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WATANA - FERC APPLICATION

FEASIBILITY LEVEL

SUMMARY OF COST ESTIMATE

FILE # 1503-103

(L LEVY, RAM D, OEB)

JULY 10, 1984

		DIVERSIFIED (BID PRICE)
ACCOUNT 330 LAND & LAND RIGHTS	51,000,000	51,000,000
ACCOUNT 331 POWERHOUSE	69,458,841	65,610,641
ACCOUNT 332.1 RESERVOIR, DAMS & TUNN.	48,060,187	42,321,578
ACCOUNT 332.2 DIVERSION TUNNELS	97,348,501	83,990,358
ACCOUNT 332.22 U/S COFFERDAMS	18,350,520	3,532,074
ACCOUNT 332.23 D/S COFFERDAMS	2,609,410	1,543,910
ACCOUNT 332.3 MAIN DAM	808,962,223	628,480,797
ACCOUNT 332.4 RELICT CHANNEL	58,613,000	47,032,863
ACCOUNT 332.51 OUTLET FACILITIES	39,151,369	25,000,064
ACCOUNT 332.52 MAIN SPILLWAY	120,042,294	98,044,186
ACCOUNT 332.6 POWER&OUTLET INTAKE	96,979,369	66,171,697
ACCOUNT 332.8 PENSTOCKS & SURGE CHAMBER	54,500,016	40,821,552
ACCOUNT 332.9 TAILRACE	14,129,812	14,034,934
ACCOUNT 333 WATERWHEELS, TURBINES&GEN	78,800,000	79,750,646
ACCOUNT 334 ACCESSORY ELECTRICAL	21,200,000	47,532,996
ACCOUNT 335 MISC POWER PLANT EQ.	13,800,000	12,924,965
ACCOUNT 336 ROADS, RAIL FACILITIES	213,864,000	76,773,712
ACCOUNT 350-359 TRANSMISSION LINES	395,558,000	196,346,204
ACCOUNT 399 GENERAL PLANT	5,092,000	IN DIRECTS & INDIRECTS
ACCOUNT (63) CONSTRUCTION CAMP	301,824,033	204,756,965
ACCOUNT (68) MITIGATION	29,200,000	29,200,000
SUBTOTAL -	2,522,622,775	1,814,870,082
CONTINGENCY ALLOWANCE	371,377,225	
TOTAL CONSTRUCTION COST	2,894,000,000	
ENGINEERING & ADMINISTRATION	467,000,000	
TOTAL COST - JAN 82 PRICE LEVEL	3,361,000,000	

NOTE: THE TRANSMISSION LINE COSTS ARE TAKEN FROM ACRES 1982 LEVEL ESTIMATE.

WATANA - FERC APPLICATION

FEASIBILITY LEVEL

SUMMARY OF COST ESTIMATE

FILE # 1563-103

(L LEVY, RAM D, OEB)

JULY 10, 1984

		DIVERSIFIED (BID PRICE)
ACCOUNT 330 LAND & LAND RIGHTS	51,000,000	51,000,000
ACCOUNT 331 POWERHOUSE	69,458,841	[illegible]
ACCOUNT 332.1 RESERVOIR, DAMS & TUNN.	48,060,187	[illegible]
ACCOUNT 332.2 DIVERSION TUNNELS	97,348,501	[illegible]
ACCOUNT 332.22 U/S COFFERDAMS	18,350,520	3,532,274 ✓
ACCOUNT 332.23 D/S COFFERDAMS	2,689,416	1,543,910 ✓
ACCOUNT 332.3 MAIN DAM	888,962,223	628,480,737 ✓
ACCOUNT 332.4 RELICT CHANNEL	58,613,000	[illegible]
ACCOUNT 332.51 OUTLET FACILITIES	39,151,369	[illegible]
ACCOUNT 332.52 MAIN SPILLWAY	120,042,294	[illegible]
ACCOUNT 332.6 POWER&OUTLET INTAKE	96,979,369	[illegible]
ACCOUNT 332.8 PENSTOCKS & SURGE CHAMBER	54,560,016	[illegible]
ACCOUNT 332.9 TAILRACE	14,129,812	[illegible]
ACCOUNT 333 WATERWHEELS, TURBINES&GEN	70,800,000	[illegible]
ACCOUNT 334 ACCESSORY ELECTRICAL	21,200,000	[illegible]
ACCOUNT 335 MISC POWER PLANT EQ.	13,800,000	[illegible]
ACCOUNT 336 ROADS, RAIL FACILITIES	213,864,000	[illegible]
ACCOUNT 350-359 TRANSMISSION LINES	395,550,000	[illegible] ✓
ACCOUNT 399 GENERAL PLANT	5,092,000	[illegible]
ACCOUNT (63) CONSTRUCTION CAMP	301,824,033	[illegible]
ACCOUNT (68) MITIGATION	29,200,000	[illegible]
SUBTOTAL -	2,522,622,775	[illegible]
CONTINGENCY ALLOWANCE	371,377,225	
TOTAL CONSTRUCTION COST	2,894,000,000	
ENGINEERING & ADMINISTRATION	467,000,000	
TOTAL COST - JAN 82 PRICE LEVEL	3,361,000,000	

NOTE: THE TRANSMISSION LINE COSTS ARE TAKEN FROM ACRES 1982 LEVEL ESTIMATE.

Estimate Summary

BIDS OPENED _____ Date _____ AT _____ Location _____

COMPLETION TIME _____ BID BOND _____

TRICK & MURRAY, SEATTLE 47203

DIVERSIFIED CONSTRUCTORS, INC.

COST & ESTIMATE SUMMARY

JOB Watana Dam

FOR Alaska Power Authority

EST. BY A. Lee

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST	TOTAL COST Unit Cost	TOTAL COST Amount
330	LAND & LAND RIGHTS												
	Land & Land Rights	1	L.S.							$1,000,000	$1,000,000		
	Subtotal - Account 330									$1,000,000	$1,000,000		
331	POWERHOUSE												
331.11	Powerhouse & Tailrace												
.111	Excavation Rock	160,000	C.Y.	30.38 / 4860800	10.51 / 1681600	10.50 / 1680000	10.04 / 1606400	11.91 / 1905600	23.43 / 3748800		96.77	15483200	
.113	Drill & Grout U/S of Powerhouse	44,730	L.F.	4.53 / 202725	0.34 / 15338	1.89 / 84442	0.67 / 29792	1.29 / 57656	1.19 / 53237		9.91	442990	
.114	Concrete	43,500	C.Y.	95.86 / 4170055	10.08 / 438404	13.88 / 603837	13.81 / 600619	17.21 / 748733	62.14 / 2703240	15.00 / 652500	227.88	9917388	
.117	Drain Holes	44,430	L.F.	2.78 / 123515	0.21 / 9330	1.13 / 50206	0.43 / 19105	0.86 / 38210			5.41	240366	
.118	Metalwork	1	L.S.							L.S. 2100000	L.S.	2100000	
.119	Architectural	1	L.S.							L.S. 865000	L.S.	865000	
.110	Mechanical	1	L.S.							L.S. 10052550	L.S.	10052550	
331.12	ACCESS TUNNELS & PORTALS												
.120	35' x 20' Excavation	2,970	L.F.	306.54 / 2699430	38.72 / 1011928	30.41 / 901120	45.30 / 1083901	36.21 / 1077791	61.86 / 1837304		291.80	8799494	
.121	21'H x 25'W.H.S. Surge Chamber Access	100	L.F.	560.37 / 100866	202.23 / 36402	156.03 / 28086	328.13 / 59064	212.09 / 38176	452.02 / 81363		1910.87	343957	
.123	Drainage Gallery 10' x 10'	570	L.F.	247.79 / 141239	103.74 / 59130	73.27 / 41764	35.08 / 19997	67.42 / 38427	62.67 / 35720		589.97	336277	
.12A	Access Portal & Road, Common Excavation	94,420	C.Y.	1.12 / 105750	0.02 / 1888	0.64 / 60429	0.71 / 67039	0.83 / 78369			3.32	313474	
.12B	Access Portal & Road, Rock Excavation	71,790	C.Y.	5.80 / 416523	2.30 / 164876	2.60 / 186836	1.57 / 112754	2.34 / 168247			14.61	1049216	
.12C	Ventilation Gallery, 14'H x 12'W.H.S.	560	L.F.	323.35 / 181075	129.54 / 72540	101.23 / 56687	46.93 / 26290	95.84 / 53671	178.50 / 99959		878.39	491898	
.124	Portals Concrete	600	C.Y.	188.14 / 112881	30.45 / 18272	19.08 / 11445	21.39 / 12834	23.49 / 14096	64.38 / 38625	15.00 / 9000	361.83	217153	
.125	Tunnel Slab Concrete	1,690	C.Y.	154.40 / 260936	11.98 / 20246	26.84 / 45360	26.12 / 44143	35.19 / 59470	63.45 / 107231		317.98	537286	
.126	Penstock Access Plug Concrete	7,275	C.Y.	50.07 / 364259	26.5 / 19279	13.53 / 98431	12.24 / 89046	16.70 / 121493	42.36 / 308168		137.55	1000677	
.129	Main Portal Doors	2	EA.							49500 / 99000	49500	99000	

continued

DIVERSIFIED CONSTRUCTORS, INC.

COST & ESTIMATE SUMMARY

JOB Watana Dam NO. 8402 - A
FOR Alaska Power Authority DATE
EST. BY A. Lee SHEET 1 OF

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS		TOTAL DIRECT COST		TOTAL COST Unit Cost	TOTAL COST Amount	BID Unit Cost	BID Amount	Unit Cost	Amount
	1	L.S.														51000000		51000000				51000000 -		
																51000000		51000000				51000000 -		
	160,000	C.Y.	30.38	4860800	10.51	1681600	10.50	1680000	10.04	1606400	11.91	1905600	23.43	3748800			96.77	15483200			118.00	18880000 -		
	44,730	L.F.	4.53	202725	0.34	15338	1.89	84442	0.67	29792	1.29	57656	1.19	53037			9.91	442990			12.00	536760 -		
	43,500	C.Y.	95.86	4170055	10.08	438404	13.88	603837	13.81	600619	17.21	748733	62.14	2703240	15.00	652500	227.98	9917388			278.50	12114750 -		
	44,430	L.F.	2.78	123515	0.21	9330	1.13	50206	0.43	19105	0.86	38210					5.41	240366			6.60	293238 -		
	1	L.S.													L.S.	2100000	L.S.	2100000			L.S.	2564730 -		
	1	L.S.													L.S.	865000	L.S.	865000			L.S.	1056424 -		
	1	L.S.													L.S.	1005250	L.S.	1005250			L.S.	1227712 -		
	2,970	L.F.	706.54	2697430	340.72	1011928	303.41	901120	432.30	1283921	361.21	1072791	618.62	1837304			2962.80	8799494			3618.00	10745460 -		
cess	100	L.F.	560.37	100866	202.23	36402	156.03	28086	328.13	59064	212.09	38176	452.02	81363			1910.87	343957			2334.00	233400 -		
	570	L.F.	247.79	141239	103.74	59130	73.27	41764	35.08	19997	67.42	38427	62.67	35720			589.97	336277			720.00	410400 -		
vation	94,420	C.Y.	1.12	105750	0.02	1888	0.64	60429	0.71	67038	0.83	78369					3.32	313474			4.00	377680 -		
ion	71,790	C.Y.	5.80	416523	2.30	164876	2.60	186836	1.57	112734	2.34	168247					14.61	1049216			17.80	1277812 -		
	560	L.F.	323.35	181075	129.54	72540	101.23	56687	49.93	27960	95.84	53671	178.50	99959			878.39	491892			1073.00	600880 -		
	600	C.Y.	188.14	112881	30.45	18272	19.08	11445	21.39	12834	23.49	14096	64.38	38625	15.00	9000	361.93	217153			442.00	265200 -		
	1,690	C.Y.	154.40	260936	11.98	20246	26.84	45360	26.12	44143	35.13	59370	63.45	107231			317.92	537286			388.00	655720 -		
	7,275	C.Y.	50.07	364259	2.65	19279	13.53	98431	12.24	89046	16.70	121493	42.36	308169			137.55	1000677			168.00	1222200 -		
	2	EA.													49500 -	99000	49500 -	99000			60450.00	120900 -		

continued

FOLD LENGTH
12
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MANUAL
FEED

BIDS OPENED _____ Date _____ AT _____ Location _____

COMPLETION TIME _____ BID BOND _____

TRICK & MURRAY, SEATTLE 47263

DIVERSIFIED CONSTRUCTORS, INC.

COST & ESTIMATE SUMMARY

JOB _____

FOR _____

EST. BY _____

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS		TOTAL DIRECT COST		TOTAL COST Unit Cost	TOTAL COST Amount
331.13	ACCESS SHAFT																				
.131	Rock Excavation 23' Diameter	740	L.F.	917.85	678765	242.-	179080	184.11	136241	126.26	93432	227.44	168306	372.91	275853			2069.97	1531777		
.134	Concrete Lining 20' I.D.	740	L.F.	1013.85	749949	94.67	70057	109.27	80840	117.90	87245	139.84	103479	275.49	203860	5629	41655	1867.31	1381802		
.138	Miscellaneous Metalwork	50	Tns.													2500.-	125000	2500.-	125000		
.13C	Elevators	1	L.S.													L.S.	284500	L.S.	284500		
.14	Fire Protection Headtank	1	L.S.													L.S.	96813	L.S.	96813		
331.15	BUS TUNNELS																				
.151	Excavation Horizontal 22x22	156	L.F.	924.43	150451	216.11	41201	322.60	50325	292.38	45612	369.85	57696	418.12	65227			2631.49	410512		
.152	Excavation Inclined 16x16	202	L.F.	347.58	70210	155.87	31485	118.96	24029	107.-	21615	134.92	27253	211.23	42669			1075.36	217261		
.154	Bus Tunnel Slab Concrete	350	C.Y.	148.63	52017	17.14	5999	20.43	7151	20.27	7094	25.85	9048	76.60	26810	15.00	5250	323.91	113369		
331.16	TRANSFORMER GALLERY																				
.161	Excavation	26,200	C.Y.	26.91	705042	11.01	288462	8.84	231608	10.77	282174	10.47	274314	24.23	634826			92.23	2416426		
.164	Concrete Slab	2,100	C.Y.	237.01	497721	26.41	55461	23.96	50316	25.40	53340	30.73	64535	72.72	152712	15.00	31500	431.23	905463		
.167	Drain Holes	8,300	L.F.	2.78	23074	0.21	1743	1.13	9379	0.43	3569	0.86	7138					5.41	44903		
331.17	BUS SHAFTS																				
.171	Excavation 10.5' Diameter	560	L.F.	298.12	167059	88.01	49285	79.08	44287	112.89	63209	107.15	60004	77.80	43566			763.23	427464		
.174	Concrete Lining 9.0' Diameter	560	L.F.	481.91	269870	43.24	24214	47.18	26423	51.11	28619	60.83	34062	103.92	58195	17.46	9780	805.65	451163		
.178	Miscellaneous Metalwork	9	Tns.													5000.88	45000	5000.88	45000		
.179	Enclosures (Architectural)	1	L.S.													L.S.	58000	L.S.	58000		
.170	Manhoist	1	Ea.													L.S.	154000	L.S.	154000		
331.18	CARE OF WATER	1	L.S.					L.S.	233084	L.S.	26310	L.S.	202587					L.S.	460981		
331.19	INSTRUMENTATION	1	L.S.													L.S.	140000	L.S.	140000		
331.20	MISCELLANEOUS BUILDINGS & STRUCTURES	1	L.S.													L.S.	1215000	L.S.	1215000		
	SUBTOTAL = ACCOUNT 331 POWERHOUSE				1714209		429422		474316		468487		540325		1051726		6937128		5372197		

continued

Location
BOND

DIVERSIFIED CONSTRUCTORS, INC.

