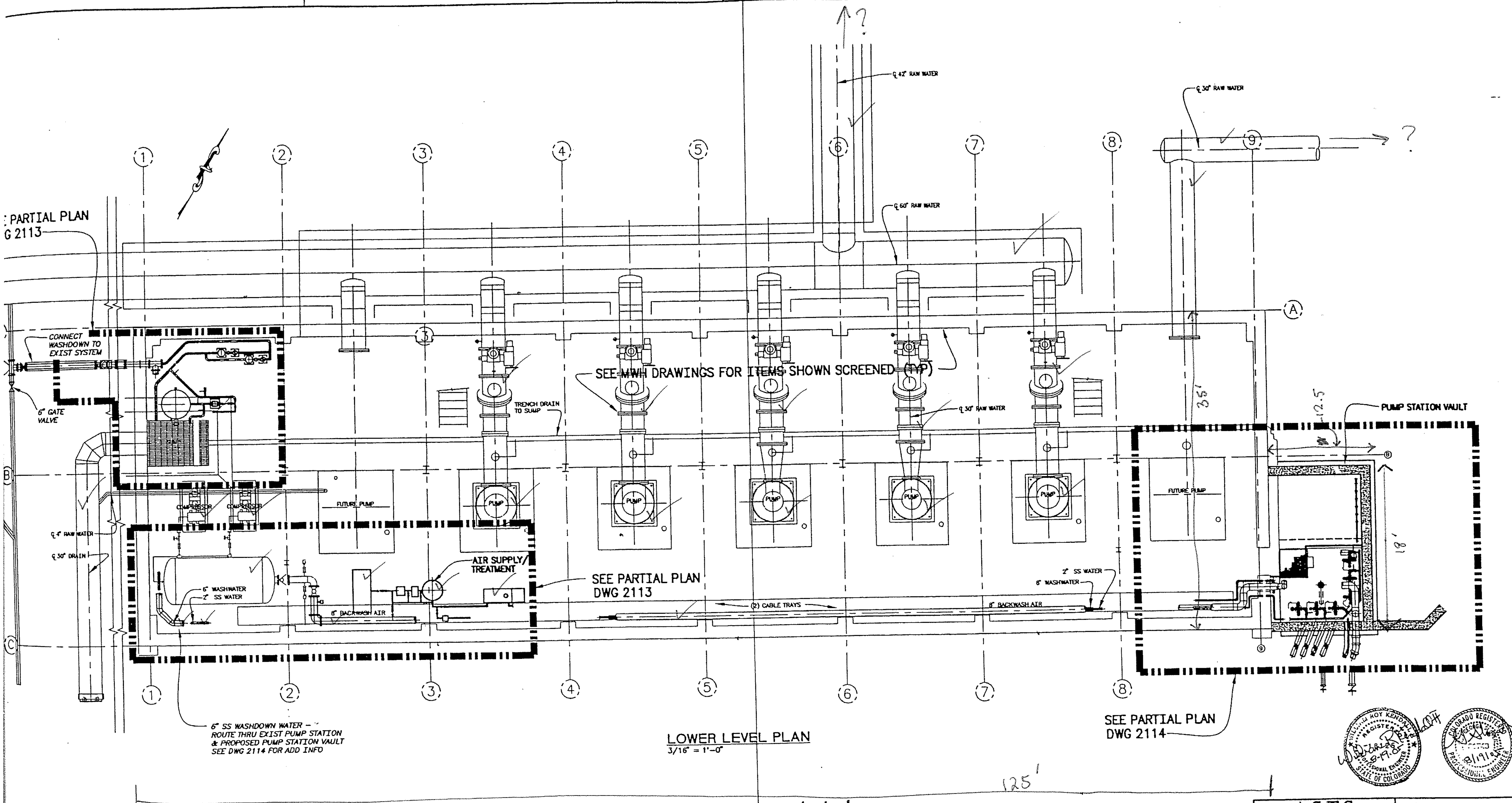
CENTRAL VALLEY PROJECT
AUBURN - FOLSOM SOUTH UNIT - CALIFORNIA

AMERICAN RIVER PUMP STATION
PHASE II - RIVER INTAKE STRUCTURES
PUMP STATION VAULT PLAN AND SECTIONS

ASTS		BUREAU OF RECLAMATION	
DESIGNED	GAB, GGS, WRK		
DRAWN	AVJ	REVIEWED	A.W. STROPPINI P.E. PROJECT MANAGER
CHECKED	DLM		
SUBMITTED	G. SLOVENSKY TECHNICAL APPROVAL	RECEIVED	POMPIANO, MARQUEZ CHIEF, ENGINEERING BRANCH
CADD SYSTEM	AutoCAD	CADD FILENAME	AMERICAN_RIVER_PUMP_STATION.DWG
SACRAMENTO, CALIFORNIA	2005-11-01 DRAWINGS DESIGNED AND DRAWN BY ASTS, DENVER, CO		859-208-2114



PARTIAL PLAN
G 2113
CONNECT WASHDOWN TO EXIST SYSTEM
6" GATE VALVE
℄ 42" RAW WATER
℄ 30" RAW WATER
℄ 60" RAW WATER
℄ 30" RAW WATER
SEE MWH DRAWINGS FOR ITEMS SHOWN SCREENED (TYP)
TRENCH DRAIN TO SUMP
PUMP STATION VAULT
FUTURE PUMP
PUMP
COMPRESSOR
℄ 4" RAW WATER
℄ 30" DRAIN
6" WASHWATER
2" SS WATER
8" BACKWASH AIR
AIR SUPPLY/ TREATMENT
SEE PARTIAL PLAN
DWG 2113
(2) CABLE TRAYS
2" SS WATER
8" WASHWATER
8" BACKWASH AIR
6" SS WASHDOWN WATER – ROUTE THRU EXIST PUMP STATION & PROPOSED PUMP STATION VAULT SEE DWG 2114 FOR ADD INFO
LOWER LEVEL PLAN
3/16" = 1'-0"
SEE PARTIAL PLAN
DWG 2114
125'
35'
12.5
18'
0 2.5'

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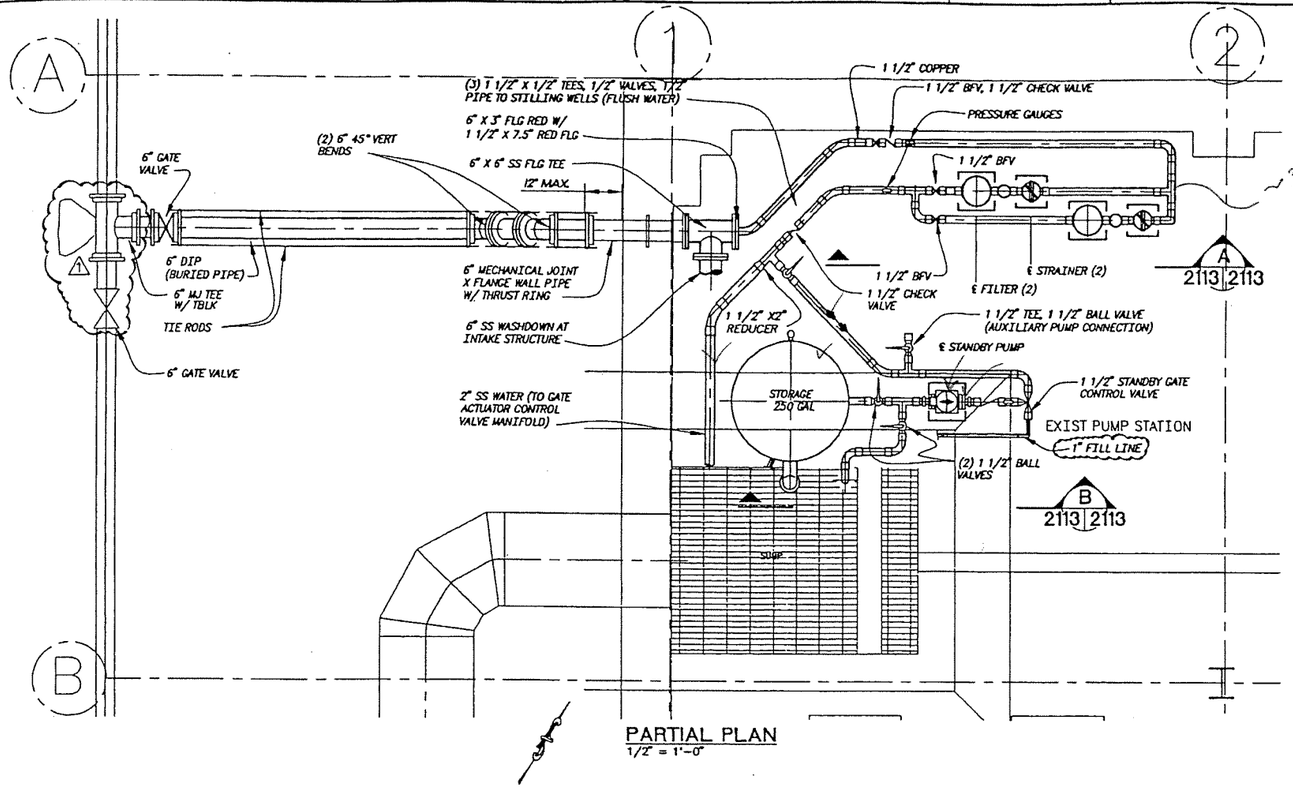
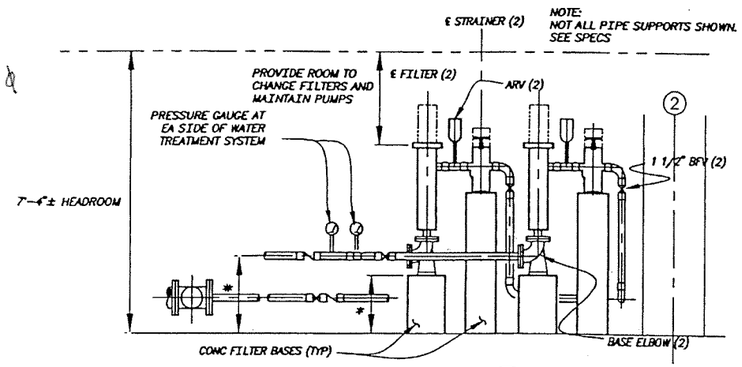
CENTRAL VALLEY PROJECT
AUBURN – FOLSOM SOUTH UNIT – CALIFORNIA