COST & ESTIMATE SUMMARY

JOB
FOR
EST. BY
NO.
DATE
SHEET 2 OF

QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS		TOTAL DIRECT COST		TOTAL COST Unit Cost	TOTAL COST Amount	BID Unit Cost	BID Amount	Unit Cost	Amount
740	L.F.	917.25	678765	242-	179080	184.11	136241	126.26	93432	227.44	168306	372.91	275953			2069.97	1531777			2528.00	1870720-		
740	L.F.	1093.85	794646	94.67	70057	109.27	80860	117.90	87245	139.84	103479	225.49	203860	56.29	41655	1867.31	1381802			2280.00	1687200-		
50	Tns.													2500-	125000	2500-	125000			3053.00	152650-		
1	L.S.													L.S.	284500	L.S.	284500			L.S.	347460-		
1	L.S.													L.S.	96813	L.S.	96813			L.S.	118238-		
156	L.F.	964.43	150451	264.11	41201	322.60	50325	292.38	45612	369.85	57696	418.12	65227			2631.49	410512			3214.00	501384-		
202	L.F.	347.58	70210	155.87	31485	118.96	24029	107-	21615	134.92	27253	211.23	42669			1075.56	217261			1313.00	265226-		
350	C.Y.	148.62	52017	17.14	5999	20.43	7151	20.27	7094	25.85	9048	76.60	26810	15.00	5250	323.91	113369			395.00	138250-		
26,200	C.Y.	26.91	705042	11.01	288462	8.84	231608	10.77	282174	10.47	274314	24.23	634826			92.23	2416426			112.00	2934400-		
2,100	C.Y.	237.01	497721	26.41	55461	23.96	50316	25.40	53340	30.73	64533	72.72	152712	15.00	31380	431.23	905463			526.00	1104600-		
8,300	L.F.	2.78	23074	0.21	1743	1.13	9379	0.43	3569	0.86	7138					5.41	44903			6.60	54780-		
560	L.F.	298.32	167059	88.01	49285	79.08	44287	112.87	63209	107.15	60004	77.80	43566			763.23	427410			932.00	521920-		
560	L.F.	481.91	269870	43.24	24214	47.18	26423	51.11	28619	60.83	34062	103.92	58195	17.46	9780	805.65	451163			984.00	551040-		
9	Tns.													5000.00	45000	5000.00	45000			6107.00	54963-		
1	L.S.													L.S.	58000	L.S.	58000			L.S.	70835-		
1	Ea.													L.S.	154000	L.S.	154000			L.S.	188080-		
1	L.S.					L.S.	232054	L.S.	26310	L.S.	202587					L.S.	460951			L.S.	562959-		
1	L.S.													L.S.	140000	L.S.	140000			L.S.	170982-		
TRUCTURES 1	L.S.													L.S.	1215000	L.S.	1215000			L.S.	1731638-		
ERHOUSE			17141909		4296220		4741316		4684872		5403259		10517266		6937128		53721970				65610641-		

continued

FOLD LENGTH
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FEED

BIDS OPENED _____ Date _____ AT _____ Location

MPLETION TIME _____ BID BOND _____

TRICK & MURRAY, SEATTLE 47263

DIVERSIFIED CONSTRUCTORS, INC.

COST & ESTIMATE SUMMARY

JOB _____

FOR _____

EST. BY _____

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS		TOTAL DIRECT COST		TOTAL COST Unit Cost	TOTAL COST Amount
332.	RESERVOIRS, DAMS and WATERWAYS																				
.1	Reservoir Clearing	37,500	Ac.	663.40	24879874	14.65	549540	87.75	3290645	60.67	2275096	97.54	3657738					924.07	34652893		
	SUBTOTAL - ACCOUNT 332.1 RESERVOIR, DAMS & WATERWAYS																		34652893		
332.2	DIVERSION TUNNELS																				
.210	Access Tunnel to Gate Chamber 15' x 20'	2,100	L.F	356.96	749623	171.30	359740	109.23	229377	89.79	188552	120.14	252298	243.51	511374			1090.93	2290964		
.211	Diversion Tunnel, Excavation 39' Dia.	7,220	L.F	1041.68	7520925	387.46	2797452	326.65	2358387	479.86	3464602	402.47	2905861	142.90	1103188			2781.02	20150415		
.21A	Diversion Tunnel, Excavation 48' Dia.	760	L.F	1477.22	1122687	609.98	463587	479.08	364104	615.98	468142	573.57	435911	285.80	217208			4041.63	3071639		
.21B	Portals, Common Excavation	67,100	C.Y	1.12	75152	0.02	1342	0.64	42944	0.71	47641	0.83	55693					3.32	222772		
.21C	Portals, Rock Excavation	85,550	C.Y	5.80	496190	2.30	196765	2.60	222430	1.57	134314	2.34	200187					14.61	1249886		
.21D	Emergency Release Chambers, Rock Excav.	4,700	C.Y	34.74	163278	11.88	55836	12.16	57152	10.86	51042	13.65	64155	24.23	113881			107.52	505344		
.212	Temporary Cofferdam Fill for U/S Portals	34,540	C.Y	0.27	9200	0.02	675	0.19	6488	0.10	3498	0.13	4570					0.71	24431		
.214	Tunnel Concrete Lining - 36' I.D.	7,220	L.F	1859.14	13423001	170.89	1233804	185.76	1341179	193.64	1398114	241.30	1742212	353.93	2555360	2.08	15000	3006.74	21708670		
.21E	Tunnel Concrete Lining - 45' I.D.	760	L.F	241.13	1832462	241.03	183181	231.75	176133	245.36	186472	302.03	229542	437.88	332785	2.96	2250	3872.14	2942875		
.215	Portal Concrete	18,525	C.Y	183.14	3485294	30.45	564086	19.08	353457	21.39	396250	23.49	435152	64.38	1192640	15.00	277875	361.93	6704754		
.215A	Mass Concrete	200	C.Y	284.39	56877	28.99	5797	28.32	5663	29.53	5905	36.78	7356	53.81	10762	0.37	73	462.19	92433		
.216	Flip Bucket Concrete	2,000	C.Y	56.91	113820	5.85	11700	11.76	23520	11.06	22120	14.43	28860	48.85	97700	7.50	15000	156.36	312720		
.217	Emergency Release Chamber Concrete	15,300	C.Y	52.39	801567	4.66	71298	11.20	171360	10.48	160344	13.66	208998	47.55	727515	7.50	114750	147.44	2255832		
.218	Suspended Metal Roof, Emerg. Release Chmb	2,775	S.F													28.50	79088	28.50	79088		
.219	Lower Diversion Tunnel Plug Concrete	5,570	C.Y	89.45	498237	11.13	61994	12.39	69012	12.66	70516	15.39	85722	37.58	209321	1.50	8355	180.10	1003157		
.21F	Lower Diversion Tunnel Plug @ Tailrace Tunnel	8,500	C.Y	59.87	508895	6.05	51425	11.63	98855	11.13	94605	14.25	121125	38.91	330735	1.55	13175	143.39	1218815		
.21G	Diversion Tunnel Mechanical	1	L.S													L.S.	4873960	L.S.	4873960		

continued

Location
BOND

DIVERSIFIED CONSTRUCTORS, INC.

COST & ESTIMATE SUMMARY

JOB
FOR
EST. BY
NO.
DATE
SHEET 3 OF

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS		TOTAL DIRECT COST		TOTAL COST Unit Cost	TOTAL COST Amount	BID Unit Cost	BID Amount	Unit Cost	Amount
YS																								
	37,500	Ac.	163.46	24879874	14.65	549540	87.75	3290645	60.67	2275096	97.54	3657738					924.07	34652893			1128.58	42321578 -		
ERVOIR,																								
																		34652893				42321578 -		
' x 20'	2,100	L.F	356.96	749623	171.30	359740	109.23	229377	89.79	188552	120.14	252298	243.51	511374			1090.93	2290964			1332.00	2797200 -		
Dia.	7,220	L.F	1041.68	7520925	387.46	2797452	326.65	2358387	479.86	3464602	402.47	2905861	142.90	1103188			2781.00	20150415			3396.00	24519120 -		
Dia.	760	L.F	1477.22	1122687	609.98	463587	479.08	364104	615.98	468142	573.57	435911	285.80	217208			4041.63	3071639			4936.00	3751360 -		
	67,100	C.Y.	1.12	75152	0.02	1342	0.64	42944	0.71	47641	0.83	55693					3.32	222772			4.00	268400 -		
	85,550	C.Y.	5.80	496190	2.30	196765	2.60	222430	1.57	134314	2.34	200187					14.61	1249886			17.80	1522790 -		
k Excav.	4,700	C.Y.	34.74	163278	11.88	55836	12.16	57152	10.86	51042	13.65	64155	24.23	113881			107.52	505344			131.00	615700 -		
Portals	34,540	C.Y.	0.27	9200	0.02	675	0.19	6488	0.10	3498	0.13	4570					0.71	24431			0.90	31086 -		
	7,220	L.F	1859.14	13423001	170.89	1233804	185.76	1341179	193.64	1398114	244.30	1742212	353.93	2555360	2.08	15000	3006.74	21708670			3672.00	26511840 -		
	760	L.F	241.13	1832462	241.03	183181	231.75	176133	245.36	186472	302.03	229542	437.88	332785	2.96	2250	3872.14	2942825			4729.00	3594040 -		
	18,525	C.Y.	188.14	3485294	30.45	564086	19.08	353457	21.39	396250	23.49	435152	64.38	1192640	15.00	277875	361.93	6704754			442.00	8188050 -		
	200	C.Y.	284.39	56877	28.99	5797	28.32	5663	29.53	5905	36.78	7356	53.81	10762	0.37	73	467.19	92433			564.00	112800 -		
	2,000	C.Y.	56.91	113820	5.85	11700	11.76	23520	11.06	22120	14.43	28860	48.85	97700	7.50	15000	156.36	312720			191.00	382000 -		
ete	15,300	C.Y.	52.39	801567	4.66	71298	11.20	171360	10.48	160344	13.66	208998	47.55	727515	7.50	114750	147.44	2255832			180.00	2754000 -		
ase Chmb	2,775	S.F													28.50	79088	28.50	79088			34.80	96570 -		
rete	5,570	C.Y.	89.45	498237	11.13	61994	12.39	69012	12.66	70516	15.39	85722	37.58	209321	1.50	8355	180.10	1003157			220.00	1225400 -		
llrace Tunnel	8,500	C.Y.	59.87	508895	6.05	51425	11.63	98855	11.13	94605	14.25	121125	38.91	330735	1.55	13175	143.39	1218815			175.00	1487500 -		
	1	L.S.													L.S.	4873960	L.S.	4873960			L.S.	6054175 -		

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BIDS OPENED _____ Date _____ AT _____ Location

PLETION TIME _____ BID BOND _____

TRICK & MURRAY, SEATTLE 47263

DIVERSIFIED CONSTRUCTORS, INC.

COST & ESTIMATE SUMMARY

JOB _____

FOR _____

EST. BY _____

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS		TOTAL DIRECT COST		TOTAL COST	
																				Unit Cost	Amount
.21H	Granular Backfill	8,215	C.Y.	4.48	36839	0.12	989	1.02	8410	0.83	6844	1.26	10359					7.71	63370		
	SUBTOTAL - ACCOUNT 332.2 DIVERSION TUNNELS				3089446		605971		5528471		6089961		6788031		7482469		5399526		68771275		
332.22	U/S COFFERDAM																				
.221	Common Excavation	1,000	C.Y.	1.12	1120	0.02	20	0.64	640	0.71	710	0.83	830					3.32	3320		
.222	Impervious Fill	52,000	C.Y.	3.81	198120	0.12	6240	0.97	50440	0.77	40040	1.23	63960					1.90	358800		
.223	Rock and Gravel Fill	313,000	C.Y.	0.83	259790	0.01	3130	0.52	162760	0.52	162760	0.63	197190					2.51	785630		
.224	Filters	33,000	C.Y.	4.48	147840	0.12	3960	1.02	33660	0.83	27390	1.26	41580					7.71	254430		
.225	Cut-off Wall U/S	39,000	S.F.													20.00	780000	20.00	780000		
.226	Care of Water	1	L.S.		36713		7500		140980		22687		165601					LS.	709681		
	SUBTOTAL - ACCOUNT 332.22 U/S COFFERDAM				773983		20850		894480		258587		469161		-0-		780000		2897061		
332.23	D/S COFFERDAM																				
.231	Common Excavation	5,000	C.Y.	1.12	5600	0.02	100	0.64	3200	0.71	3550	0.83	4150					3.32	16600		
.232	Impervious Fill	47,250	C.Y.	3.81	180023	0.12	5670	0.97	45832	0.77	36383	1.23	58117					1.90	326025		
.233	Rock and Gravel Fill	42,800	C.Y.	0.83	35524	0.01	428	0.52	22256	0.52	22256	0.63	26964					2.51	107428		
.235	Cut-off Wall D/S	29,500	S.F.													20.00	590000	20.00	590000		
.236	Removal of Cofferdam	90,000	C.Y.	0.84	75600	0.02	1800	0.52	46800	0.50	45000	0.61	54900					2.48	224100		
	SUBTOTAL - ACCOUNT 332.23 D/S COFFERDAM				226747		7998		118089		107189		144131				590000		1264153		
332.3	MAIN DAM																				
.311	Common Excavation	4,936,000	C.Y.	3.74	18458957	0.22	1066615	0.71	3526342	0.85	4178539	1.25	6172477					6.77	33397929		
.312	Rock Excavation	1,214,000	C.Y.	4.10	4974464	1.85	2240195	2.57	3116580	1.92	2333908	2.51	3048946					12.95	15723293		
.31A	Impervious Fill	7,077,000	C.Y.	1.45	10226400	0.01	98465	0.84	5923061	1.07	7571216	1.13	8014462					4.50	31833604		

continued

DIVERSIFIED CONSTRUCTORS, INC.

COST & ESTIMATE SUMMARY

Location
BOND

JOB
FOR
EST. BY
NO.
DATE
SHEET 4 OF

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST	TOTAL COST Unit Cost	TOTAL COST Amount	BID Unit Cost	BID Amount	Unit Cost	Amount
	8,245	C.Y.	4.48 36938	0.12 989	1.02 8410	0.83 6844	1.26 10389			7.71 63570			9.50	78327-		
VERSION INELS			30894146	6059671	5528471	6698961	6788031	7402469	5399526	68771275				83990358-		
	1,000	C.Y.	1.12 1120	0.02 20	0.64 640	0.71 710	0.83 830			3.32 3320			4.05	4050-		
	52,000	C.Y.	3.81 198120	0.12 6240	0.97 50440	0.77 40040	1.23 63960			6.90 358800			8.40	436800-		
	313,000	C.Y.	0.83 259790	0.01 3130	0.52 162760	0.52 162760	0.63 197190			2.51 785630			3.05	954650-		
	33,000	C.Y.	4.48 147840	0.12 3960	1.02 33660	0.83 27390	1.26 41580			7.71 254430			9.40	310200-		
	39,000	S.F.							20.00 780000	20.00 780000			24.40	951600-		
	1	L.S.	367113	7500	146980	22687	165601			L.S. 709881			L.S.	874774-		
S FFERDAM			973983	20850	394480	253587	469161	-0-	780000	2892061				3532074-		
	5,000	C.Y.	1.12 5600	0.02 100	0.64 3200	0.71 3550	0.83 4150			3.32 16600			4.05	20250-		
	47,250	C.Y.	3.81 180023	0.12 5670	0.97 45832	0.77 36383	1.23 58117			6.90 326025			8.40	396900-		
	42,800	C.Y.	0.83 35524	0.01 428	0.52 22256	0.52 22256	0.63 26964			2.51 107428			3.05	130540-		
	29,500	S.F.							20.00 590000	20.00 590000			24.40	719800-		
	90,000	C.Y.	0.84 75600	0.02 1800	0.52 46800	0.50 45000	0.61 54900			2.49 224100			3.07	276420-		
S FFERDAM			296747	7998	118088	107189	144131		590000	1264153				1543910-		
	4,936,000	C.Y.	3.74 18458957	0.22 1066615	0.71 3526342	0.85 4173538	1.25 6172477			6.77 33397929			8.26	40771360-		
	1,214,000	C.Y.	4.10 4974664	1.85 2247195	2.57 3118580	1.92 2333908	2.51 3048946			12.95 15723293			15.82	19205480-		
	7,077,000	C.Y.	1.45 10226400	0.01 98465	0.84 5923061	1.07 7571216	1.13 8014462			4.50 31833604			5.50	38923500-		

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BIDS OPENED _____ Date _____ AT _____ Location

PLETION TIME _____ BID BOND _____

TRICK & MURRAY, SEATTLE 47263

DIVERSIFIED CONSTRUCTORS, INC.

COST & ESTIMATE SUMMARY

JOB _____

FOR _____

EST. BY _____

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS		TOTAL DIRECT COST		TOTAL COST Unit Cost	TOTAL COST Amount
.31B	Provide Drying Facilities for Impervious Fill	1	L.S															LS.	-0-		
.31C	Drying Impervious Fill	1,576,000	C.Y	0.80	1262691	0.01	20790	0.42	666634	0.44	694755	0.54	849018	0.06	90568			2.27	3584456		
.31D	U/S Gravel & D/S Sand Fill	20,626,000	C.Y	1.56	32264615	0.01	206376	1.02	20974521	1.49	30655497	1.77	36597121					5.85	120698130		
.31E	Filters	6,338,000	C.Y	1.57	9941708	0.01	76316	1.02	6464840	1.49	9448908	1.77	11226150					5.86	37157922		
.31F	Rockfill From Quarry	18,563,400	C.Y	2.82	52317242	1.34	24871893	1.39	25789020	1.81	33560057	2.40	44527811					9.76	181066023		
.31G	Rockfill From Stockpile	2,307,000	C.Y	3.42	7888828	1.34	3091380	2.09	4812977	2.51	5789854	3.20	7380292					12.56	28963331		
.31H	Rockfill Directly From Excavation	3,924,600	C.Y	1.64	6446636	0.02	61050	0.91	3565564	1.13	4426247	1.20	4719043					4.90	19218540		
.3H1	Raking Rock Fill	902,000	C.Y	0.12	104738	0.01	7740	0.07	62013	0.04	40109	0.06	52400					0.30	267000		
.313	Drill & Grout - Consolidation	345,000	L.F													26.00	8907900	26.00	8907900		
.311	Drill & Grout - Curtain	203,450	L.F													20.00	4069000	20.00	4069000		
.314	Dam Dental Concrete	85,000	C.Y	150.22	12768904	20.65	1755023	14.02	1192112	16.29	1384674	18.32	1557404	35.35	3004750			254.85	21662867		
.317	Drain Holes	136,000	L.F	2.78	378080	0.21	28560	1.13	153680	0.43	58480	0.86	116960					[illegible].41	735760		
.32	Grout Galleries and Portals																				
.321	Horizontal Galleries 10' x 10'	7,450	L.F	223.84	1667608	82.11	611720	66.19	493115	31.69	236091	60.90	453705	50.64	377268			515.37	3839507		
.322	Inclined Galleries 10' x 10'	2,580	L.F	223.84	577507	82.11	211844	66.19	170720	31.69	81760	60.90	157122	50.64	130651			515.37	1329654		
.323	Shafts 10' x 10'	900	L.F	357.74	321966	93.32	83988	88.69	79821	99.89	89901	106.42	95778	70.52	63468			816.58	734922		
.32A	Common Excavation - Portals	3,600	C.Y	1.12	4032	0.02	72	0.64	2304	0.71	2556	0.83	2988					3.32	11952		
.32B	Rock Excavation - Portals	1,000	C.Y	5.80	5800	2.30	2300	2.60	2600	1.57	1570	2.34	2340					14.61	14610		
.324	Tunnel Concrete - Slabs	3,410	C.Y	190.61	649980	20.64	70382	25.38	86546	24.14	82317	35.00	119350	53.75	183288			349.52	1191863		
.325	Portal Concrete	20	C.Y	188.14	3763	30.45	609	19.08	382	21.39	428	23.49	470	64.38	1288	15.00	300	361.93	7240		
.326	Tunnel Plug Concrete	700	C.Y	77.01	53909	8.58	6007	15.02	10516	14.04	9829	18.95	13266	42.60	29820			176.20	123347		

continued

Location
BOND

DIVERSIFIED CONSTRUCTORS, INC.

COST & ESTIMATE SUMMARY

JOB
FOR
EST. BY
NO.
DATE
SHEET 5 OF

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST	TOTAL COST Unit Cost	TOTAL COST Amount	BID Unit Cost	BID Amount	Unit Cost	Amount
vious Fill	1	L.S								L.S. -0-			L.S. -0-			
	1,576,000	C.Y	0.80 1262691	0.01 20790	0.42 666634	0.44 694755	0.54 849018	0.06 90568		2.27 3584456			2.77 4365520 -			
	20,626,000	C.Y	1.56 32264615	0.01 206376	1.02 20974521	1.49 30655497	1.77 36597121			5.85 120698130			7.14 147269640 -			
	6,338,000	C.Y	1.57 9941708	0.01 [illegible]	1.02 6464840	1.49 9448908	1.77 11226150			5.86 37157922			7.16 45380080 -			
	18,563,400	C.Y	2.82 52317242	1.34 24871893	1.39 25789020	1.81 33560057	2.40 44527811			9.76 181066023			11.92 221275728 -			
	2,307,000	C.Y	3.42 7888828	1.34 3091380	2.09 4812977	2.51 5789854	3.20 7380292			12.56 28963331			15.34 35389380 -			
	3,924,600	C.Y	1.64 6446636	0.02 61050	0.91 3565564	1.13 4426247	1.20 4719043			4.90 19218540			5.98 23469108 -			
	902,000	C.Y	0.12 104738	0.01 7740	0.07 62013	0.04 40109	0.06 52400			0.30 267000			0.37 333740 -			
	345,000	L.F							26.00 8907900	26.00 8907900			31.75 10953750 -			
	203,450	L.F							20.00 4069000	20.00 4069000			24.40 4964180 -			
	85,000	C.Y	150.22 12768904	20.65 1755023	14.02 1192112	16.29 1384674	18.32 1557404	35.35 3004750		254.85 21662867			310.02 26351262 -			
	136,000	L.F	2.78 378050	0.21 28560	1.13 153680	0.43 58480	0.86 116960			5.41 735760			6.61 898960 -			
	7,450	L.F	223.84 1667608	82.11 611720	66.19 493115	31.69 236091	60.90 453705	50.64 377268		515.37 3839507			629.40 4689030 -			
	2,580	L.F	223.84 577507	82.11 211844	66.19 170770	31.69 81760	60.90 157122	50.64 130651		515.37 1329654			629.40 1623852 -			
	900	L.F	357.74 321966	93.32 83988	88.69 79821	99.89 89901	106.42 95778	70.52 63468		816.58 734922			997.00 897300 -			
	3,600	C.Y	1.12 4032	0.02 72	0.64 2304	0.71 2556	0.83 2988			3.32 11952			4.05 14580 -			
	1,000	C.Y	5.80 5800	2.30 2300	2.60 2600	1.57 1570	2.34 2340			14.61 14610			17.85 17850 -			
	3,410	C.Y	190.61 649980	20.64 70382	25.38 86546	24.14 82317	35.00 119350	53.75 183288		349.52 1191863			426.00 1452660 -			
	20	C.Y	188.14 3763	30.45 609	19.08 382	21.39 428	23.49 470	64.38 1288	15.00 300	361.93 7240			442.00 8840 -			
	700	C.Y	77.01 53909	8.58 6007	15.02 10516	14.04 9829	18.95 13266	42.60 29820		176.20 123347			215.00 150500 -			

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TRICK & MURRAY, SEATTLE 47253

DIVERSIFIED CONSTRUCTORS, INC.

COST & ESTIMATE SUMMARY

JOB _____

FOR _____

EST. BY _____

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST	TOTAL COST Unit Cost	TOTAL COST Amount
.329	Portal Doors, Architectural	2	Ea.							13000 - 26000	13000 - 26000		
.33	Dam Instrumentation	1	L.S							L.S. 35000	L.S. 35000		
	SUBTOTAL - ACCOUNT 332.3 MAIN DAM			160318028	34518325	77095398	100641695	125107103	3881101	13038200	514599850		
332.4	RELICT CHANNEL												
.4	Relict Channel	1	L.S	10540435	365668	6662521	9570443	11371424			L.S. 38510491		
	SUBTOTAL - ACCOUNT 332.4 RELICT CHANNEL												
332.51	OUTLET FACILITIES												
.512	Tunnel - Horizontal Excavation 31' Dia.	2,050	L.F	529.92 1086336	314.73 645196	171.55 351678	150.70 308935	192.93 395506	677.23 1388322		2037.06 4175973		
.51A	Inclined Shaft Excavation 31' Dia.	460	L.F	1192.53 548564	389.96 179381	262.60 120794	183.58 84445	307.12 141275	677.23 311526		3013.02 1385985		
.51B	Tunnel Excavation, Manifold	900	L.F	250.85 225765	111.94 100746	74.24 66816	59.91 53919	81.15 73035	95.47 85923		673.56 606204		
.514	Concrete Lining - Horizontal 28' I.D.	1,675	L.F	1391.66 2331023	127.24 213132	135.49 226945	141.59 237167	176.97 296417	309.09 517720	38.61 64680	2320.65 3887084		
.51C	Concrete Lining - Horizontal, Steel Lined 28' I. D.	375	L.F	386.34 144879	18.23 6836	88.08 33029	78.05 29270	113.68 42631	248.79 91420		928.17 348065		
.51D	Concrete Lining - Manifold 8' I. D.	900	L.F	491.99 442788	43.69 39322	60.12 54110	59.81 53832	77.63 69868	172.97 155673	22.91 20617	929.12 836210		
.51E	Inclined Lining - 28' I. D. (Shaft)	460	L.F	2360.29 1085732	268.20 123374	151.08 69496	191.90 88275	206.86 95157	309.04 142160	38.61 17760	3525.48 1621954		
.51F	Mechanical - Inlet	1	L.S							L.S. 1016940	L.S. 1016940		
.51G	Mechanical - Outlet	1	L.S							L.S. 6591628	L.S. 6591628		
	SUBTOTAL - ACCOUNT 332.51 OUTLET FACILITIES			5865087	1307987	922868	855843	1113889	2692744	7711625	20470043		
332.52	MAIN SPILLWAY												
.521	Common Excavation, Approach & Control Structure	379,000	C.Y.	.123 467678	0.01 5055	0.75 284698	0.95 359633	0.98 369662			3.92 1486726		
.522	Common Excavation, Chute, Flip Bucket & Outfall	310,300	C.Y.	.123 381669	0.01 3103	0.75 232725	0.95 294785	0.98 304094			3.92 1216376		
.52A	River Channel, Alluvium Excavation	1,060,000	C.Y.	.139 1471036	0.02 15900	0.84 895488	1.07 1131190	1.10 1162735			4.42 4676349		
.52B	Rock Excavation, Approach Structure	1,096,000	C.Y.	.410 4493600	1.85 2027600	2.57 2816720	1.92 2104320	2.51 2750960			12.95 14193200		

continued

Location
BOND

DIVERSIFIED CONSTRUCTORS, INC.