AMERICAN RIVER PUMP STATION
PHASE II – RIVER INTAKE STRUCTURES
PUMP STATION PLAN

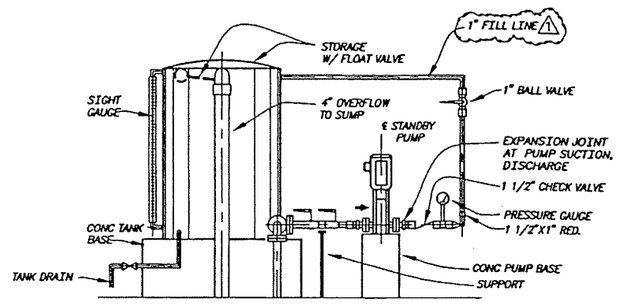
ASTS	BUREAU OF RECLAMATION
DESIGNED GAB WRK	REVIEWED [signature] P.E. PROJECT MANAGER
DRAWN AWJ	
CHECKED DLM	RECEIVED [signature] CHIEF, ENGINEERING BRANCH
SUBMITTED [signature] TECHNICAL APPROVAL	
CADD SYSTEM AutoCAD	CADD FILENAME AMERICAN RIVER PUMP STATION.DWG
SACRAMENTO, CALIFORNIA 2005-08-05 DRAWINGS DESIGNED AND DRAWN BY ASTS, DENVER, CO	859-208-2112



PARTIAL PLAN
1/2" = 1'-0"

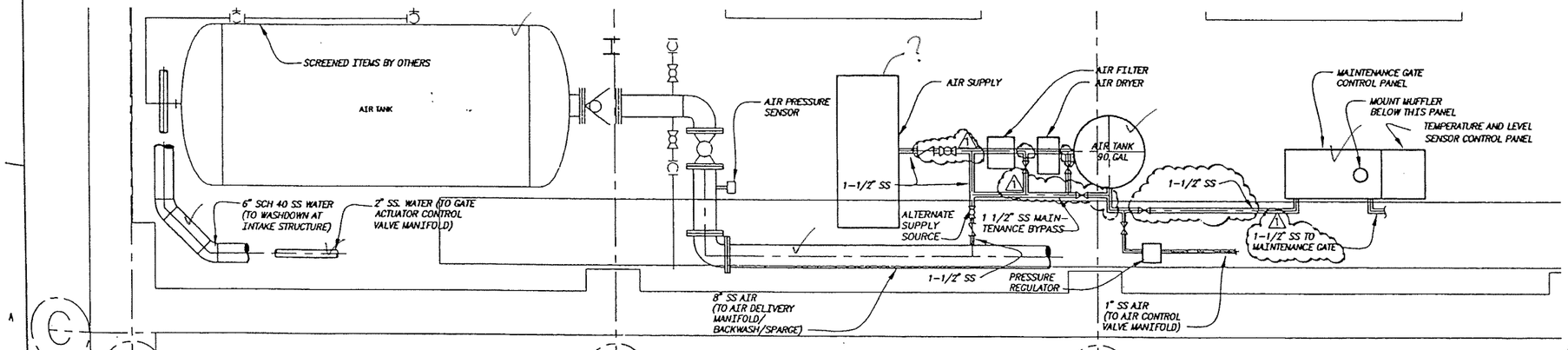


ELEVATION
1/2" = 1'-0"
A 2113 2113



ILLUSTRATIVE ELEVATION
1/2" = 1'-0"
B 2113 2113

* ACTUAL DIMENSIONS DEPEND UPON THE MANUFACTURER OF THE "APPROVED" EQUIPMENT. CONTRACTOR SHALL COORDINATE.



PARTIAL PLAN
1/2" = 1'-0"

1/4" = 1'

REV NO	2003-10-14	
1	ASTS- €05	REVISED PIPING SIZES, NOTES & NEW TO EXISTING

ASTS ARCTIC SLOPE TECHNICAL SERVICES, INC.

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CENTRAL VALLEY PROJECT
AUBURN – FOLSOM SOUTH UNIT – CALIFORNIA

AMERICAN RIVER PUMP STATION
PHASE II – RIVER INTAKE STRUCTURES
PUMP STATION DETAIL PLAN AND ELEVATIONS

ASTS	BUREAU OF RECLAMATION
DESIGNED – CAB, WPK	
DRAWN – AVJ	REVIEWED – A.W. STROPPINI P.E. PROJECT MANAGER
CHECKED – DLM	
SUBMITTED – G. SLOVENSKY TECHNICAL APPROVAL	RECEIVED – PONCIANO MARQUEZ CHIEF, ENGINEERING BRANCH
CADD SYSTEM AutoCAD	CADD FILENAME AMERICAN_RIVER_PUMP_STATION.DWG
SACRAMENTO, CALIFORNIA 2003-08-08 DRAWINGS DESIGNED AND DRAWN BY ASTS, DENVER, CO	859-208-2113

W. WILLIAM ROY KENDRICK REGISTERED 16175 PROFESSIONAL ENGINEER STATE OF COLORADO 10-14-03

URS

Job Auburn Dam | Project No. 18600819.04000 | Page ___ of ___ | Sheet ___ of ___

Description Emergency Intake & Conduit Demo Quantities | Computed by EKS | Date 5/8/06 | Checked by ___ | Date ___ | Reference

Conduit

$L = 62' + 11 + 8 = 81'$ 81' of 7'x7' conduit (concrete)

Emergency Intake

Structure adjacent to tunnel

floor $23 \times 26 \times 1.5' = 897 ft^3$ or $33.22 yd^3$

walls: $(1.5' \times 23' \times 22')2 + (1.5 \times 22 \times 26)2 = 3234 ft^3$ or $120 yd^3$

roof: same as floor: $33.22 yd^3$

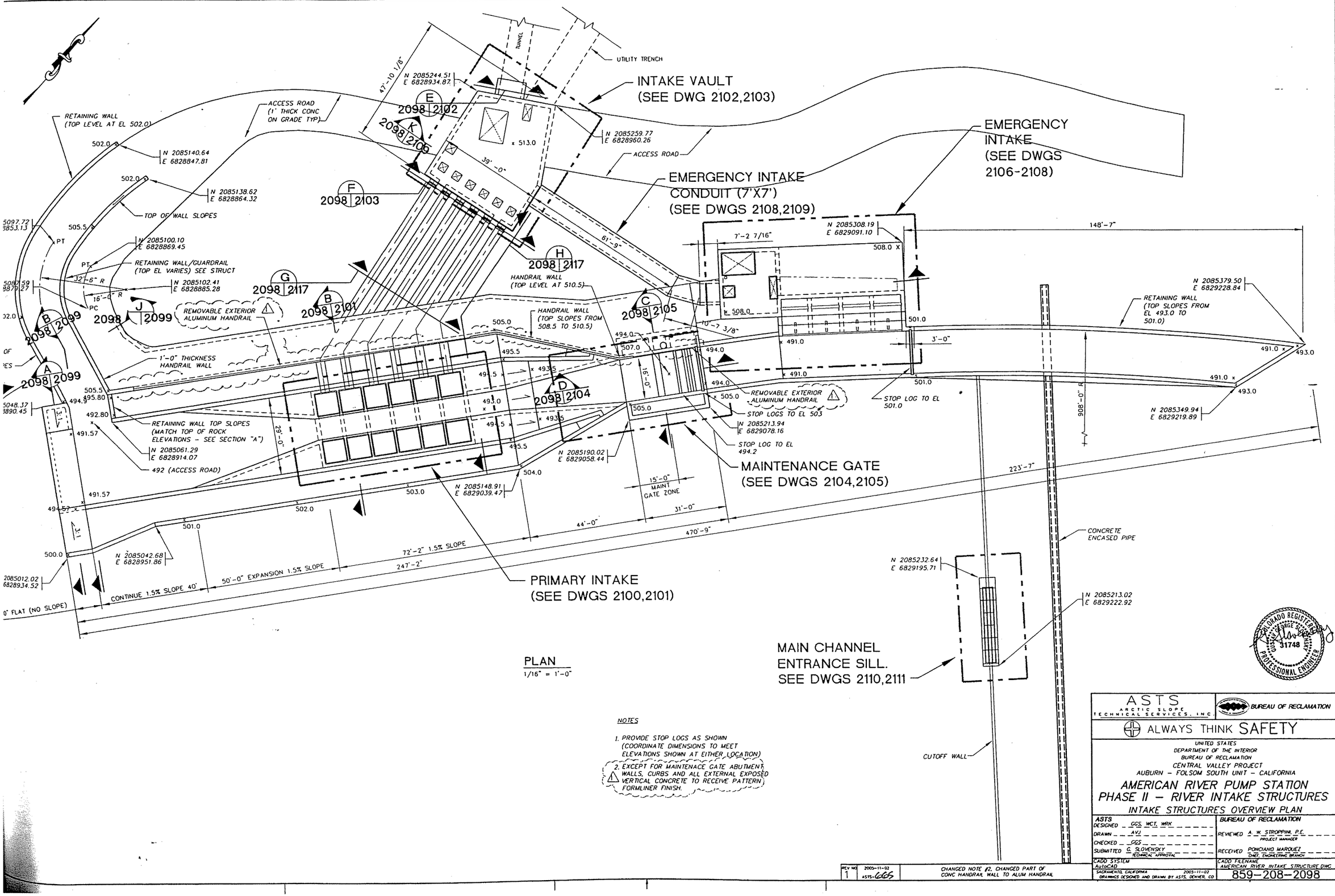
Intake Bays

floor: $23' \times 1.5' \times 48' = 1656 ft^3$ or $61.33 yd^3$

walls: $(1.5 \times 14 \times 18')5 + 1.5 \times 18 \times 48 + 1(18)(48) + (1(18)4)4$

$= 4338 ft^3$ or $161 yd^3$

Total conc. This sht.: $409 yd^3$



PLAN
1/16" = 1'-0"

NOTES

1. PROVIDE STOP LOGS AS SHOWN (COORDINATE DIMENSIONS TO MEET ELEVATIONS SHOWN AT EITHER LOCATION)
2. EXCEPT FOR MAINTENACE GATE ABUTMENT WALLS, CURBS AND ALL EXTERNAL EXPOSED VERTICAL CONCRETE TO RECEIVE PATTERN FORMLINER FINISH.