COST & ESTIMATE SUMMARY

JOB
FOR
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NO.
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SHEET 6 OF

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST	TOTAL COST Unit Cost	TOTAL COST Amount	BID Unit Cost	BID Amount	Unit Cost	Amount
	2	Ea.							13000 - 26000	13000 - 26000			15876.00	31752 -		
	1	L.S.							L.S. 35000	L.S. 35000			L.S.	42745 -		
DAM			160318028	34518325	77095398	100641695	125107103	3881101	13038200	514599850				628480797 -		
	1	L.S.	10540435	365668	6662521	9570443	11371424			L.S. 38510491			L.S.	47032863 -		
CT NNEL																
la.	2,050	L.F	529.92 1086336	314.73 645196	171.55 351678	150.70 308935	192.93 395506	677.23 1388322		2037.06 4175973			2488.00	5100400 -		
	460	L.F	1192.53 548564	389.96 179381	262.60 120794	183.58 84445	307.12 141275	677.23 311526		3013.02 1385985			3680.00	1692800 -		
	900	L.F	250.85 225765	111.94 100746	74.24 66816	59.91 53919	81.15 73035	95.47 85923		673.56 606204			822.00	739800 -		
D.	1,675	L.F	1391.66 2331023	127.34 213132	135.49 226945	141.59 237167	176.97 296417	309.09 517720	38.61 64680	2320.65 3887084			2834.00	4746950 -		
Lined	375	L.F	386.34 144879	18.23 6836	88.08 33029	78.05 29270	113.68 42631	248.79 91420		928.17 348065			1134.00	425250 -		
	900	L.F	491.99 442788	43.69 39322	60.12 54110	59.81 53832	77.63 69868	172.97 155673	22.91 20617	929.12 836210			1135.00	1021500 -		
	460	L.F	2360.29 1085732	268.20 123374	151.08 69496	191.90 88275	206.86 95157	309.04 142160	38.61 17760	3525.98 1621954			4306.00	1980760 -		
	1	L.S							L.S. 1016940	L.S. 1016940			L.S.	1242249 -		
	1	L.S							L.S. 6591628	L.S. 6591628			L.S.	8050355 -		
TLET CILITIES			5865087	1307987	922868	855843	1113889	2692744	7711625	20470043				25000064 -		
ntrol	379,000	C.Y.	1.23 467678	0.01 5055	0.75 284698	0.95 359633	0.98 369662			3.92 1486726			4.78	1811620 -		
cket &	310,300	C.Y.	1.23 381669	0.01 3103	0.75 232725	0.95 294785	0.98 304094			3.92 1216376			4.79	1486337 -		
	1,060,000	C.Y.	1.39 1471036	0.02 15900	0.84 895488	1.07 1131190	1.10 1165735			4.42 4676349			5.39	5713400 -		
re	1,096,000	C.Y.	4.10 4493600	1.85 2027600	2.57 2816720	1.92 2104320	2.51 2750960			12.95 14193200			15.82	17338720 -		

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BIDS OPENED _____ Date _____ AT _____ Location

COMPLETION TIME _____ BID BOND _____

DIVERSIFIED CONSTRUCTORS, INC.

JOB _____

FOR _____

EST. BY _____

COST & ESTIMATE SUMMARY

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST	TOTAL COST Unit Cost	TOTAL COST Amount
.52C	Rock Excavation, Control Structure	274,000	C.Y.	4.10 1123400	1.85 506900	2.57 704180	1.92 526080	2.51 687740			12.95 3549300		
.52D	Rock Excavation, Chute & Flip Bucket	1,592,500	C.Y.	4.10 6529250	1.85 2946125	2.57 4092725	1.92 3057600	2.51 3997175			12.95 20622875		
.52F	Backfill	1	L.S.	72300	2000	15200	10200	15700			L.S. 113400		
.523	Drill & Grout, Consolidation	66,000	L.F.							26.00 1716000	26.00 1716000		
.524	SPILLWAY CONCRETE												
.52G	Piers	40,060	C.Y.	8.73 3274104	7.16 286830	14.56 583274	15.42 617725	17.98 720279	62.63 2508958	15.00 600900	214.48 8592070		
.52H	Deck	350	C.Y.	4.53.71 158644	82.30 28805	30.68 10738	45.02 15757	44.24 15484	73.65 25778	22.50 7875	751.64 263081		
.521	Guide Walls	11,510	C.Y.	155.56 1790496	1.45.2 16725	20.91 240674	20.43 235149	24.85 286074	69.32 797873	15.00 172650	320.56 3689991		
.52J	Slab	30,000	C.Y.	9.64.5 2593500	7.26 217800	19.33 579900	19.00 570000	23.41 702300	66.83 2004900	15.00 450000	247.18 7415400		
.52K	Ogee	34,800	C.Y.	4.46.47 155456	3.29 81592	11.88 294624	12.13 300824	14.50 359600	60.67 1504616	15.00 372000	163.94 4065712		
.52L	Flip Bucket & Outlet Discharge Structure	28,300	C.Y.	5.81.16 164592.8	4.85 137255	12.50 353750	12.35 349505	14.80 418840	60.99 1726017	15.00 424500	178.65 5055795		
.52M	Drain Gallery & Aeration Gallery Concrete	3,710	C.Y.	1.11.40 413294	1.05.1 38997	17.05 63256	17.60 65296	21.09 78244	65.06 241373	26.64 98908	269.39 999363		
.52P	Gravity Retaining Wall & Flip Bucket	1,000	C.Y.	1.58.96 15960	26.33 26330	16.47 16470	18.51 18510	20.07 20070	60.45 60450	15.00 15000	315.79 315790		
.525	15' Rock Bolts	433	Ea.	30.00 12990	2.34 1013	13.60 5889	4.92 2130	9.82 4252	43.80 18965		104.48 45237		
.526	10' Rock Bolts	8,100	Ea.	22.14 179334	1.74 14094	10.02 81162	3.66 29646	7.26 58806	29.20 236520		74.02 599562		
.528	Half Rounds to Drainage Gallery	15,000	L.F.	3.61 54207	0.12 1820	0.31 4594	0.15 2262	0.40 6030	17.50 262500		22.09 331413		
.52N	Spillway Mechanical & Electrical	1	L.S.							L.S. 13319.02	L.S. 13319.02		
	SUBTOTAL - ACCOUNT 332.52 MAIN SPILLWAY			26277846	1508339	11271867	9690612	11957995	9387950	5189735	80279544		
332.6	POWER & OUTLET INTAKE & APPROACH												
.611	Common Excavation	423,000	C.Y.	1.23 520290	0.01 4230	0.75 317250	0.95 401850	0.98 414540			3.92 1658160		
.612	Rock Excavation - Approach	1 695,300	C.Y.	4.10 6950730	1.85 3136305	2.57 4354921	1.92 3254976	2.51 4255203			12.95 21954135		

continued

Location
BOND

DIVERSIFIED CONSTRUCTORS, INC.

COST & ESTIMATE SUMMARY

JOB
FOR
EST. BY
NO.
DATE
SHEET 7 OF

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS		TOTAL DIRECT COST		TOTAL COST Unit Cost	TOTAL COST Amount	BID Unit Cost	BID Amount	Unit Cost	Amount
e	274,000	C.Y	4.10	1123400	1.85	506900	2.57	704180	1.92	526080	2.51	687740					12.95	3548300			15.82	4334680 -		
ket	1,592,500	C.Y	4.10	6529250	1.85	2946125	2.57	4092725	1.92	3057600	2.51	3997175					12.95	20622875			15.81	25177425 -		
	1	L.S		72300		2000		13200		10200		15700					L.S.	113400			L.S.	138495 -		
	66,000	L.F													26.00	1716000	26.00	1716000			31.75	2095500 -		
	40,060	C.Y	81.73	3274104	7.16	286830	14.56	583274	15.42	617725	17.98	720279	62.63	2508958	15.00	600900	214.48	8592070			262.00	10495720 -		
	350	C.Y	453.27	158644	82.30	28805	30.68	10738	45.02	15757	44.24	15484	73.65	25778	22.50	7875	751.66	263081			918.00	321300 -		
	11,510	C.Y	155.56	1790496	14.52	167125	20.91	240674	20.43	235149	24.85	286024	69.32	797873	15.00	172650	320.58	3689991			391.00	4500410 -		
	30,000	C.Y	96.45	2893500	7.26	217800	19.23	576900	19.00	570000	23.41	702300	66.83	2004900	15.00	450000	247.18	7415400			302 -	9060000 -		
	24,800	C.Y	46.47	1152456	3.29	81592	11.88	294624	12.13	300824	14.50	359600	60.67	1504616	15.00	372000	163.94	4065712			200.22	4965456 -		
ucture	28,300	C.Y	58.16	1645928	4.85	137255	12.50	353750	12.35	349505	14.80	418840	60.99	1726017	15.00	424500	178.65	5055795			218.20	6175060 -		
ncrete	3,710	C.Y	111.40	413294	10.51	38992	17.05	63256	17.60	65296	21.09	78244	65.06	241373	26.66	98908	269.37	999363			329 -	1220590 -		
t	1,000	C.Y	158.96	158960	26.33	26330	16.47	16470	18.51	18510	20.07	20070	60.45	60450	15.00	15000	315.79	315790			385.67	385670 -		
	433	Ea.	30.00	12990	2.34	1013	13.60	5889	4.92	2130	9.82	4252	43.80	18965			104.48	45239			127.00	54991 -		
	8,100	Ea.	22.14	179334	1.74	14094	10.02	81162	3.66	29646	7.26	58806	29.20	236520			74.02	599562			90.40	732240 -		
	15,000	L.F	3.61	54207	0.12	1820	0.31	4594	0.15	2262	0.40	6030	17.50	262500			22.09	331413			26.98	404700 -		
	1	L.S													L.S.	1331902	L.S.	1331902			L.S.	1631872 -		
WAY ACH				26272846		6508339		11271067		9690612		11957995		9387950		5189735		80278544				98044186 -		
	423,000	C.Y	1.23	520290	0.01	4230	0.75	317250	0.95	401850	0.98	414540					3.92	1658160			4.78	2021940 -		
	1 695,300	C.Y	4.10	6950730	1.85	3136305	2.57	4356921	1.92	3254976	2.51	4255203					12.95	21954135			15.81	26802693 -		

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ICK & MURRAY, SEATTLE 47263

DIVERSIFIED CONSTRUCTORS, INC.

COST & ESTIMATE SUMMARY

JOB _____
FOR _____
EST. BY _____

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS		TOTAL DIRECT COST		TOTAL COST Unit Cost	TOTAL COST Amount
.61B	Rock Excavation - Intake	115,300	C.Y.	4.10	472730	1.85	213325	2.57	296321	1.92	221376	2.51	289403					12.85	1481135		
.61C	Concrete	96,400	C.Y.	86.40	8328960	8.79	847356	14.03	1352492	15.54	1498056	17.54	1690856	61.43	5921852	15.00	1446000	218.73	21095572		
.615	1" x 15' Rockbolts	330	Ea.	30.00	9900	2.34	772	13.60	4488	4.92	1624	9.82	3241	43.80	14454			104.46	34479		
.61C	Intake, Mechanical & Electrical	1	L.S.													L.S.	6180809	L.S.	6180809		
.61D	Intake Building	1	L.S.													L.S.	65000	L.S.	65000		
.61E	Strand VSL Anchors, Including Installation	5,800	L.F.													15.00	87000	15.00	87000		
.61F	Drilling 11" Dia. Holes and Grouting	5,800	L.F.													45.00	261000	45.00	261000		
.62	Intake Gate	2	Ea.													130473	260946	130473	260946		
.63	Bulkhead Gate	2	Ea.													95063	190126	95063	190126		
.64	Circular Trashrack	4	Ea.													102750	411000	102750	411000		
	SUBTOTAL - ACCOUNT 332.6 POWER INTAKE				1628260		400196		632472		537882		665324		5936306		9401891		54191362		
332.8	PENSTOCK & SURGE CHAMBER																				
.711	Rock Excavation	102,000	C.Y.	28.77	2934540	11.40	1162800	9.91	1010820	9.63	982260	11.27	1149540	23.35	2381700			94.33	9621660		
.712	Vent Shaft Excavation 8.5' Dia.	535	L.F.	342.48	183226	79.80	42692	76.69	41031	25.29	50980	100.28	53652	50.91	27235			746.45	399816		
.714	Concrete 6.5' I.D.	90	L.F.	361.58	32542	39.90	3591	31.04	2794	33.74	3037	41.39	3725	72.50	6525	13.17	1185	593.32	53399		
.715	Shotcrete, 2" Thick	1	L.S.		287846		17405		24776		24431		45520				240988	L.S.	639956		
.716	Surge Chamber Concrete	5,100	C.Y.	150.84	769284	16.85	85935	19.04	97104	18.27	93177	23.18	118218	68.05	347055	16.17	82512	312.35	1592985		
.717	Drain Holes	15,500	L.F.	2.78	43090	0.21	3255	1.13	17515	0.43	6665	0.86	13330					5.41	83855		
.710	1" x 10' Rockbolts	400	Ea.	22.14	8856	1.74	696	10.02	4008	3.66	1464	7.26	2904	29.20	11680			74.02	29608		
.71C	Stoplogs, Guides & Followers, Stoplogs 40'wide x 44'high	1	L.S.													L.S.	157925	L.S.	157925		

Continued

DIVERSIFIED CONSTRUCTORS, INC.