COLORADO REGISTERED GEORGE SLOVENSKY 31748 PROFESSIONAL ENGINEER

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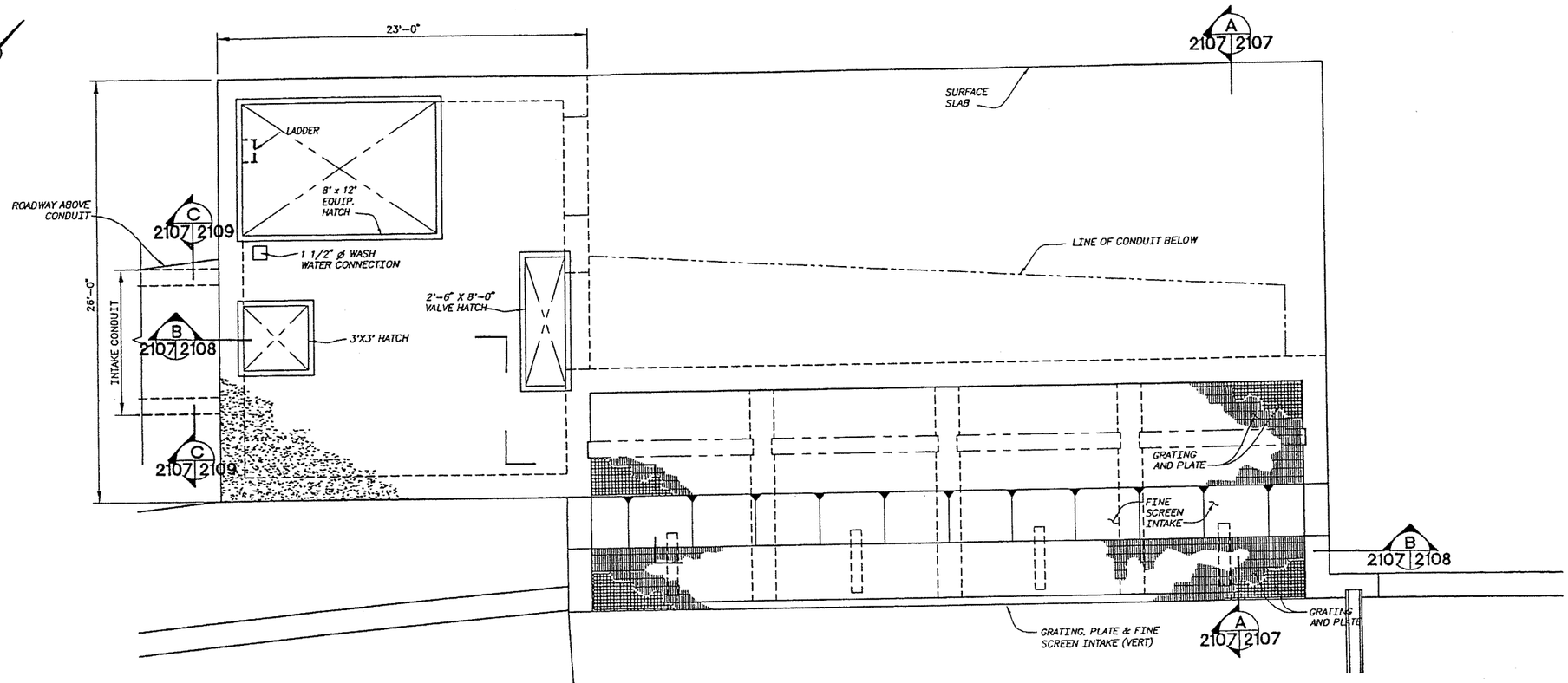
CENTRAL VALLEY PROJECT
AUBURN - FOLSOM SOUTH UNIT - CALIFORNIA

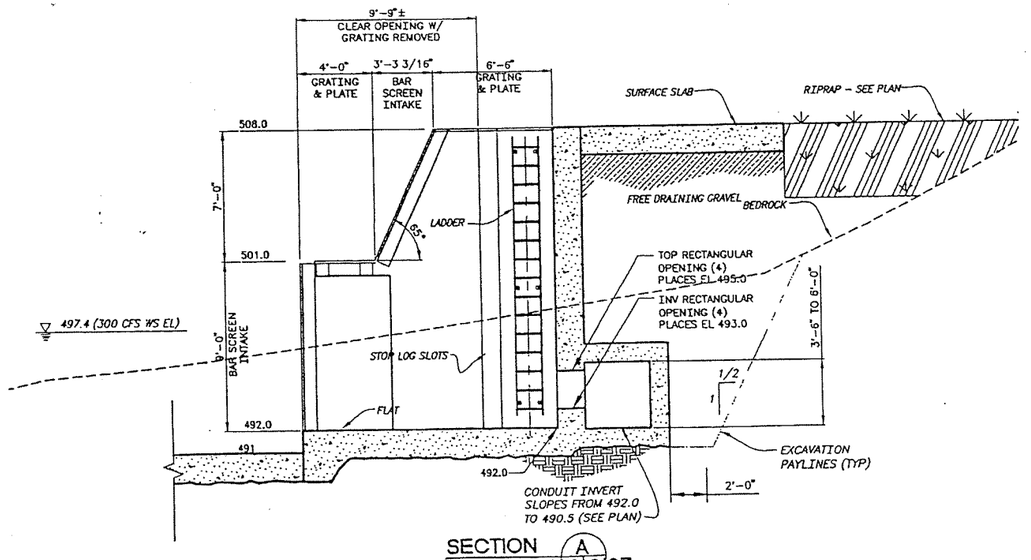
AMERICAN RIVER PUMP STATION
PHASE II - RIVER INTAKE STRUCTURES
INTAKE STRUCTURES OVERVIEW PLAN

ASTS	BUREAU OF RECLAMATION
DESIGNED GGS, MCT, MRK	REVIEWED A. W. STROPPINI, P.E. PROJECT MANAGER
DRAWN AVJ	
CHECKED GGS	
SUBMITTED G. SLOVENSKY TECHNICAL APPROVAL	RECEIVED PONCIANO MARQUEZ CHIEF, ENGINEERING BRANCH
CADD SYSTEM AutoCAD	CADD FILENAME AMERICAN_RIVER_INTAKE_STRUCTURE.DWG
SACRAMENTO, CALIFORNIA 2005-11-02 DRAWINGS DESIGNED AND DRAWN BY ASTS, DENVER, CO	859-208-2098

REV NO	2005-11-02	CHANGED NOTE #2, CHANGED PART OF CONC HANDRAIL WALL TO ALUM HANDRAIL
1	ASTS-GGS	



PLAN
1/4" = 1'-0"



SECTION A
1/4" = 1'-0"
2106 2107
2107

COLORADO REGISTERED PROFESSIONAL ENGINEER
21750
8/9/10

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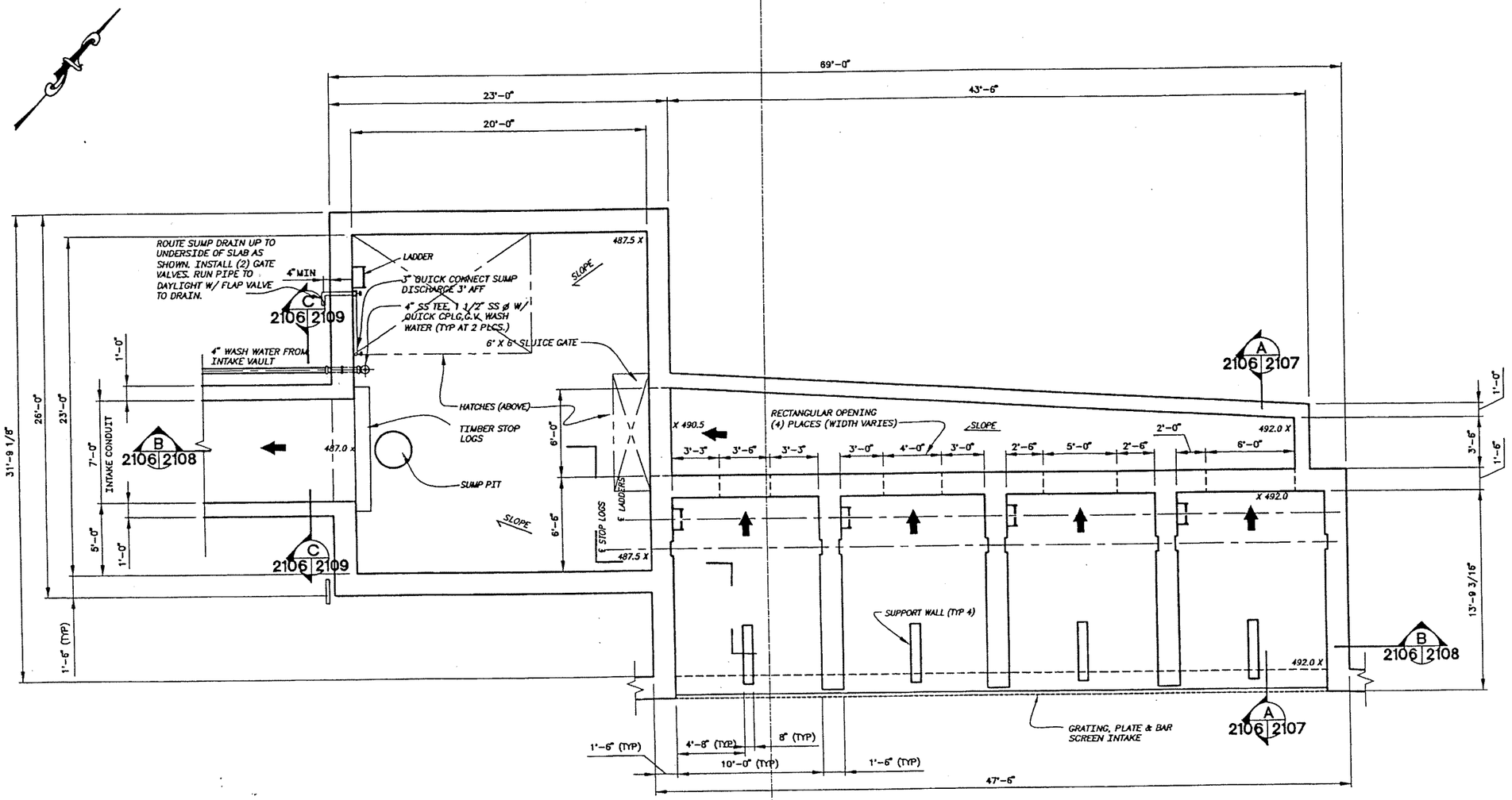
AMERICAN RIVER PUMP STATION
PHASE II – RIVER INTAKE STRUCTURES
EMERGENCY INTAKE PLAN AND SECTION