COST & ESTIMATE SUMMARY

Location
BOND

JOB
FOR
EST. BY
NO.
DATE
SHEET 8 OF

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS		TOTAL DIRECT COST		TOTAL COST Unit Cost	TOTAL COST Amount	BID Unit Cost	BID Amount	Unit Cost	Amount
	115,300	C.Y.	4.10	472730	1.85	213305	2.57	296321	1.92	221376	2.51	289403					12.95	1493135			15.82	1824046 -		
	96,400	C.Y.	86.40	8328960	8.79	847356	14.03	1352492	15.54	1498056	17.54	1690856	61.43	5921852	15.00	1446000	218.73	21085572			267.00	25738800 -		
	330	Ea.	30.00	9900	2.34	772	13.60	4488	4.92	1624	9.82	3241	43.80	14454			104.48	34479			127.00	41910 -		
	1	L.S.													L.S.	6680809	L.S.	6680809			L.S.	8184823 -		
	1	L.S.													L.S.	65000	L.S.	65000			L.S.	79385 -		
nstallation	5,800	L.F.													15.00	87000	15.00	87000			18.32	106256 -		
r.g	5,800	L.F.													45.00	261000	45.00	261000			55.00	319000 -		
	2	Ea.													130473	260946	130473	260946			159346	318692 -		
	2	Ea.													95063	190126	95063	190126			116100	232200 -		
	4	Ea.													102750	411000	102750	411000			125488	501952 -		
WER INTAKE				16282610		4201968		6327472		5377882		6653243		5936306		9401881		54181362				66171697 -		
	102,000	C.Y.	28.77	2934540	11.40	1162800	9.91	1010820	9.63	982260	11.27	1149540	23.35	2381700			94.33	9621660			115.20	11750400 -		
	535	L.F.	342.48	183226	79.80	42692	76.69	41031	95.29	50980	100.28	53652	50.91	27235			745.45	398816			910.00	486850 -		
	90	L.F.	361.58	32542	39.90	3591	31.04	2794	33.74	3037	41.39	3725	72.50	6525	13.17	1185	593.32	53399			725.00	65250 -		
	1	L.S.		287846		17405		26776		21421		45520				240988	L.S.	639956			L.S.	781578 -		
	5,100	C.Y.	150.84	769284	16.85	85935	19.04	97104	18.27	93177	23.18	118218	68.05	347055	16.12	82212	312.35	1592985			381.50	1945650 -		
	15,500	L.F.	2.78	43090	0.21	3255	1.13	17515	0.43	6665	0.86	13330					5.41	83855			6.60	102300 -		
	400	Ea.	22.14	8856	1.74	696	10.02	4008	3.66	1464	7.26	2904	29.20	11680			74.02	29608			90.40	36160 -		
plogs	1	L.S.													L.S.	157925	L.S.	157925			L.S.	192874 -		

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BIDS OPENED _____ Date _____ AT _____ Location

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TRICK & MURRAY, SEATTLE 47263

DIVERSIFIED CONSTRUCTORS, INC.

COST & ESTIMATE SUMMARY

JOB _____

FOR _____

EST. BY _____

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST	TOTAL COST Unit Cost	TOTAL COST Amount
.8	PENSTOCKS												
.811	Excavation, Shaft - 27' Dia.	1,800	L.F	983.34 / 1770612	296.42 / 533556	169.49 / 305082	130.26 / 234468	215.38 / 387684	513.92 / 925056		2308.81	4155858	
.81A	Excavation, Horizontal - 27' Dia.	1,245	L.F	507.57 / 631925	262.85 / 327248	177.64 / 221162	158.63 / 197494	197.39 / 245741	513.91 / 639813		1819.99	2265998	
.812	Excavation, Horizontal - 21' Dia.	690	L.F	340.32 / 234821	181.85 / 125477	119.11 / 82186	106.36 / 73398	133.69 / 92246	310.88 / 214507		1192.21	822625	
.81B	Excavation, Horizontal - 18' Dia.	1,200	L.F	794.55 / 953460	158.84 / 190608	103.09 / 123708	92.05 / 110460	115.71 / 138852	228.24 / 273888		985.48	1182576	
.813	Drill & Grout, Consolidation	1	L.S.							L.S. 375000	L.S.	375000	
.814	Penstock Concrete Liner-Shaft 24' Dia.	1,800	L.F	1183.65 / 2130573	104.71 / 188485	117.35 / 211230	121.80 / 219235	153.12 / 275618	287.79 / 518020	44.55 / 80190	2012.97	36233351	
.81B	Concrete Liner-Horizontal 24' I.D.	1,245	L.F	1194.80 / 1487654	109.14 / 135876	111.26 / 144206	121.46 / 151223	151.97 / 189198	285.69 / 355782	44.55 / 55462	2071.87	25797367	
.81C	Concrete Liner-Horizontal 18' I.D.	690	L.F	918.66 / 631805	84.71 / 58449	89.90 / 62032	93.- / 64494	117.55 / 81107	220.96 / 152465	34.06 / 23502	1556.60	10740554	
.815	Concrete Liner-Horizontal 15' I.D.	1,200	L.F	764.26 / 917512	70.54 / 84647	75.71 / 90854	78.78 / 94541	99.01 / 118812	182.91 / 219490	28.83 / 34598	1306.08	15672553	
.818	Steel Liner	1,820	Tn.							1782.58 / 3242496	1782.58	3242496	
	SUBTOTAL - ACCOUNT 332.8 PENSTOCKS SURGE CHAMBER			12419146	2957320	2441048	2304507	2918651	6075427	4313553		33424772	
332.9	TAILRACE												
.911	Tunnel Excavation - 37' Dia.	2,080	L.F	611.62 / 1272170	350.95 / 729976	214.06 / 445245	191.15 / 397592	240.27 / 499762	791.42 / 1646154		2399.47	49908899	
.912	Portal Excavation, Common	4,560	C.Y.	1.12 / 5107	0.02 / 91	0.04 / 198	0.71 / 3238	0.83 / 3795			3.32	15139	
.913	Portal Excavation, Rock	31,095	C.Y.	5.80 / 180351	2.30 / 71519	2.60 / 80847	1.57 / 48819	2.34 / 72762			14.61	454298	
.914	Tailrace Tunnel Concrete - 34' I.D.	2,000	L.F	1671.89 / 3344378	151.32 / 302641	162.84 / 325682	170.17 / 340233	212.50 / 425009	395.86 / 791715	61.35 / 122690	2825.83	56517658	
.91A	Portal Concrete	300	C.Y.	188.14 / 56442	30.45 / 9135	19.08 / 5724	21.39 / 6417	23.49 / 7047	14.38 / 19314	15.00 / 4500	361.93	108579	
.915	Portal Rockbolts - 1" x 25'	110	Ea.	52.14 / 5735	4.00 / 440	23.62 / 2598	8.58 / 944	17.08 / 1879	73.00 / 8030		178.42	19626	
.91C	Tailrace Stoplogs, Guides & Followers	1	L.S.							L.S. 251500	L.S.	251500	
	SUBTOTAL - TAILRACE			4863593	1113902	863014	797243	1010244	2465213	378690		11491799	

continued

Location
BID BOND

DIVERSIFIED CONSTRUCTORS, INC.

COST & ESTIMATE SUMMARY

JOB
FOR
EST. BY
NO.
DATE
SHEET 9 OF

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS		TOTAL DIRECT COST		TOTAL COST Unit Cost	TOTAL COST Amount	BID Unit Cost	BID Amount	Unit Cost	Amount
	1,800	L.F	983.34	1770012	296.42	533556	169.49	305082	130.26	234468	215.38	387684	513.92	925056			2308.81	4155858			2819.75	5075550 -		
	1,245	L.F	507.57	631925	262.85	327248	177.64	221162	158.63	197494	199.39	248241	513.91	639818			1819.99	2265888			2223	2767635 -		
	690	L.F	340.32	234821	181.85	125477	119.11	82186	106.36	73388	133.69	92246	310.88	214507			1192.21	822625			1456 -	1004640 -		
	1,200	L.F	294.55	853460	151.84	182208	103.09	123708	92.05	110460	115.71	138852	228.24	273888			985.48	1182576			1203.50	1444200 -		
	1	L.S													L.S.	375000	L.S.	375000			L.S.	459890 -		
Dia.	1,800	L.F	1183.65	2130573	104.71	188485	117.35	211230	121.80	219235	153.12	275618	287.79	518020	44.55	80190	2012.97	3623351			2458	4424400 -		
	1,245	L.F	1194.90	1487654	109.14	135876	116.28	144766	121.46	151223	151.97	189198	283.69	353188	44.55	55462	2021.99	2517367			2469 -	3073905 -		
	690	L.F	915.66	631805	84.71	58449	89.90	62032	93.76	64694	117.55	81107	220.91	152465	34.06	23502	1556.60	1074054			1901 -	1311690 -		
	1,200	L.F	766.26	919512	70.54	84647	75.71	90854	78.78	94541	99.01	118816	186.91	224290	28.83	34593	1306.04	1567253			1595.50	1914600 -		
	1,820	Tn.													1792.58	3262496	1792.58	3262496			2189 -	3983980 -		
STOCKS & HAMBER				12419146		2952320		x 2441068		x 2304507		2918651		6075427		4313553		33424672				40821552 -		
	2,000	L.F	611.62	1272170	350.95	729976	214.06	445245	191.15	397592	240.27	499762	791.42	1646154			2399.47	4990899			2930 -	5860000 -		
	4,560	C.Y.	1.12	5107	0.02	91	0.64	2918	0.71	3238	0.83	3785					3.32	15139			4.05	18468 -		
	31,095	C.Y.	5.80	180351	2.30	71519	2.60	80847	1.57	48819	2.34	72762					14.61	454298			17.80	553491 -		
	2,000	L.F	1671.89	3343788	151.32	302641	162.84	325682	170.12	340233	212.50	425009	395.86	791715	61.35	122690	2825.88	5651758			3451 -	6902000 -		
	300	C.Y.	188.14	56442	30.45	9135	19.08	5724	21.39	6417	23.49	7047	64.38	19314	15.00	4500	361.93	108579			442 -	132600 -		
	110	Ea.	52.14	5735	4.00	440	23.62	2598	8.58	944	17.08	1879	73.00	8030			178.42	19626			218 -	23980 -		
ers	1	L.S.													L.S.	251500	L.S.	251500			L.S.	544395 -		
				4863593		1113802		863014		797243		1010244		2465213		378690		11491799				14034934 -		

continued

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BIDS OPENED _____ AT _____
Date Location
COMPLETION TIME _____ BID BOND _____

TRICK & MURRAY, SEATTLE 47263

DIVERSIFIED CONSTRUCTORS, INC.

COST & ESTIMATE SUMMARY

JOB _____
FOR _____
EST. BY _____

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST	TOTAL COST Unit Cost	TOTAL COST Amount
333	WATERWHEELS, TURBINES & GENERATORS												
.10	Guard Valves	6	Ea.							470800 2824800	470800 2824800		
.11	Turbines & Governors	6	Ea.							3912500 23475000	3912500 23475000		
.21	Generators & Exciters	6	Ea.							6500000 39000000	6500000 39000000		
	SUBTOTAL - WATERWHEELS, TURBINES & GENERATORS.									65299800	65299800		
334	ACCESSORY ELECTRICAL EQUIPMENT												
.334	Accessory Electrical Equipment	1	L.S							L.S. 38920000	L.S. 38920000		
	SUBTOTAL - ACCESSORY ELECTRICAL EQUIPMENT												
335	MISCELLANEOUS POWER PLANT EQUIPMENT												
.335	Miscellaneous Power Plant Equipment	1	L.S							L.S. 10582957	L.S. 10582957		
	SUBTOTAL - MISCELLANEOUS POWER PLANT EQUIPMENT												
336	ROADS, RAIL FACILITIES and AIRSTRIP												
.11	Permanent Access Roads	1	L.S	6326341	337155	2187923	1790790	2424890	14854615		L.S. 27921714		
.12	Site Roads	20	Mi.	252775 5043498	11391- 227810	102975 2059498	78130 1562609	109033 2180669	621453 12429054		1175157 23503138		
.13	Permanent Roads	6	Mi.	154192 925154	8218- 49305	53326 319958	43647 261882	59102 354612	314617 1887703		633102 3798614		
.2	Rail Facilities	1	L.S							L.S. 3900000	L.S. 3900000		
.3	Airstrip	1	L.S	647073	34485	223786	183166	248023	2402289		L.S. 3738822		
	SUBTOTAL - ROADS, RAIL FACILITIES and AIRSTRIP			12942066	648755	4791165	3798447	5208194	31573661	3900000	62862288		
350-359	TRANSMISSION LINES												
	Transmission Lines	1	L.S	25260480	1255327	2856124	2036483	2384996	20993120	105926686	L.S. 160713216		
	SUBTOTAL - TRANSMISSION LINES												
399	GENERAL PLANT												
	General Plant	1	L.S				IN DIRECTS						

continued

DIVERSIFIED CONSTRUCTORS, INC.

COST & ESTIMATE SUMMARY

Location
ID BOND

JOB _____ NO. _____
FOR _____ DATE _____
EST. BY _____ SHEET 10 OF _____

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST	TOTAL COST Unit Cost	TOTAL COST Amount	BID Unit Cost	BID Amount	Unit Cost	Amount
NERATORS																
	6	Ea.							470800 2824800	470800 2824800			574988	3449928 -		
	6	Ea.							3912500 23475000	3912500 23475000			4778333	28670018		
	6	Ea.							6500000 39000000	6500000 39000000			7958450	47630700		
URBINES &									65299800	65299800				79750646		
MENT																
	1	L.S							L.S. 38920000	L.S. 38920000				47532996		
TRICAL																
EQUIPMENT																
ent	1	L.S							L.S. 10582957	L.S. 10582957				12924965 -		
OWER PLANT																
IRSTRIP																
	1	L.S	6326341	337155	2187923	1790790	2424890	14854615		L.S. 27921714				34100789 -		
	20	MI.	25275 5043498	11391 - 227810	102975 2059498	78130 1562609	109033 2180669	621453 12429054		1175157 23503138				28704382 -		
	6	MI.	154192 925154	8218 - 49305	53326 319958	43647 261882	59102 354612	314617 1887703		633102 3798614				4639247 -		
	1	L.S							L.S. 3900000	L.S. 3900000				4763070 -		
	1	L.S	647073	34485	223786	183166	248023	2402289		L.S. 3738822				4566224 -		
LITIES and			12942066	648755	4791165	3798447	5208194	31573661	3900000	62862288				76773712 -		
	1	L.S	25260480	1255327	2856124	2036483	2384996	20993120	105926686	L.S. 160713216				196346204 -		
ES																
	1	L.S														

IN DIRECTS

continued

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BID OPENED _____ AT _____
Date Location
COMPLETION TIME _____ BID BOND _____

TRICK & MURRAY, SEATTLE 47283

DIVERSIFIED CONSTRUCTORS, INC.

COST & ESTIMATE SUMMARY

JOB _____
FOR _____
EST. BY _____

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST	TOTAL COST Unit Cost	TOTAL COST Amount
63	CONSTRUCTION CAMP & FACILITIES												
.1 -													
.5	Construction Camps & Permenent Village	1	L.S							L.S. 28148120	L.S. 28148120		
.6	Catering & Support	2,227,336	M.D.							35.00 77956760	35.00 77956760		
.7	ELECTRIC POWER												
.71	34.5 KV System	1	L.S							L.S. 13000000	L.S. 13000000		
.72	Camp Power	80,000	MWH							150.00 12000000	150.00 12000000		
.73	Construction Power	60,000	MWH				IN DIRECTS			-0-	-0-		
.8	CONSTRUCTION HEATING & VENTILATING												
.81	Plant	1	L.S							L.S. 1500000	L.S. 1500000		
.82	Operation	2,700	Days							2500- 6750000	2500- 6750000		
	SUBTOTAL - CONSTRUCTION FACILITIES									167254880	167254880		
68	MITIGATION												
	Mitigation	1	L.S							L.S. 99200000	L.S. 99200000		
	SUBTOTAL - MITIGATION												
	TOTAL PROJECT COST												

continued

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Location
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DIVERSIFIED CONSTRUCTORS, INC.