ASTS		BUREAU OF RECLAMATION	
DESIGNED	WCT, GCS	REVIEWED	PROJECT MANAGER P.E.
DRAWN	AVJ		
CHECKED	DLH	RECEIVED	CHIEF, ENGINEERING BRANCH
SUBMITTED	TECHNICAL APPROVAL		
CADD SYSTEM		CADD FILENAME	

2107

CONSECUTIVE SHEET 30



PLAN
1/4" = 1'-0"

ASTS
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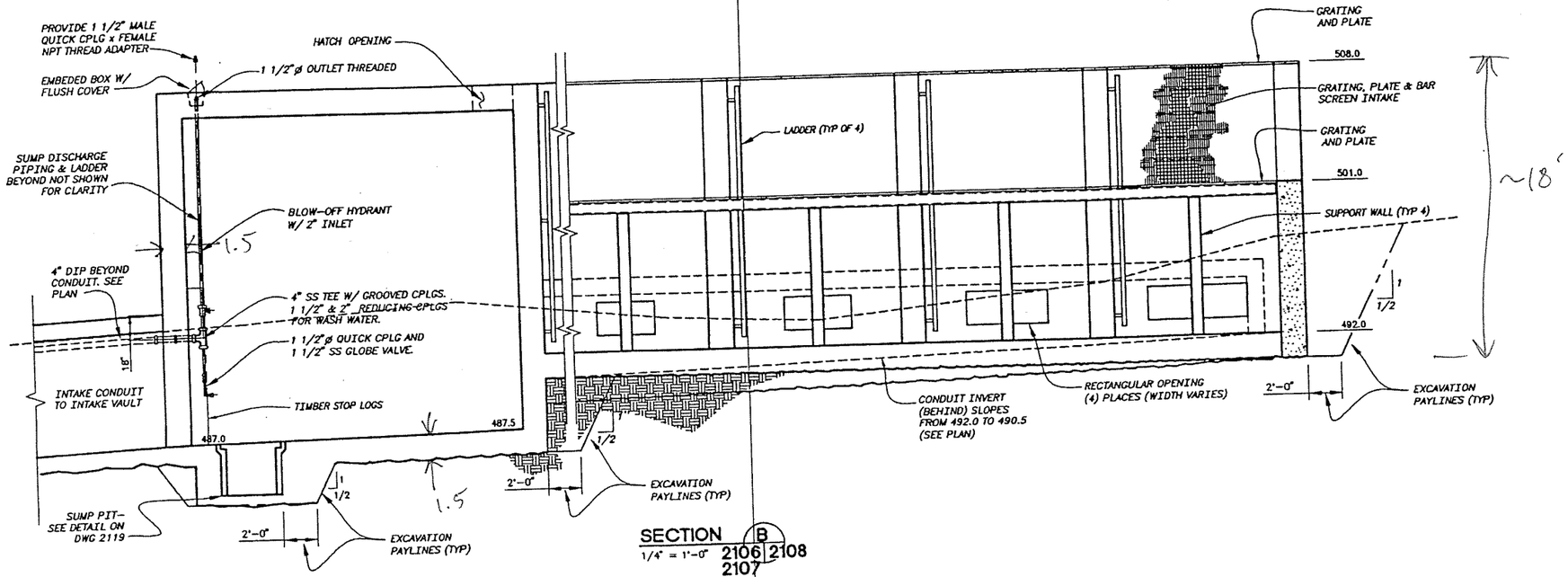
CENTRAL VALLEY PROJECT
AUBURN – FOLSOM SOUTH UNIT – CALIFORNIA

AMERICAN RIVER PUMP STATION
PHASE II – RIVER INTAKE STRUCTURES
EMERGENCY INTAKE PLAN

ASTS		BUREAU OF RECLAMATION	
DESIGNED	WCT, GGS	REVIEWED	PROJECT ENGINEER, P.E.
DRAWN	AWJ		
CHECKED	DLW	RECEIVED	CHIEF, ENGINEERING BRANCH
SUBMITTED	TECHNICAL APPROVAL		
CADD SYSTEM	AutoCAD	CADD FILENAME	AMERICAN_RIVER_INTAKE_STRUCTURE.DWG
SACRAMENTO, CALIFORNIA	2005-08-26	859-208-2106	
DRAWING DESIGNED AND DRAWN BY ASTS, DENVER, CO			

COLORADO REGISTERED PROFESSIONAL ENGINEER 31763 05/11/06

NOTE:
SEE STRUCT DWGS FOR INTAKE SCREENS, GRATING, CHECKER PLATE COVER AND SUPPORT FRAME



SECTION B
1/4" = 1'-0"

2106 2108
2107

COLORADO REGISTERED PROFESSIONAL ENGINEER
12/19/08

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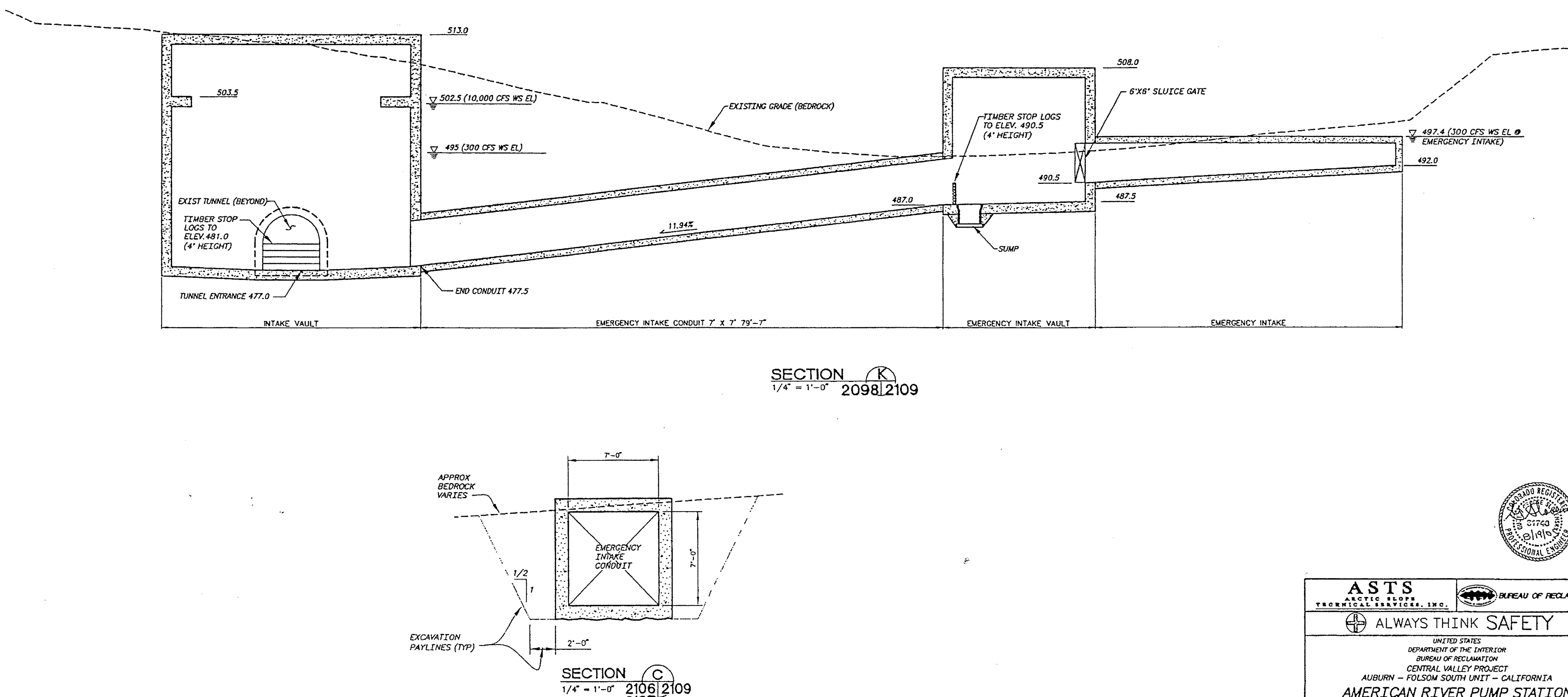
AUBURN – FOLSOM SOUTH UNIT – CALIFORNIA

AMERICAN RIVER PUMP STATION
PHASE II – RIVER INTAKE STRUCTURES
EMERGENCY INTAKE SECTIONS

ASTS DESIGNED – MCT, GGS	BUREAU OF RECLAMATION
DRAWN – AWJ	REVIEWED (PROJECT MANAGER)
CHECKED – BLM	RECEIVED (CNTRY, ENGINEERING BRANCH)
SUBMITTED (TECHNICAL APPROVAL)	
CADD SYSTEM AutoCAD	CADD FILENAME AMERICAN_RIVER_INTAKE_STRUCTURE.DWG
SACRAMENTO, CALIFORNIA 2005-08-03 DRAWINGS DESIGNED AND DRAWN BY ASTS, DENVER, CO	859-208-2108



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AMERICAN RIVER PUMP STATION
PHASE II – RIVER INTAKE STRUCTURES
EMERGENCY INTAKE CONDUIT PROFILE

ASTS	BUREAU OF RECLAMATION
DESIGNED SGS	REVIEWED P.E. PROJECT MANAGER
DRAWN JKL	
CHECKED DLH	RECEIVED CHIEF, ENGINEERING BRANCH
SUBMITTED TECHNICAL APPROVAL	
CADD SYSTEM AutoCAD	CADD FILENAME AMERICAN_RIVER-MAINTENANCE_GATE.DWG
SACRAMENTO, CALIFORNIA 2005-06-03 DRAWINGS DESIGNED AND DRAWN BY ASTS, DENVER, CO	859-208-2109

URS

Page ____ of ____

Job Auburn Dam Pump Sta Remove Project No. 18600819.04000 Sheet ____ of ____

Description Quantities for Demolition of Intake Vault. Computed by EKS Date 4/25/06

Checked by ____ Date ____

Reference

Intake Vault (2102, 2103 drawings)

Concrete:

Floor (use dwg 859-208-2102, attached)

① $39' \times (18' + 1.5') \times 1.5' = 1140.75\ ft^3$

② $17' \times 32.5' \times 1.5' = 828.75\ ft^3$

③ $\frac{1}{2}(27.135 + 1.5 + 1)(12') = 177.81\ ft^3$

④ $\frac{1}{2}(17)(7) = 59.5\ ft^3$

Floor Total: $2206.81\ ft^3$ or $81.73\ yd^3$

Walls

$[39' + 34' + (27.135 + 1.5 + 1.5) + 28.56'] \times 1.5' \times (513 - 478) =$

$131.7(1.5)(35) = 6914.25\ ft^3$ or $256.1\ yd^3$

Roof (same as floor) = $81.73\ yd^3$

Platform

Ⓐ $6' \times (8.5 + 6) = 87$

Ⓑ $6' \times 24' = 144$

Ⓒ $6' \times 14.5 = 87$

Ⓓ $19' \times 6' + \frac{1}{2}(2.5)(6) = 121.5$

Ⓔ $11' \times 8' = 88$

Ⓕ $3 \times 22 = 66$

Ⓖ $3 \times 17 = 51$

$T = 644.5\ ft^2$ $\quad 644.5\ ft^2(1.5') = 966.75\ ft^3$ or $35.81\ yd^3$

$T = 81.73 + 256.1 + 81.73 + 35.81\ yd^3 = \boxed{455.37\ yd^3}$

URS

Job Auburn Dam Pump Sta Dem. Project No. 18600819.04000

Description Intake Vault Quan. Computed by EKS

Checked by

Page ____ of ____

Sheet ____ of ____

Date 4/25/06

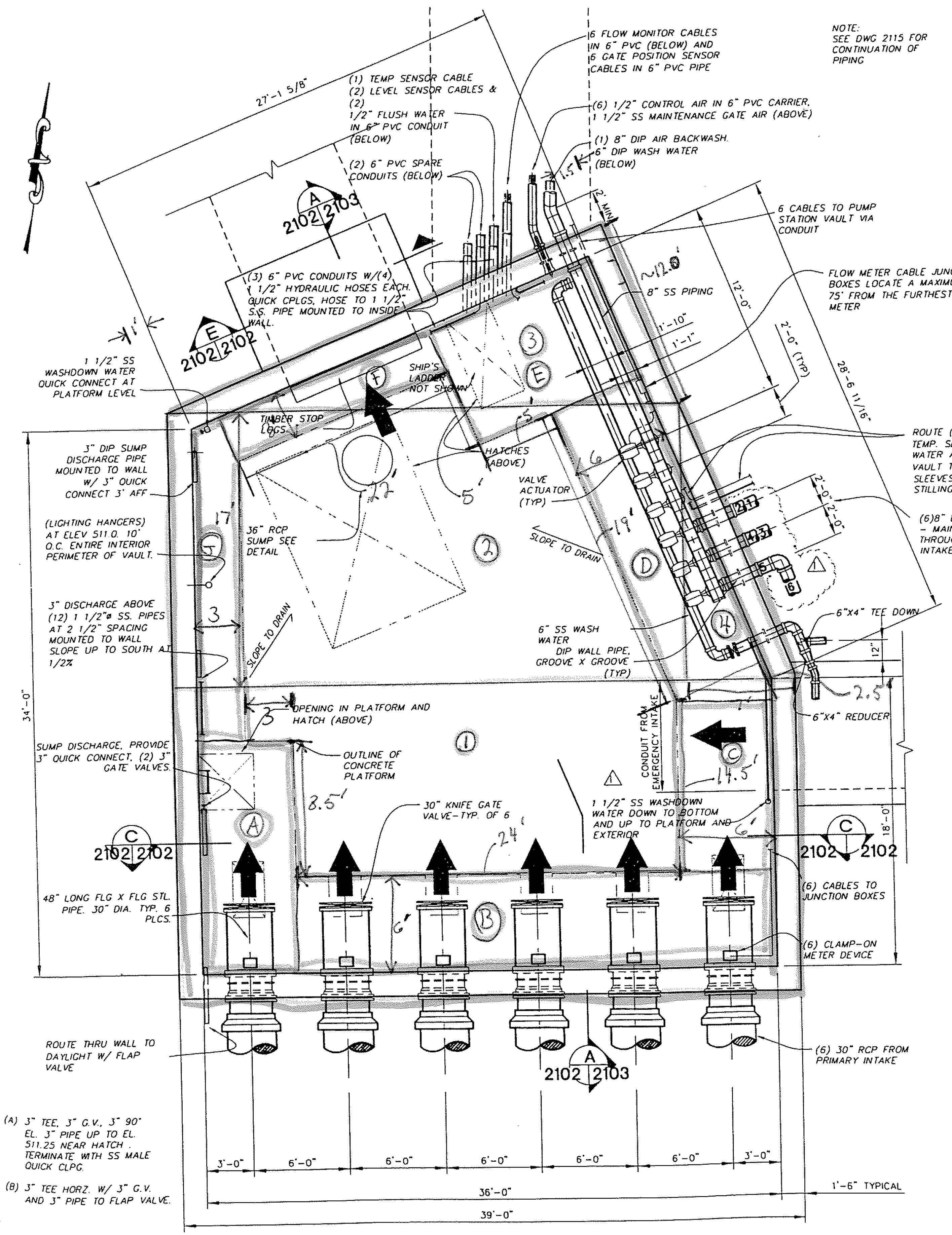
Date

Reference

Intake Vault Equipment

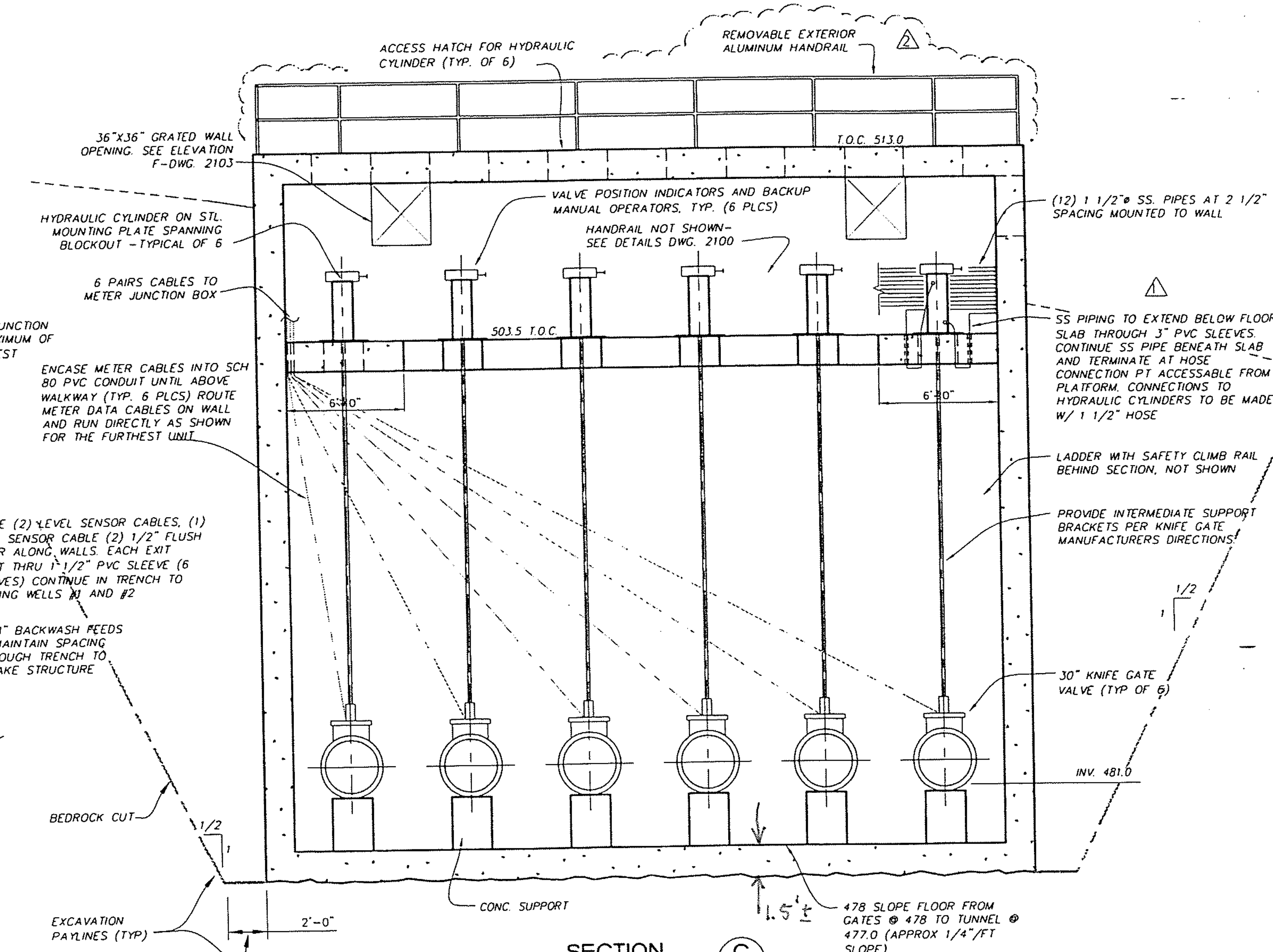
6, - 30" knife gates, stems, operators

~300' of piping 6"ϕ to 8"ϕ, for various uses.