COST & ESTIMATE SUMMARY

JOB NO.
FOR DATE
EST. BY SHEET 11 OF

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST	TOTAL COST Unit Cost	TOTAL COST Amount	E/D Unit Cost	E/D Amount	Unit Cost	Amount
IES																
illage	1	L.S							L.S. 18148120	L.S. 18148120				L.S. 8322799-		
	2,227,336	M.D.							35.00 77956760	35.00 77956760			42.75	95208591-		
	1	L.S							L.S. 1300000	L.S. 1300000				L.S. 1581690-		
	80,000	MWH							150.00 12000000	150.00 12000000			183.20	14655600-		
	60,000	MWH				IN DIRECTS			-0-	-0-						
TILATING																
	1	L.S							L.S. 1500000	L.S. 1500000				L.S. 1931950-		
	2,700	Days							2500- 6750000	2500- 6750000			3059.24	8261775-		
CILITIES									16254880	16254880				204756.905-		
	1	L.S							L.S. 29200000	L.S. 29200000						

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BIDS OPENED _____ AT _____
Date Location
COMPLETION TIME _____ BID BOND _____

TRICK & MURRAY, SEATTLE 47283

DIVERSIFIED CONSTRUCTORS, INC.

COST & ESTIMATE SUMMARY

JOB _____
FOR _____
EST. BY _____

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST	TOTAL COST Unit Cost	TOTAL COST Amount
ACCOUNT SUMMARY													
330.	Land & Land Rights									51000000	51000000		
331	Powerhouse			17141909	4296220	4741316	4684872	5403259	10517266	6937128	53721970		
332.1	Reservoir, Dams & Waterways			24879874	549540	3290645	2275096	3657738			34652893		
332.2	Diversion Tunnels			30894146	6059671	5528471	6698961	6788031	7402469	5399526	68771275		
332.22	U/S Cofferdam			973983	20850	394480	253587	469161		780000	2892061		
332.23	D.S Cofferdam			296747	7998	118088	107189	144131		590000	1264153		
332.3	Main Dam			160318028	34518325	77095398	100641695	125107103	3881101	13038200	514599850		
332.4	Relict Channel			10540435	365668	6662521	9570443	11371424			38510491		
332.51	Outlet Facilities			5865087	1307987	922868	855843	1113889	2692744	7711625	20470043		
332.52	Main Spillway			26272846	6508339	11271067	9690612	11957995	9387950	5189735	80278544		
332.6	Power & Outlet Intake & Approaches			16282610	4201968	6327472	5377882	6653243	5936306	9401881	54181362		
332.8	Penstocks & Surge Chambers			12419146	2952320	2441068	2304507	2918651	6075427	4313553	33424672		
332.9	Tailrace			4863593	1113802	863014	797243	1010244	2465213	378690	11491799		
333	Waterwheels, Turbines & Generators									65299800	65299800		
334	Accessory Electrical									38920000	38920000		
335	Miscellaneous Power Plant Equipment									10582957	10582957		
336	Roads, Rail Facilities & Airstrip			12942066	648755	4791165	3798447	5208194	31573661	3900000	62867288		
350-359	Transmission Lines			25260480	1255327	2856124	2036483	2384996	20993120	105926686	160713216		
399	General Plant					IN DIRECT & INDIRECT COSTS							
63	Construction Camp & Facilities									167654880	167654880		
68	Mitigation									29200000	29200000		

continued

DIVERSIFIED CONSTRUCTORS, INC.

PAGE

Location

BID BOND

DIVERSIFIED CONSTRUCTORS, INC.

COST & ESTIMATE SUMMARY

JOB

FOR

EST. BY

NO.

DATE

SHEET 12 OF

QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST	TOTAL COST Unit Cost	TOTAL COST Amount	BID Unit Cost	BID Amount	Unit Cost	Amount
								51000000	51000000				51000000-		
		17141909	4296220	4741316	4684872	5403259	10517266	6937128	53721970				65610641-		
		24879874	549540	3290645	2275096	3657738			34652893				42321578-		
		30894146	6059671	5528471	6698961	6788031	7402469	5399526	68771275				83990358-		
		973983	20850	394480	253587	469161		780000	2892061				3532074-		
		296747	7998	118088	107189	144131		590000	1264153				1543910-		
		160318028	34518325	77095398	100641695	125107103	3881101	13038200	514599850				628480797-		
		10540435	365668	6662521	9570443	11371424			38510491				47032863-		
		5865087	1307987	922868	855843	1113889	2692744	7711625	20470043				25000064-		
		26272846	6508339	11271067	9690612	11957995	9387950	5189735	80278544				98044186-		
nes		16282610	4201968	6327472	5377882	6653243	5936306	9401881	54181362				66171697-		
		12419146	2952320	2441068	2304507	2918651	6075427	4313553	33424672				40821552-		
		4863593	1113802	863014	797243	1010244	2465213	378690	11491799				14034934-		
ors								65299800	65299800				79750646-		
								38920000	38920000				47532996-		
ent								10582957	10582957				12924965-		
		12942066	648755	4791165	3798447	5208194	31573661	3900000	62862288				76773712-		
		25260480	1255327	2856124	2036483	2384996	20993120	105926686	160713216				196346204-		
				IN DIRECT & INDIRECT COSTS											
								167654880	167654880				204756905-		
								29200000	29200000				29200000-		

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DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ESTIMATE SUMMARY ITEM NO. SHEET ___ OF ___ PAGE ___

JOB KIATAHA DAM

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

DIRECT COST			
DIRECT LABOR	3489509.50		
SUPPLIES	63806770		
REPAIR LABOR	127303697		
EQUIPMENT	149092860		
EQUIPMENT SUPPLIES	18418859		
PERMANENT MATERIAL	10092525 7		
SUB-CONTRACT	526224661		1500492254
INDIRECT COST			
LABOR	95860344		
EQUIPMENT	6338251		
SUPPLIES	26011750		
SUB-CONTRACT	6538000		134748345
DIRECT & INDIRECT COST			1635240599
EQUIPMENT WRITE OFF			38857178
PROFIT			
10% PRIME			114135572
5% SUB-CONTRACT			26638133
BID PRICE			1814870082
PRORATE	1.2213		

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DIVERSIFIED CONSTRUCTORS, INC.

OPERATION GENERAL EXPENSE AND OVERHEAD (CONTINUED) ITEM NO. SHEET 1 OF 8 PAGE

JOB

QUANTITY UNIT EST. BY CK'D BY DATE

		LABOR AND INSURANCE		PERMANENT MATERIALS		PLANT		EQUIPMENT		SUPPLIES		SUB-CONTRACTS		TOTAL DIRECT COST	
		UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT
OVERHEAD SALARIES:															
2001 – MANAGEMENT & SUPERVISION SALARIES															
1 Project Manager	120 Mos.	7500 -	900000											7500 -	900000
1 General Superintendent	120 Mos.	6500 -	780000											6500 -	780000
2 Shift Superintendents	240 Mos.	5000 -	1200000											5000 -	1200000
1 Excavation Superintendent	120 Mos.	4500 -	540000											4500 -	540000
1 Concrete Superintendent	120 Mos.	4500 -	540000											4500 -	540000
1 Carpenter Superintendent	120 Mos.	4500 -	540000											4500 -	540000
1 Rigging Superintendent	120 Mos.	4000 -	540000											4500 -	540000
1 Tunnel Superintendent	100 Mos.	5000 -	500000											5000 -	500000
1 Quarry Superintendent	120 Mos.	4500 -	540000											4500 -	540000
2 Master Mechanic	240 Mos.	6000 -	1440000											6000 -	1440000
P.R.T. & Ins. 24 % on $ 7,520,000 - Labor			1804800												1804800
Total Management & Supervision Salaries			9324800												9324800
2002 – OFFICE SALARIES															
1 Office Manager	120 Mos.	5000 -	600000											5000 -	600000
1 Chief Accountant	120 Mos.	4500 -	540000											4500 -	540000
Cost Accountant	120 Mos.	4000 -	480000											4000 -	480000
Accountant	240 Mos.	3500 -	840000											3500 -	840000
Voucher Clerk	100 Mos.	3000 -	300000											3000 -	300000
Paymaster	120 Mos.	3500 -	420000											3500 -	420000
1 Chief Timekeeper	120 Mos.	3000 -	360000											3000 -	360000
2 Timekeepers	240 Mos.	2500 -	600000											2500 -	600000
Payroll Clerk	120 Mos.	2500 -	300000											2500 -	300000
Secretaries & Stenographers	360 Mos.	2500 -	900000											2500 -	900000
Switchboard-Receptionist	120 Mos.	2000 -	240000											2000 -	240000
Machine Operator	240 Mos.	2500 -	600000											2500 -	600000
P.R.T. & Ins. 24 % on $ 6180000 - Labor			1483200												1483200
Total Office Salaries			7663200												7663200
SUB-TOTAL FORWARD			16988000												16988000

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION GENERAL EXPENSE AND OVERHEAD (CONTINUED) ITEM NO. SHEET 2 OF 8 PAGE

JOB

QUANTITY UNIT EST. BY CK'D BY DATE

FORM CWC

			LABOR AND INSURANCE		PERMANENT MATERIALS		PLANT		EQUIPMENT		SUPPLIES		SUB-CONTRACTS		TOTAL DIRECT COST	
			UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT
	Brought Forward			16988000												16988000
	2003 – ENGINEERING SALARIES															
1	Project Engineer	120 Mos.	7000 -	840000											7000 -	840000
1	Office Engineer	120 Mos.	6500 -	780000											6500 -	780000
1	Cost & Materials Engineer	120 Mos.	6000 -	720000											6000 -	720000
	Draftsman	480 Mos.	5000 -	2400000											5000 -	2400000
1	Field Engineer	120 Mos.	6500 -	780000											6500 -	780000
3	Party Chief	360 Mos.	8000 -	2880000											8000 -	2880000
	Instrumentman	360 Mos.	7700 -	2772000											7700 -	2772000
	Rodman	360 Mos.	7500 -	2700000											7500 -	2700000
	CHAINMAN	360 Mos.	7000 -	2520000											7000 -	2520000
	P.R.T. & Ins. 24 % on $ 16392000 - Labor			3934080												3934080
	Total Engineering Salaries			20326080												20326080
	2004 – WAREHOUSE & PURCHASING SALARIES & WAGES															
1	Purchasing Agent	120 Mos.	6500 -	780000											6500 -	780000
1	Chief Warehouseman	120 Mos.	6000 -	720000											6000 -	720000
	Receiving Clerk	120 Mos.	5000 -	600000											5000 -	600000
	Records Clerk	120 Mos.	4000 -	480000											4000 -	480000
	Warehousemen	720 Mos.	7200 -	5240000											7200 -	5240000
	P.R.T. & Ins. 24 % on $ 5820000 - Labor			1396800												1396800
	Total Warehouse & Purchasing Salaries			7216800												7216800
	2005 – LABOR RELATIONS SALARIES															
1	Labor Coordinator	120 Mos.	4500 -	540000											4500 -	540000
	P.R.T. & Ins. 24 % on $ 540000 - Labor			129600												129600
	Total Labor Relations Salaries			669600												669600
	2006 – SAFETY & FIRST AID SALARIES															
1	Safety Engineer	120 Mos.	5000 -	600000											5000 -	600000
	First Aid Man	360 Mos.	4500 -	1620000											4500 -	1620000
	Nurse	240 Mos.	4000 -	960000											4000 -	960000
	P.R.T. & Ins. 24 % on $ 3180000 - Labor			763200												763200
	Total Safety & First Aid Salaries			3943200												3943200
	SUB-TOTAL FORWARD			49143680												49143680

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION GENERAL EXPENSE AND OVERHEAD (CONTINUED) ITEM NO. SHEET 3 OF 8 PAGE

JOB

QUANTITY UNIT EST. BY CK'D BY DATE

FORM CWS

		LABOR AND INSURANCE		PERMANENT MATERIALS		PLANT		EQUIPMENT		SUPPLIES		SUB-CONTRACTS		TOTAL DIRECT COST	
		UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT
	Brought Forward		49143680												49143680
	2007 – WATCHMAN, GUARDS & FIRE GUARDS–SALARIES														
1	Chief Guard 120 Mos.	4500 -	540000											4500 -	540000
2	Guards 240 Mos.	3000 -	720000											3000 -	720000
	Watchmen 360 Mos.	2000 -	720000											2000 -	720000
	P.R.T. & Ins. 24 % on $ 1980000 - Labor		475200												475200
	Total Watch., Guard & Fire Guard Salaries		24455200												24455200
	SUB–TOTAL OVERHEAD SAL'RIES		51598880												51598880
	2008 – OFFICE, BUILDINGS & LAND RENTAL														
	AUTOMOTIVE EXPENSE:														
	2009 – GENERAL AUTOMOTIVE EXPENSE														
	Rental—Sedans 120 Mos.							300 -	36000					300 -	36000
	30 —Pickups 3600 Mos.							250 -	900000					250 -	900000
	2 —Ambulances 240 Mos.							150 -	36000					150 -	36000
	6 —Service Trucks 720 Mos.							700 -	504000					700 -	504000
	Operation Cost—Sedans 120 Mos.									600 -	72000			600 -	72000
	30 —Pickups 3600 Mos.									700 -	2520000			700 -	2520000
	2 —Ambulances 240 Mos.									200 -	48000			200 -	48000
	6 —Service Trucks 720 Mos.									900 -	648000			900 -	648000
	Total General Automotive Expense						1476000		3288000						4764000
	2010 – MANUAL														
	Rental—Bus 4 480 MOS							550 -	264000					550 -	264000
	4 Flatracks 480 MOS							600 -	288000					600 -	288000
	Operation Cost—Bus 4 480 Mos.	1695 -	813600							900 -	432000			1695 -	1245600
	4 —Flatracks 480 Mos.	1695 -	813600							950 -	456000			1695 -	1269600
	Total Manhaul		1627200				552000		888000						3067200
	2011 – AUTOMOTIVE LICENSE FEES & PERMITS														
	8 Units 10 Yrs. 80 Yrs.									150 -	120000			150 -	120000
	SUB–TOTAL AUTOMOTIVE EXPENSE		1627200				2028000		4188000						7843200
	SUB–TOTAL FORWARD		27846080				2028000		4188000						34082080

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION GENERAL EXPENSE AND OVERHEAD (CONTINUED) ITEM NO. SHEET 4 OF 8 PAGE

JOB

QUANTITY UNIT EST. BY CK'D BY DATE

FORM CWC

		LABOR AND INSURANCE		PERMANENT MATERIALS		PLANT		EQUIPMENT		SUPPLIES		SUB-CONTRACTS		TOTAL DIRECT COST	
		UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT
Brought Forward			67866080						2028000		4188000				74082080
MISCELLANEOUS OPERATING EXPENSE:															
2012 – Stationery and Office Supplies	120 Mos.									400 -	48000			400 -	48000
2013 – Data Processing	120 Mos.									350 -	42000			350 -	42000
2014 – Office Equipment and Furniture–Rental or Depreciation	120 Mos.									750 -	90000			750 -	90000
2015 – Office Expense – Other	120 Mos.									600 -	72000			600 -	72000
2016 – Engineering Supplies and Expense	120 Mos.									500 -	60000			500 -	60000
2017 – Engineering Equip. – Rental or Depreciation	120 Mos.									800 -	96000			800 -	96000
2018 – Photography and Reproduction	120 Mos.									250 -	30000			250 -	30000
2019 – Outside Engineering Expense	24 Mos.											6000 -	144000	6000 -	144000
2020 – Consultants Expense	12 Mos.											12000 -	144000	12000 -	144000
2021 – Warehouse and Purchasing Expense	120 Mos.									300 -	36000			300 -	36000
2022 – Labor Relations – Supplies & Expense	120 Mos.									200 -	24000			200 -	24000
2023 – Safety and First Aid – Supplies & Expense	120 Mos.									1500 -	180000			1500 -	180000
2024 – Watchman, Guards & Fire Guards Expense	120 Mos.									500 -	60000			500 -	60000
2025 – Telephone and Telegraph	120 Mos.									4000 -	480000			4000 -	480000
2026 – Radio Communications	120 Mos.									1250 -	150000			1250 -	150000
2027 – Heat, Light, Power & Janitor Service	120 Mos.									10000 -	1200000			10000 -	1200000
2028 – Building Maintenance – Owners Facilities	120 Mos.									1000 -	120000			1000 -	120000
2029 – Legal Expense	LS. Mos.											LS.	500000	LS.	500000
2030 – Travel Expense – Job Connected	120 Mos.									5000 -	600000			5000 -	600000
2031 – Travel Expense – Move-in Personnel	50 Men									5000 -	250000			5000 -	250000
2032 – Entertainment, Donations & Contributions	120 Mos.									500 -	60000			500 -	60000
2033 – Bank Charges	LS Mos.											LS.	1500000	LS.	1500000
2034 – Fire Protection	LS. Mos.									LS.	250000			LS.	250000
2035 – Sanitary Facilities	1440 Mos.									150 -	216000			150 -	216000
2036 – Drinking Water and Ice	120 Mos.									250 -	30000			250 -	30000
2037 – Misc. Job Road and Yards Maintenance	120 Mos.	142406	17088682					27242	3269066	41146	4937501			210794	25295249
2038 – Job Signs	Mos.									LS.	5000			LS.	5000
2038A – Small Tools			IN DIRECTS												
2039 – Winter Shutdown															
Winterize Building & Equipment											150000				150000
Move Out & In of Personnel											250000				250000
Standby Time for Supervisory Personnel											-0-				-0-
SUB–TOTAL MISCELLANEOUS OPERATING EXPENSE			17088682						3269066		9436501		2288000		32082249
SUB–TOTAL GENERAL EXPENSE FORWARD TO SHEET NO. 7			84954762						5297066		13624501		2288000		106164329

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION MISC. JOB ROAD & YARDS MAINTENANCE ITEM NO. SHEET 24 OF PAGE

JOB

QUANTITY 120 UNIT MONTHS EST. BY CK'D. BY DATE

FORM 2

THE FOLLOWING SPREAD WORKING 120 MONTHS - 10 HOURS PER DAY = 258 (120) = 30960 HOURS.

SPREAD	LABOR	EQUIPMENT	SUPPLIES
1- 966 FEL	14.02	17.80	26.63
3- LEGAL END SPILLS	40.86	28.86	42.57
3- MOTOR PATROLS	44.44	53.79	58.53
1- FLATBED	4.01	4.17	14.04
1- PICKUP	2.40	0.97	5.71
1- FEL OPERATOR	35.97		
3- TEAMSTERS-END SPILLS	102.78		
3- PATROL OPERATORS	107.91		
1- TEAMSTER-FLATBED	32.84		
4- LABORERS	125.12		15.00
1- FOREMAN	39.59		
COST PER HOUR	551.96	105.59	159.48

SUMMARY	TOTAL	MONTH UNIT PRICE
LABOR	17088682	142406
EQUIPMENT	3269066	27242
SUPPLIES	4937501	41146
	25295249	210794

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION MISCELLANEOUS GENERAL EXPENSE ITEM NO. 2055 SHEET ____ OF ____ PAGE ____

JOB WATANA

QUANTITY | UNIT | EST. BY | CK'D. BY | DATE

FORM 2

DURING THE LIFE OF THE CONTRACT, THE PROJECT HAS TO HAVE A JOB SERVICING ITEM, I.E. GETTING MATERIALS AND OR SUPPLIES TO THE PROJECT.

FIGURE 120 MONTHS WITH THE FOLLOWING SPREAD. = 30960 HOURS.

SPREAD	LABOR	EQUIPMENT	SUPPLIES
1- HYDRACRANE	15.62	11.19	15.80
1- LOBOY	14.02	11.90	14.07
1- FUEL TRUCK	12.02	6.30	17.91
1- FLATBED	4.01	4.17	11.04
1- PICKUP	2.40	0.97	5.71
1- CRANE OPERATOR	37.84		
3- TEAMSTERS	100.82		
4- LABORERS	125.12		15.00
1- FOREMAN	39.59		
COST PER HOUR	351.44	33.53	79.53
COST 30960 HOURS,	10880582	1041185	2462249

SUMMARY	TOTAL	MONTHLY UNIT PRICE
LABOR	10880582	90672
EQUIPMENT	1041185	8677
SUPPLIES	2462249	20519
	14384016	119868

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DIVERSIFIED CONSTRUCTORS, INC.

OPERATION GENERAL EXPENSE AND OVERHEAD (CONTINUED) ITEM NO. SHEET 5 OF 8 PAGE

JOB

QUANTITY UNIT EST. BY CK'D BY DATE

FORM CMC

		LABOR AND INSURANCE		PERMANENT MATERIALS		PLANT		EQUIPMENT		SUPPLIES		SUB-CONTRACTS		TOTAL DIRECT COST	
		UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT
GENERAL PLANT:															
TEMPORARY BUILDINGS															
1901 – Main Office 5 TRAILERS			25000								175000				1500000
1902 – Warehouse – Building													350000		3500000
Shelving													15000		150000
Yard, Surfacing, Sill, Fencing													50000		500000
1904 – Field Office													50000		500000
1906 – Hospital or First Aid Building or Trailer													75000		750000
1908 – Inspectors' Field Office													25000		250000
1909 – Inspectors' Concrete Testing Facilities													25000		250000
1911 – Riggers Loft													15000		150000
1912 – Carpenter Shop – Building													50000		500000
– Cutting Deck													7500		75000
1913 – Electrical Repair Shop													25000		250000
1914 – Equipment Repair Shop													250000		2500000
1915 – Paint Shop															- 0 -
1916 – Pipefitters Shop													50000		500000
1917 – Tire Repair Shop													25000		250000
1918 – Grease Rack & Lube Shop													15000		150000
1919 – Service Station													75000		750000
1920 – Oil Storage													7500		75000
1921 – Fuel Storage													40000		400000
1925 – Powder House													75000		750000
1926 – Cap House													20000		200000
1930 – Tool Sheds													30000		300000
1931 – Workmen's Shelter													75000		750000
1937 – General Yard & Site Grading & Surfacing													250000		2500000
Total Temporary Buildings			25000								175000		2100000		22500000
UTILITIES INSTALLATION – (Excluding Camp)															
1951 – Electrical Supply & Distribution													125000		1250000
1952 – Telephone Lines & Job Telephone System													75000		750000
1953 – Water Supply Storage & Distribution													150000		1500000
1954 – Sewer System & Treatment Facilities													50000		500000
1955 – Radio Communications													100000		1000000
Total Utilities Installation													500000		5000000
TEMPORARY ROADS															
1961 – General & Access Roads & Bridges								IN DIRECTS							
SUB–TOTAL GENERAL PLANT, FORWARD TO SHEET NO. 7			25000								175000		2600000		27500000

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION GENERAL EXPENSE AND OVERHEAD (CONTINUED) ITEM NO. SHEET 6 OF 8 PAGE

JOB

QUANTITY UNIT EST. BY CK'D BY DATE

FORM CWE

		LABOR AND INSURANCE		PERMANENT MATERIALS		PLANT		EQUIPMENT		SUPPLIES		SUB-CONTRACTS		TOTAL DIRECT COST	
		UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT
CAMP CONSTRUCTION:															
TEMPORARY BUILDINGS–CAMP															
Total Direct Labor Cost $_____															
Ave. Dir. Labor Cost/Mo.: (____Mo.) $_____/Mo.															
Ave. Hourly Wage Rate_____/Hr.															
Ave. Monthly Wage_____															
Average Number of Men_____															
Peak Manpower Required +____%=____															
Non-Manual Personnel_____															
Total Manpower at Peak_____															
Est.____% Find Own Accom. =____															
Est.____% Live in Barracks =____															
Est.____% Live in Trailers =____															
Est. Residences for Supervision =____Units															
1971 – Barracks____Men @____SF/Men =____	S.F.														
1972 – Mess Hall for____Men															
1973 – Commissary															
1974 – Recreation Hall															
1975 – Bull Cooks Dormitory____Men @____SF EA.	S.F.														
1976 – Trailer Court–Including Utilities															
1977 – Trailer Court Wash House															
1978 – Residences for Supervisory Personnel															
1979 – Site Grading and Surfacing (Other than Trailer Court)															
Total Temporary Buildings – Camp															
UTILITIES FOR CAMP FACILITIES–Other Than Trailer Ct.															
1981 – Power Supply and Distribution															
1982 – Telephone–Camp Telephone System															
1983 – Water Supply and Distribution															
1984 – Sewer System and Treatment Facilities															
Total Utilities for Camp Facilities															
SUB–TOTAL CAMP CONSTRUCTION COST–TO SHEET NO. 7															

INCLUDED IN DIRECT COSTS

INCLUDED IN DIRECT COSTS

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DIVERSIFIED CONSTRUCTORS, INC.

OPERATION GENERAL EXPENSE AND OVERHEAD (CONTINUED) ITEM NO. SHEET 7 OF 8 PAGE

JOB

QUANTITY UNIT EST. BY CK'D BY DATE

FORM CWA

		LABOR AND INSURANCE		PERMANENT MATERIALS		PLANT		EQUIPMENT		SUPPLIES		SUB-CONTRACTS		TOTAL DIRECT COST	
		UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT
CAMP OPERATIONS															
2043 – Commissary Operations															
2044 – Mess Hall Operations –															
_____ Mo. Operation x _____ Men x															
_____ Meals/Day x _____ Days = _____	Meals														
Less Revenue	Man Days														
Total Mess Hall Operations															
2045 – Barracks Operations															
_____ Mo. Operation x _____ Men x															
_____ Days = _____	Man Days														
Less Revenue	Man Days														
Total Barracks Operations															
2046 – Residence Operations															
_____ Mo. Operation x _____ Residences															
= _____ Mo. of Occupancy	Mos.														
Less Revenue	Mos.														
Total Residence Operations															
2047 – Trailer Camp Operations															
_____ Mo. Operation x _____ Avg. Spaces															
Occupied = _____	T.M.														
Less Revenue	T.M.														
Total Trailer Camp Operations															
2048 – Free Meals Expense	Mos.														
SUB–TOTAL CAMP OPERATIONS															
CAMP CONSTRUCTION–(From Sheet No. 6)															-0-
NET COST OF CAMP OPERATIONS															
DISMANTLE AND MOVE–OUT															
1991 – Specific Plant													250000		250000
1992 – Mobile Equipment													500000		500000
1993 – General Plant													250000		250000
Total Dismantle and Move–Out													1000000		1000000
GENERAL EXPENSE (From Sheet No. 4)			84954762				5297066		13624501				2288000		16164329
GENERAL PLANT (From Sheet No. 5)			25000						125000				2600000		2750000
SUB–TOTAL FORWARD			84979762				5297066		13749501				5888000		19914329

INCLUDED IN DIRECTS

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DIVERSIFIED CONSTRUCTORS, INC.