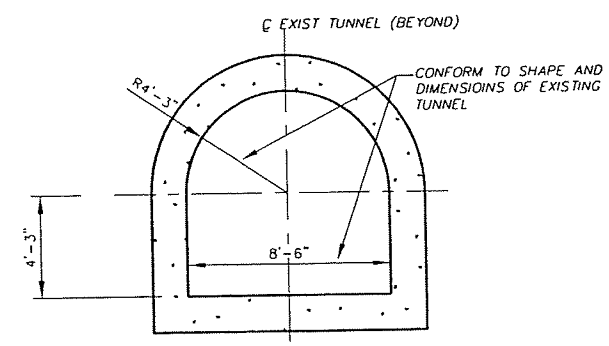
LOWER PLAN

1/4" = 1'-0"



SECTION C 2102 | 2102 2103

1/4" = 1'-0"



SECTION E 2102 | 2102 2103

1/4" = 1'-0"

3/16" = 1.5'

WILLIAM ROY KENDALL · REGISTERED · 16125 · PROFESSIONAL ENGINEER · STATE OF COLORADO

COLORADO REGISTERED · GUSTAV GEORGE SLOVENSKY · 31748 · PROFESSIONAL ENGINEER

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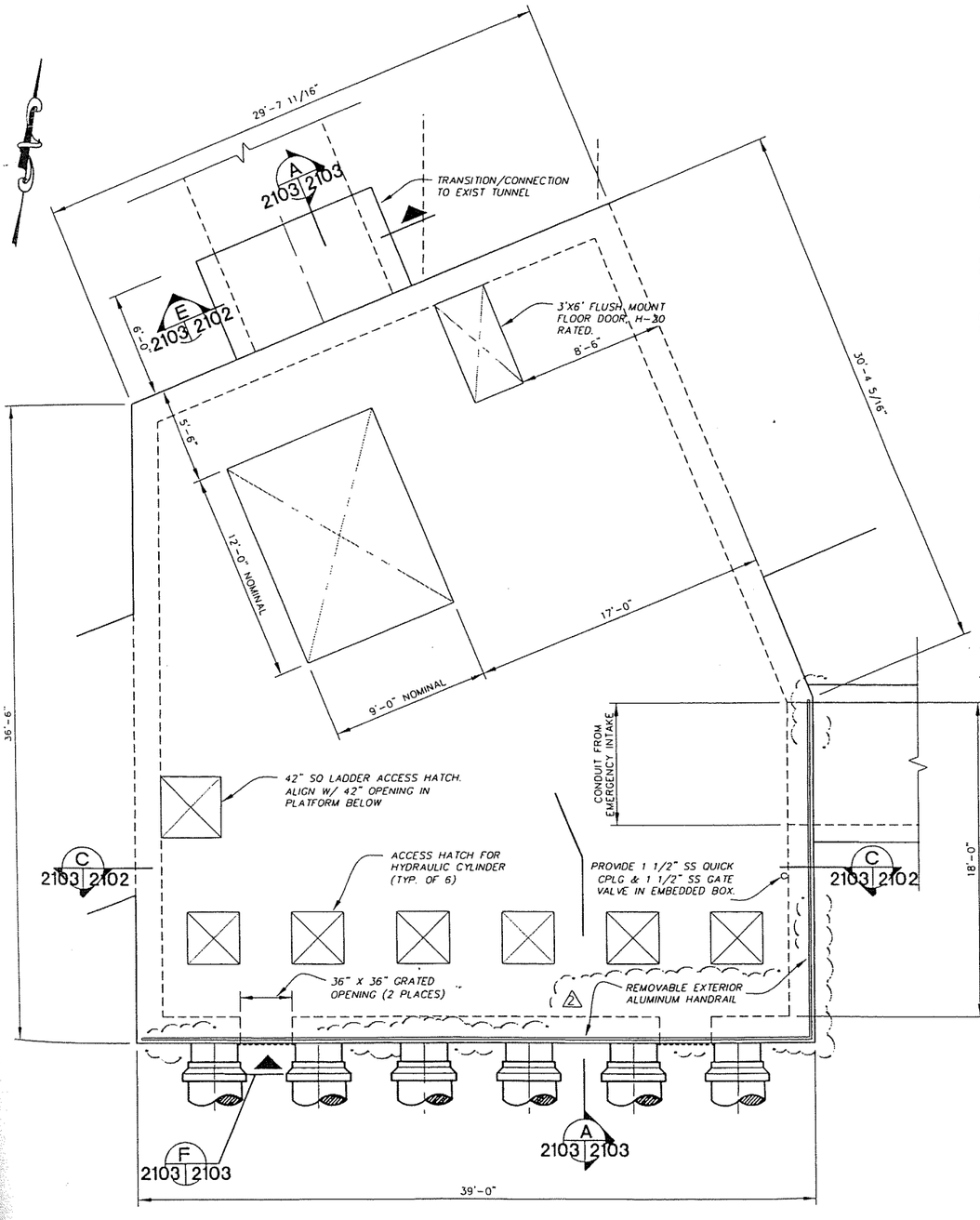
AUBURN - FOLSOM SOUTH UNIT - CALIFORNIA

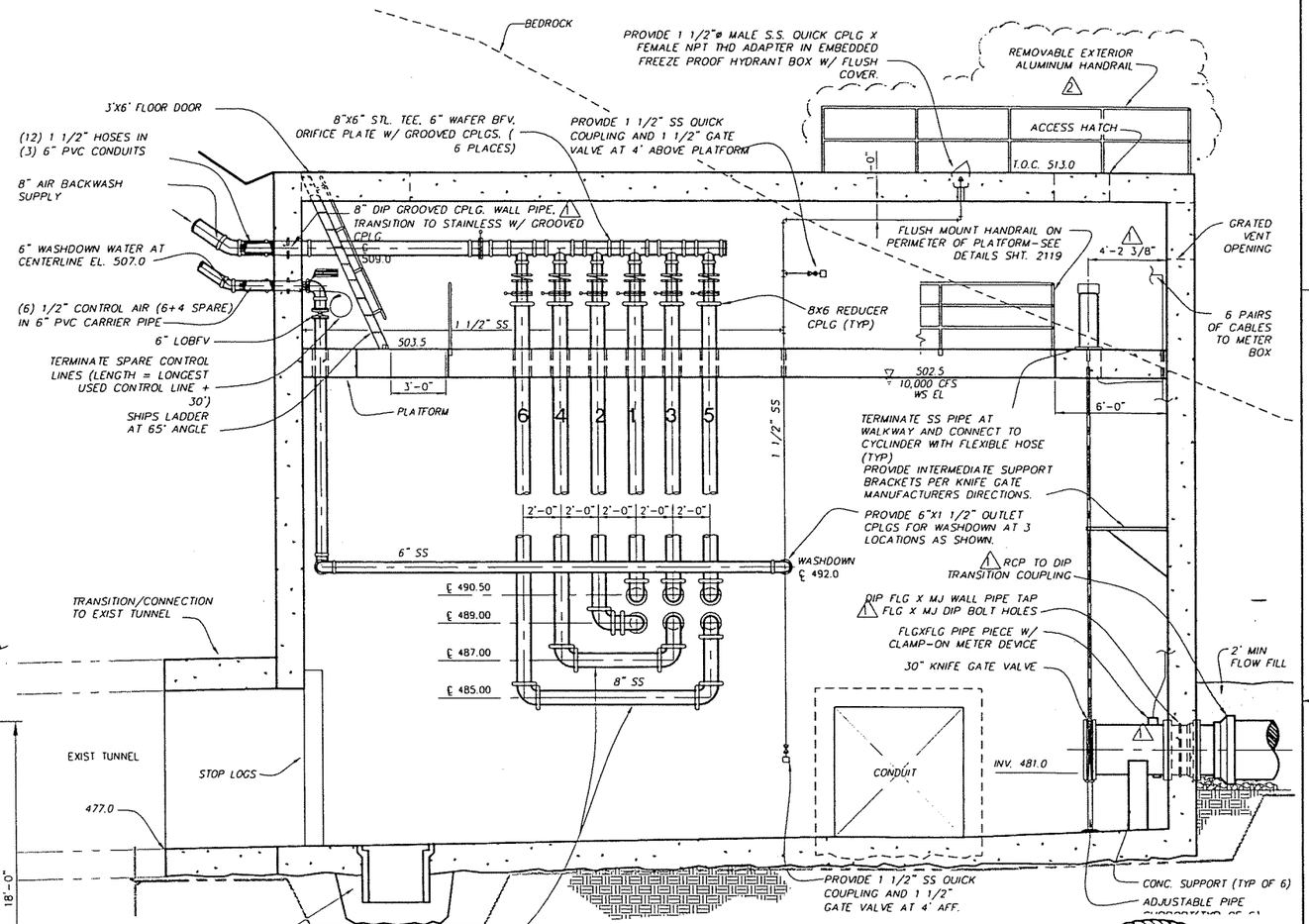
AMERICAN RIVER PUMP STATION
PHASE II - RIVER INTAKE STRUCTURES
INTAKE VAULT & PLAN SECTIONS

ASTS		BUREAU OF RECLAMATION	
DESIGNED	WRK, GGS	REVIEWED	A.W. STROPPINI P.E. PROJECT MANAGER
DRAWN	AVJ, EMF		
CHECKED	DLM		
SUBMITTED	G. SLOVENSKY TECHNICAL APPROVAL	RECEIVED	PONCIANO MARQUEZ CHIEF, ENGINEERING BRANCH
CADD SYSTEM AutoCAD		CADD FILENAME AMERICAN_RIVER_INTAKE_STRUCTURE.DWG	
SACRAMENTO, CALIFORNIA DRAWINGS DESIGNED AND DRAWN BY ASTS, DENVER, CO	2005-11-02	859-208-2102	

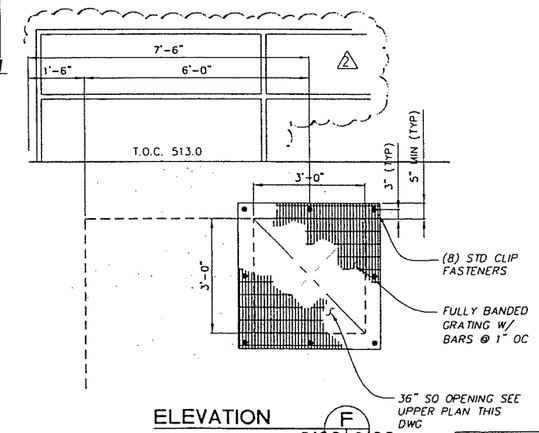
REV NO	DATE		DESCRIPTION
2	2005-11-02	ASTS-GGS	CHANGED CONCRETE HANDRAIL TO ALUMINUM
1	2005-10-14	ASTS-GGS	CLARIFIED PIPING MATERIALS AND ROUTING



UPPER PLAN
1/4" = 1'-0"



ILLUSTRATIVE SECTION A 2102 2103 2103
1/4" = 1'-0"



ELEVATION F 2103 2103
1/2" = 1'-0"

COLORADO REGISTERED GEORGE SLOVENSKY 31748 PROFESSIONAL ENGINEER

WILLIAM ROY KENDALL II REGISTERED 16125 PROFESSIONAL ENGINEER STATE OF COLORADO

REV NO		
2	2005-11-03 ASTS- (65)	REPLACED CONC HANDRAIL WITH ALUMINUM HANDRAIL
REV NO 1	2005-10-14 ASTS- (65)	REVISED NOTES, ADDED DIMENSION

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AUBURN - FOLSOM SOUTH UNIT - CALIFORNIA

AMERICAN RIVER PUMP STATION
PHASE II - RIVER INTAKE STRUCTURES
INTAKE VAULT PLAN AND SECTIONS

ASTS		BUREAU OF RECLAMATION	
DESIGNED	WRK, GGS	REVIEWED	A.W. STROPPINI P.E. PROJECT MANAGER
DRAWN	AVJ, EMF		
CHECKED	DLM		
SUBMITTED	G. SLOVENSKY TECHNICAL APPROVAL	RECEIVED	PONCIANO MARQUEZ CHIEF, ENGINEERING BRANCH
CADD SYSTEM AutoCAD		CADD FILENAME AMERICAN_RIVER_INTAKE_STRUCTURE.DWG	
SACRAMENTO, CALIFORNIA 2005-08-05 DRAWINGS DESIGNED AND DRAWN BY ASTS, DENVER, CO		859-208-2103	

URS

Job Auburn Dam | Project No. 186008l9.04000 | Page ____ of ____

Description Maintenance Gate | Computed by EKS | Date 5/3/06 | Sheet ____ of ____

Demo Quantities | Checked by ____ | Date ____ | Reference

Concrete:
Left "box" (looking down stream)

$(14' \times (15+16) \times 1.5) 2 + 14 \times (7-3) \times 1.5 = 735\ ft^3$ or $27.22\ yd^3$

Floor of gate

$3'$ thick $\times$ ($31'$ long) $\times$ $16'$ wide $= 1488\ ft^3$ or $55.1\ yd^3$

Right Box

$(31' \times 1.5' \times 17')2 + (1.5 \times 17 \times 5)4 = 2091\ ft^3$ or $77.4\ yd^3$

Platform (includes entire length)

$(26 \times 40 \times 1.5) + (86 \times 26 \times 1.5) + (150 \times 1.5 \times 14) = 6114\ ft^3$ or $226.44\ yd^3$

retain walls, flume, road, from primary intake to intake vault.

Floor 40' wide floor, 200 feet long, 1.5 thick $= 12000\ ft^3$ or $444.5\ yd^3$

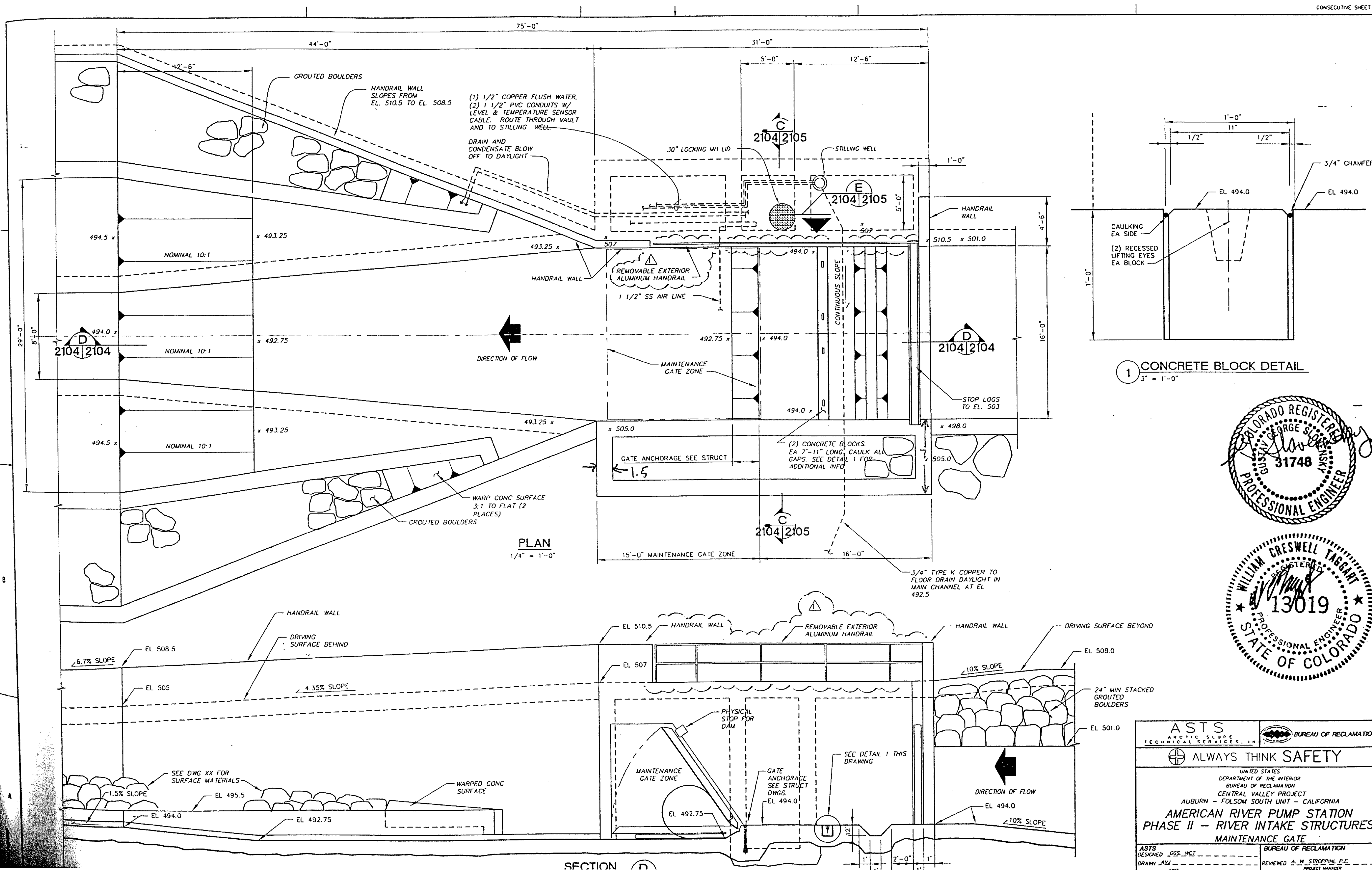
walls 80' long ($13' \times 1.5$) + $80' (10' \times 1.5) = 2760\ ft^3$ or $103\ yd^3$

Approach flume up to the Maintenance Gate

Floor 16' wide, x 240' long x 1.5' thick $= 5760\ ft^3$ or $213.3\ yd^3$

walls 17' tall, x 1.5' wide x 480' $= 12240\ ft^3$ or $454\ yd^3$

Total This Sheet: $1601\ yd^3$


CONSECUTIVE SHEET 48
75'-0"
44'-0"
31'-0"
12'-6"
5'-0"
12'-6"
GROUTED BOULDERS
HANDRAIL WALL SLOPES FROM EL. 510.5 TO EL. 508.5
(1) 1/2" COPPER FLUSH WATER, (2) 1 1/2" PVC CONDUITS W/ LEVEL & TEMPERATURE SENSOR CABLE. ROUTE THROUGH VAULT AND TO STILLING WELL.
DRAIN AND CONDENSATE BLOW OFF TO DAYLIGHT
30" LOCKING MH LID
STILLING WELL
1'-0"
HANDRAIL WALL
NOMINAL 10:1
REMOVABLE EXTERIOR ALUMINUM HANDRAIL
HANDRAIL WALL
1 1/2" SS AIR LINE
CONTINUOUS SLOPE
DIRECTION OF FLOW
MAINTENANCE GATE ZONE
STOP LOGS TO EL. 503
GATE ANCHORAGE SEE STRUCT
(2) CONCRETE BLOCKS. EA 7'-11" LONG, CAULK ALL GAPS. SEE DETAIL 1 FOR ADDITIONAL INFO
WARP CONC SURFACE 3:1 TO FLAT (2 PLACES)
GROUTED BOULDERS
PLAN
1/4" = 1'-0"
15'-0" MAINTENANCE GATE ZONE
16'-0"
3/4" TYPE K COPPER TO FLOOR DRAIN DAYLIGHT IN MAIN CHANNEL AT EL 492.5
1'-0"
11"
1/2"
3/4" CHAMFER
EL 494.0
CAULKING EA SIDE
(2) RECESSED LIFTING EYES EA BLOCK
1 CONCRETE BLOCK DETAIL
3" = 1'-0"
COLORADO REGISTERED PROFESSIONAL ENGINEER 31748
WILLIAM CRESWELL TAGGART REGISTERED PROFESSIONAL ENGINEER 13019 STATE OF COLORADO
HANDRAIL WALL
DRIVING SURFACE BEHIND
6.7% SLOPE
EL 508.5
EL 505
4.35% SLOPE
EL 510.5
EL 507
REMOVABLE EXTERIOR ALUMINUM HANDRAIL
DRIVING SURFACE BEYOND
EL 508.0
10% SLOPE
24" MIN STACKED GROUTED BOULDERS
EL 501.0
PHYSICAL STOP FOR DAM
MAINTENANCE GATE ZONE
GATE ANCHORAGE SEE STRUCT DWGS.
SEE DETAIL 1 THIS DRAWING
DIRECTION OF FLOW
SEE DWG XX FOR SURFACE MATERIALS
1.5% SLOPE
EL 495.5
WARPED CONC SURFACE
EL 494.0
EL 492.75
EL 494.0
10% SLOPE
SECTION D
ASTS ARCTIC SLOPE TECHNICAL SERVICES, INC
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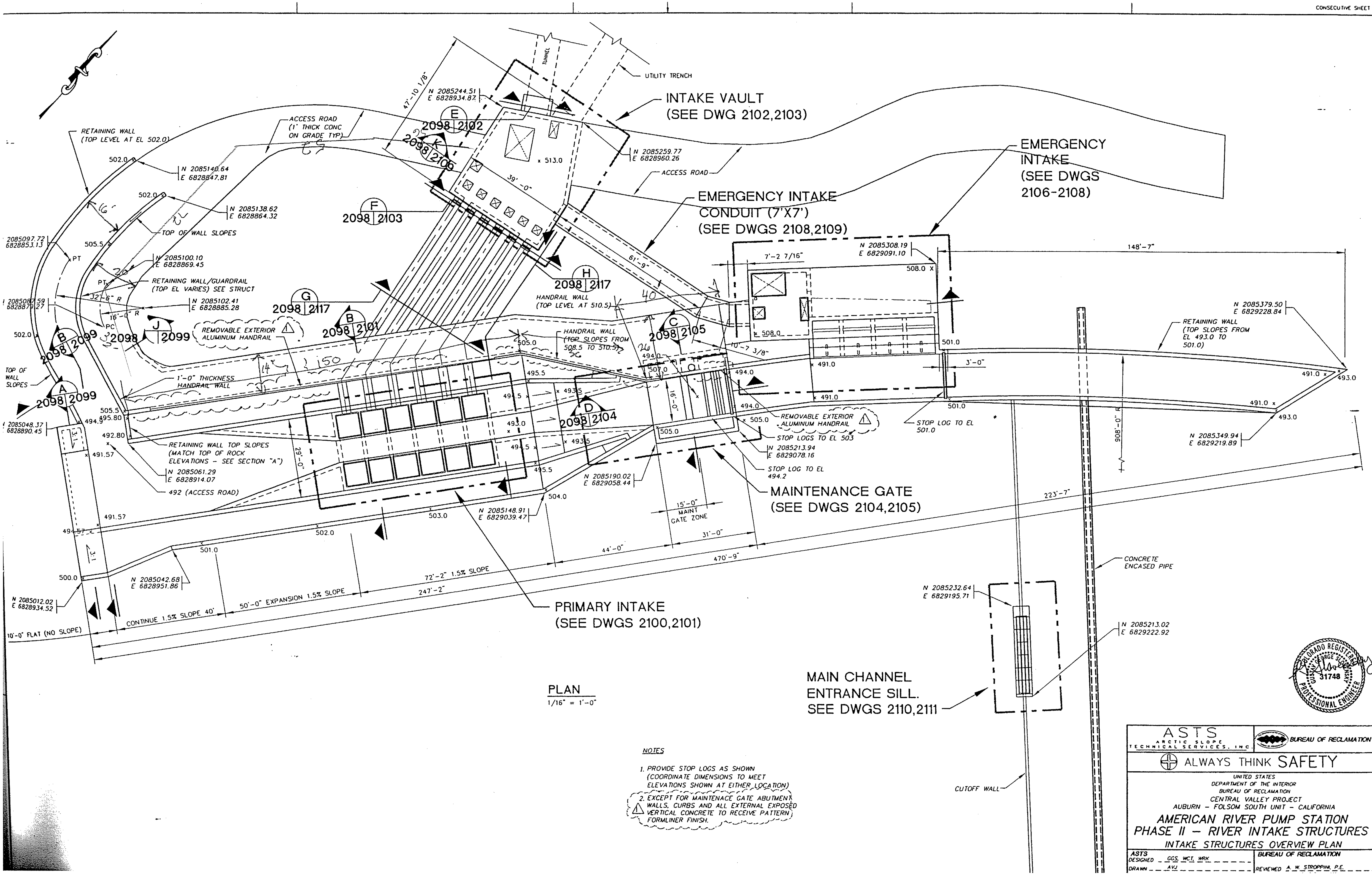
BUREAU OF RECLAMATION
CENTRAL VALLEY PROJECT
AUBURN - FOLSOM SOUTH UNIT - CALIFORNIA
AMERICAN RIVER PUMP STATION
PHASE II - RIVER INTAKE STRUCTURES
MAINTENANCE GATE
DESIGNED GCS WCT
DRAWN AVJ
REVIEWED A. W. STROPPINI, P.E. PROJECT MANAGER



NOTES

1. PROVIDE STOP LOGS AS SHOWN (COORDINATE DIMENSIONS TO MEET ELEVATIONS SHOWN AT EITHER LOCATION)
2. EXCEPT FOR MAINTENACE GATE ABUTMENT WALLS, CURBS AND ALL EXTERNAL EXPOSED VERTICAL CONCRETE TO RECEIVE PATTERN FORMLINER FINISH.

ASTS
ARCTIC SLOPE TECHNICAL SERVICES, INC.

BUREAU OF RECLAMATION

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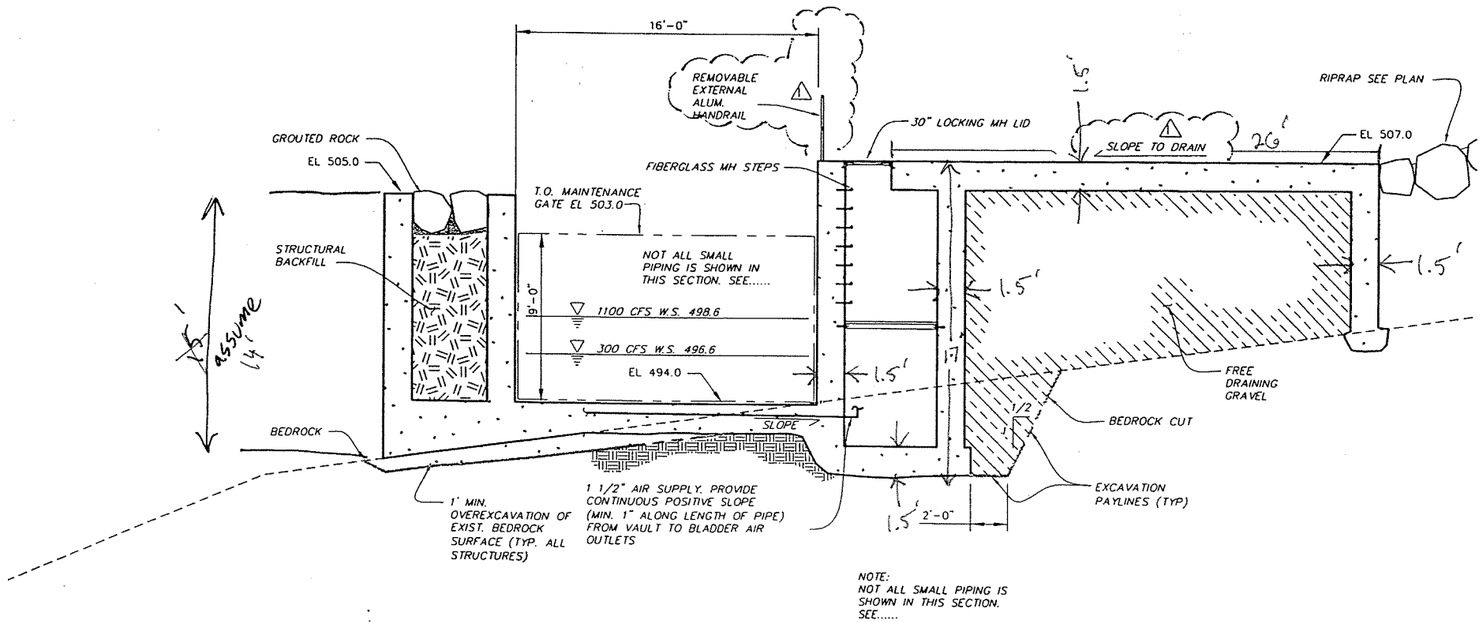
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL VALLEY PROJECT
AUBURN - FOLSOM SOUTH UNIT - CALIFORNIA

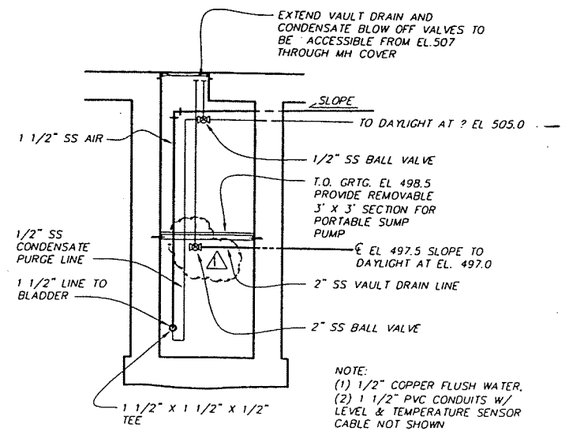
AMERICAN RIVER PUMP STATION
PHASE II - RIVER INTAKE STRUCTURES
INTAKE STRUCTURES OVERVIEW PLAN

ASTS	BUREAU OF RECLAMATION
DESIGNED GGS, WCT, WRK	
DRAWN AVJ	REVIEWED A. W. STROPPINK, P.E.



NOTE:
NOT ALL SMALL PIPING IS SHOWN IN THIS SECTION. SEE.....

SECTION C
1/4" = 1'-0" 2098 2105
2104



NOTE:
(1) 1/2" COPPER FLUSH WATER,
(2) 1 1/2" PVC CONDUITS W/ LEVEL & TEMPERATURE SENSOR CABLE NOT SHOWN

SECTION E
1/4" = 1'-0" 2104 2105

COLORADO REGISTERED GUSTAV GEORGE SLOVENSKY 31748 PROFESSIONAL ENGINEER

WILLIAM CRESWELL TAGGART REGISTERED 13019 PROFESSIONAL ENGINEER STATE OF COLORADO

REV NO		
1	2005-11-02 ASTS-665	REPLACED CONC HANDRAIL WALL WITH ALUMINUM HANDRAIL, ADDED "SLOPE TO DRAIN" NOTE & CLARIFIED VAULT PIPING

ASTS ARCTIC SLOPE TECHNICAL SERVICES, INC.

BUREAU OF RECLAMATION

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL VALLEY PROJECT
AUBURN - FOLSOM SOUTH UNIT - CALIFORNIA

AMERICAN RIVER PUMP STATION
PHASE II - RIVER INTAKE STRUCTURES
MAINTENANCE GATE

ASTS	BUREAU OF RECLAMATION
DESIGNED GGS, WCT	
DRAWN AVJ	REVIEWED PROJECT MANAGER
CHECKED WCT	
SUBMITTED TECHNICAL APPROVAL	RECEIVED CHIEF, ENGINEERING BRANCH
CADD SYSTEM AutoCAD	CADD FILENAME AMERICAN_RIVER_MAINTENANCE_GATE.DWG
SACRAMENTO, CALIFORNIA 2005-11-07 DRAWINGS DESIGNED AND DRAWN BY ASTS, DENVER, CO	859-208-2105