OPERATION GENERAL EXPENSE AND OVERHEAD (CONTINUED) ITEM NO. SHEET 8 OF 8 PAGE

JOB

QUANTITY UNIT EST. BY CK'D BY DATE

FORM CW6

	LABOR AND INSURANCE		PERMANENT MATERIALS		PLANT		EQUIPMENT		SUPPLIES		SUB-CONTRACTS		TOTAL DIRECT COST	
	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT
Brought Forward		84979762						5297066		13749501		5888000		109914329
2049 – INSURANCE OTHER THAN PAYROLL:														
Excess P.L. and P.D.														
Contractors Plant and Equipment														
General Plant Buildings $														
Camp Buildings														
Mobile Equipment														
Concrete Plant & Equipment														
Aggregate Plant														
General Expense Equipment														
Total Plant & Equipment Value $														
Yrs. Use @ % = % of Above Value										300000				300000
Buiders Risk $ Bid @ %										500000				500000
Fidelity Insurance														
Total Insurance Other Than Payroll										800000				800000
2050 – TAXES OTHER THAN PAYROLL:														
County Tax on Plant & Equipment														
Yrs. Use @ % of Value $														
State Business Tax														
City Business Tax														
Total Taxes Other Than Payroll														
2051 – SURETY BOND PREMIUM:														
Estimated Value of Bid $2,000,000,000.00 @ $4.50/M.										9000000				9000000
First $ @ $ /M = $														
Next $ @ $ /M =														
Next $ @ $ /M =														
Next $ @ $ /M =														
Additional M @ $ /M =														
Sub-Total $														
Term Premium:														
Mo. @ % = % =														
Total Surety Bond Premium:										9000000				9000000
2055 – MISCELLANEOUS GENERAL EXPENSE														
EQUIPMENT MOBILIZATION												650000		650000
JOB SERVICING	90672	10880582					8677	1041185	20519	2462249			119868	14384016
TOTAL GENERAL EXPENSE & GENERAL PLANT		95860344						6338251		26011750		6538000		134748345

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Land & Land Rights ITEM NO. 330 SHEET ____ OF ____ PAGE ____

JOB Watana Dam

BID QUANTITY 1 UNIT L.S. TAKE OFF QUANTITY ____ EST. BY A. Lee DATE ____

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
PER REMY	1	LS.							LS. 51000000	LS. 51000000

FOLD LENGTH
12
11
8.5
8

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FEED

OPERATION Excavation, Rock ITEM NO. 331.111 SHEET OF PAGE

JOB Watana Dam

BID QUANTITY 160,000 UNIT C.Y. TAKE OFF QUANTITY 154225 EST. BY A. Lee DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
TBM	5400	LF	28.74 155140	7.09 38349	6.08 32767	24.36 130874	19.94 107628			75.81 409758
EXCAVATION	149138	CY	30.40 4533831							30.40 4533831
SUPPLIES	149138	CY		10.61 1582334						10.61 1582334
SUPPORT	149138	CY						24.23 3613614		24.23 3613614
EQUIPMENT	149138	CY			10.64 1587791	9.50 1416930	11.94 1781060			32.08 4784781
	154225	CY	30.38 4687771	10.51 1620183	10.50 1619558	10.04 1547804	11.91 1837188	23.43 3613614		96.77 14924318
	160000	CY	30.38 4860800	10.51 1681600	10.50 1680000	10.04 1606400	11.91 1905600	23.43 3748800		96.77 15483200

FOLD LENGTH
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11
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OPERATION EXCAVATION ROCK POWERHOUSE — ITEM NO. 111 SHEET 1 OF PAGE

JOB WATANA

QUANTITY 160000 UNIT C.Y. EST. BY CK'D. BY DATE

FORM 2

TAKEOFF QUANTITY = 142,083 (POWERHOUSE ONLY)
12,142 (TAILRACE ONLY)
154,225 TOTAL

18'Φ TBM. - 540 L.F.

SUMMARY	UNIT PRICE	TOTAL
DIRECT LABOR	281.74	152140
SUPPLIES	70.09	37849
REPAIR LABOR	60.68	32767
EQUIPMENT	242.36	130874
EQUIP. SUPPLIES	103.94	56128
	758.81	409758

DRILL & SHOOT

BLOCK 1 — 16 ROUNDS

FIGURE 30 L.F. LONG X 9 C.F. HIGH.
4.97 (30) = 149.10 CU. YDS.
30 (9)
3.5 = 77 DRILL HOLES - AVERAGE DEPTH = 14.33 C.F.
OVERDRILL 1 L.F.

BLOCK 2, 3 & 4 — 48 ROUNDS

SAME AS ABOVE

BLOCK 5 — 16 ROUNDS

FIGURE 30 C.F. LONG X 10 C.F. HIGH.
4.35 (30) = 130.50 CU. YDS.
30 (10)
3.5 = 86 DRILL HOLES - AVERAGE DEPTH = 12.0 L.F.
OVERDRILL 1 L.F.

BLOCK 6 — 16 ROUNDS

FIGURE 30 L.F. LONG X 8 L.F. HIGH.
3.7 (30) = 111 CU. YDS.
30 (8)
3.5 = 69 DRILL HOLES - AVERAGE DEPTH = 12.0 L.F.
OVERDRILL 1 L.F.

OPERATION ITEM NO. SHEET 2 OF PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

BLOCK 7

FIGURE 30 L.F LONG X 10 L.F HIGH 16 ROUNDS

4.44 (30) = 133.20 CU. YDS.

30 (10)

3.5 = 86 DRILL HOLES - AVERAGE DEPTH = 12 L.F.

OVERDRILL 1 L.F.

BLOCK 8

FIGURE 30 L.F. LONG X 8 L.F. HIGH. 16 ROUNDS

3.78 (30) = 113.40 CU. YDS.

30 (8)

3.5 = 69 DRILL HOLES - AVERAGE DEPTH = 12 L.F.

OVERDRILL 1 L.F.

BLOCK 9

SAME AS BLOCK 5 16 ROUNDS

BLOCK 10

SAME AS BLOCK 6 16 ROUNDS

BLOCK 11 16 ROUNDS

FIGURE 30 L.F. LONG X 14 L.F. WIDE

5.25 (30) = 157.50 CU. YDS.

30 (14)

3.5 = 120 DRILL HOLES - AVERAGE DEPTH = 10 L.F.

OVERDRILL 1 L.F.

BLOCK 12 16 ROUNDS

SAME AS BLOCK 11

BLOCK 13 16 ROUNDS

SAME AS BLOCK 12

BLOCK 14 16 ROUNDS

FIGURE 30 L.F. LONG X 12 L.F. WIDE

4.35 (30) = 130.50 CU. YDS.

30 (12)

3.5 = 103 DRILL HOLES - AVERAGE DEPTH = 10 L.F.

OVERDRILL 1 L.F.

BLOCK 15 16 ROUNDS

FIGURE 30 L.F. LONG X 11.5 L.F. WIDE

3.51 (30) = 105.30 CU. YDS.

30 (11.5)

3.5 = 99 DRILL HOLES - AVERAGE DEPTH = 6.71 L.F.

OVERDRILL 1 L.F.

BLOCK 16
SAME AS BLOCK 15 — 16 ROUNDS

BLOCK 17
FIGURE 30 L.F. LONG X 14 L.F. WIDE — 16 ROUNDS
4.36 (30) = 130.80 CU. YDS.
30 (14)
3.5 = 120 DRILL HOLES — AVERAGE DEPTH = 8.5 O L.F.
OVERDRILL 1 L.F.

BLOCK 18
SAME AS BLOCK 17 — 16 ROUNDS

BLOCK 19
FIGURE 30 L.F. LONG X 17 L.F. WIDE — 16 ROUNDS
2.65 (30) = 79.50 CU. YDS.
30 (17)
3.5 = 146 DRILL HOLES — AVERAGE DEPTH = 4.65 L.F.
OVERDRILL 1 L.F.

BLOCK 20
SAME AS BLOCK 19 — 16 ROUNDS

BLOCK 21
FIGURE 30 L.F. LONG X 13 L.F. WIDE — 16 ROUNDS
5.30 (30) = 159 CU. YDS.
30 (13)
3.5 = 111 DRILL HOLES — AVERAGE DEPTH = 10 L.F.
OVERDRILL 1 L.F.

BLOCK 22
SAME AS 21 — 16 ROUNDS

BLOCK 23
SAME AS 21 — 16 ROUNDS

BLOCK 24
SAME AS 21 — 16 ROUNDS

BLOCK 25
SAME AS 21 — 16 ROUNDS

BLOCK 26
SAME AS 21 — 16 ROUNDS

BLOCK 27
SAME AS 21 — 16 ROUNDS

BLOCK 28
SAME AS 21 — 16 ROUNDS

OPERATION ITEM NO. SHEET 4 OF PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

BLOCK 29		
SAME AS 21	16	ROUNDS
BLOCK 30		
SAME AS 21	16	ROUNDS
BLOCK 31		
SAME AS 21	16	ROUNDS
BLOCK 32		
SAME AS 21	16	ROUNDS
BLOCK 33		
SAME AS 21	16	ROUNDS
BLOCK 34		
SAME AS 21	16	ROUNDS
BLOCK 35		
SAME AS 21	16	ROUNDS
BLOCK 36		
SAME AS 21	16	ROUNDS
BLOCK 37		
SAME AS 21	16	ROUNDS
BLOCK 38		
SAME AS 21	16	ROUNDS
BLOCK 39		
FIGURE 25 L.F. LONG X 13 L.F. WIDE	16	ROUNDS
5130 (25) = 132.50 CU. YDS.		
25 (18)		
3.5 = 93 DRILL HOLES - AVERAGE DEPTH = 11 L.F.		
OVERDRILL 1 L.F.		
BLOCK 40		
SAME AS BLOCK 39	16	ROUNDS
BLOCK 41		
SAME AS BLOCK 39	16	ROUNDS
BLOCK 42		
SAME AS BLOCK 39	16	ROUNDS
BLOCK 43		
SAME AS BLOCK 39	16	ROUNDS
BLOCK 44		
SAME AS BLOCK 39	16	ROUNDS

OPERATION ITEM NO. SHEET 5 OF PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

FOR

BLOCK 45

FIGURE 25' LONG X 13.5' WIDE 16 ROUNDS

7.07 (25) = 176.75 CU. YDS.

25 (13.5)

3.5 : 96 DRILL HOLES - AVERAGE DEPTH = 13 C.F.

OVERDRILL 1 C.F.

BLOCK 46

SAME AS BLOCK 45

BLOCK 47

SAME AS BLOCK 45

BLOCK 48

SAME AS BLOCK 45

BLOCK 49

FIGURE 25' LONG X 20.33' WIDE 16 ROUNDS

8.12 (25) = 168.0 CU. YDS.

25 (20.33)

3.5 = 145 DRILL HOLES - AVERAGE DEPTH = 9 C.F.

OVERDRILL 1 C.F.

BLOCK 50

FIGURE 25' LONG X 18' WIDE 16 ROUNDS

6.0 (25) = 150 CU. YDS.

25 (18)

3.5 = 129 DRILL HOLES - AVERAGE DEPTH = 9 C.F.

OVERDRILL 1 C.F.

BLOCK 51

FIGURE 25' LONG X 23.5' WIDE 16 ROUNDS

12.19 (25) = 304.75 CU. YDS.

25 (23.5)

3.5 : 168 DRILL HOLES - AVERAGE DEPTH = 14 C.F.

OVERDRILL 1 C.F.

BLOCK 52

FIGURE 25' LONG X 7.5' WIDE 16 ROUNDS

4.16 (25) = 104 CU. YDS.

25 (7.5)

3.5 : 54 DRILL HOLES - AVERAGE DEPTH = 15 C.F.

OVERDRILL 1 C.F.

OPERATION ITEM NO. SHEET 6 OF PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

BLOCK 53

FIGURE 25' LONG x 12.5' WIDE

6.26 (25) = 156.25 CU. YDS.

25 (12.5)

3.5 = 89 DRILL HOLES. — AVERAGE DEPTH = 13.5 L.F.

OVERDRILL 1 L.F.

16 ROUNDS

BLOCK 54A

FIGURE 25' LONG x 17' WIDE

3.62 (25) = 90.5 CU. YDS.

25 (17)

3.5 = 121 DRILL HOLES — AVERAGE DEPTH = 5.75 L.F.

OVERDRILL 1 L.F.

16 ROUNDS

BLOCK 54B

FIGURE 26' LONG x 17' WIDE

2.52 (26) = 65.52 CU. YDS.

26 (17)

3.5 = 126 DRILL HOLES — AVERAGE DEPTH = 4.0 L.F.

OVERDRILL 1 L.F.

8 ROUNDS

BLOCK 55A

FIGURE 25' LONG x 14.67' WIDE

3.12 (25) = 78 CU. YDS.

25 (14.67)

3.5 = 105 DRILL HOLES — AVERAGE DEPTH = 5.75 L.F.

OVERDRILL 1 L.F.

16 ROUNDS

BLOCK 55B

SAME AS 54B

8 ROUNDS

BLOCK 56

FIGURE 26' LONG x 17' WIDE

7.87 (26) = 204.62 CU. YDS.

26 (17)

3.5 = 126 DRILL HOLES — AVERAGE DEPTH = 12.5 L.F.

OVERDRILL 1 L.F.

8 ROUNDS

BLOCK 57

SAME AS 56

8 ROUNDS.

OPERATION ITEM NO. SHEET 7 OF PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

BLOCK 58
FIGURE 26'LONG X 16.5'WIDE 8 ROUNDS
8.25 (26) = 214.5 CU.YDS.
26 (16.5)
3.5 = 123 DRILL HOLES - AVERAGE DEPTH = 13.5 L.F.
OVERDRILL 1 L.F.

BLOCK 59
FIGURE 26'LONG X 16.5'WIDE 8 ROUNDS
8.86 (26) = 230.36 CU.YDS.
26 (16.5)
3.5 = 123 DRILL HOLES - AVERAGE DEPTH = 14.5 L.F.
OVERDRILL 1 L.F.

POWERHOUSE TO ACCESS ELEVATOR & ELEVATOR AREA

BLOCK 1
FIGURE 15.5 L.F. LONG X 18'WIDE
7.46 (18) = 134.28 CU.YDS.
13 (18)
3.5 = 67 DRILL HOLES - AVERAGE DEPTH = 15.5 L.F.
OVERDRILL 1 L.F.

BLOCK 2
SAME AS BLOCK 1

BLOCK 3
SAME AS BLOCK 1

BLOCK 4
SAME AS BLOCK 1

BLOCK 5
FIGURE 15.5' LONG X 18' WIDE
5.74 (18) = 103.32 CU.YDS
10 (18)
3.5 = 51 DRILL HOLES AVERAGE DEPTH = 15.5 L.F.
OVERDRILL 1 L.F.

BLOCK 6
SAME AS BLOCK 5

BLOCK 7
SAME AS BLOCK 5

BLOCK 8
SAME AS BLOCK 5

OPERATION ITEM NO. SHEET 8 OF PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

BLOCK 9
FIGURE 15.5 L.F. LONG X 18' WIDE
6.31 (18) = 113.58 CU. YDS.
11 (18)
3.5 = 57 DRILL HOLES - AVERAGE DEPTH = 15.5 L.F.
OVERDRILL 1 L.F.

BLOCK 10
SAME AS BLOCK 9

BLOCK 11
SAME AS BLOCK 9

BLOCK 12
SAME AS BLOCK 9

BLOCK 13
FIGURE 15.5 L.F. LONG X 18' WIDE
6.03 (18) = 108.54 CU. YDS
11 (18)
3.5 = 57 DRILL HOLES - AVERAGE DEPTH = 15.5 L.F.
OVERDRILL 1 L.F.

BLOCK 14
SAME AS BLOCK 13

BLOCK 15
SAME AS BLOCK 13

BLOCK 16
SAME AS BLOCK 13

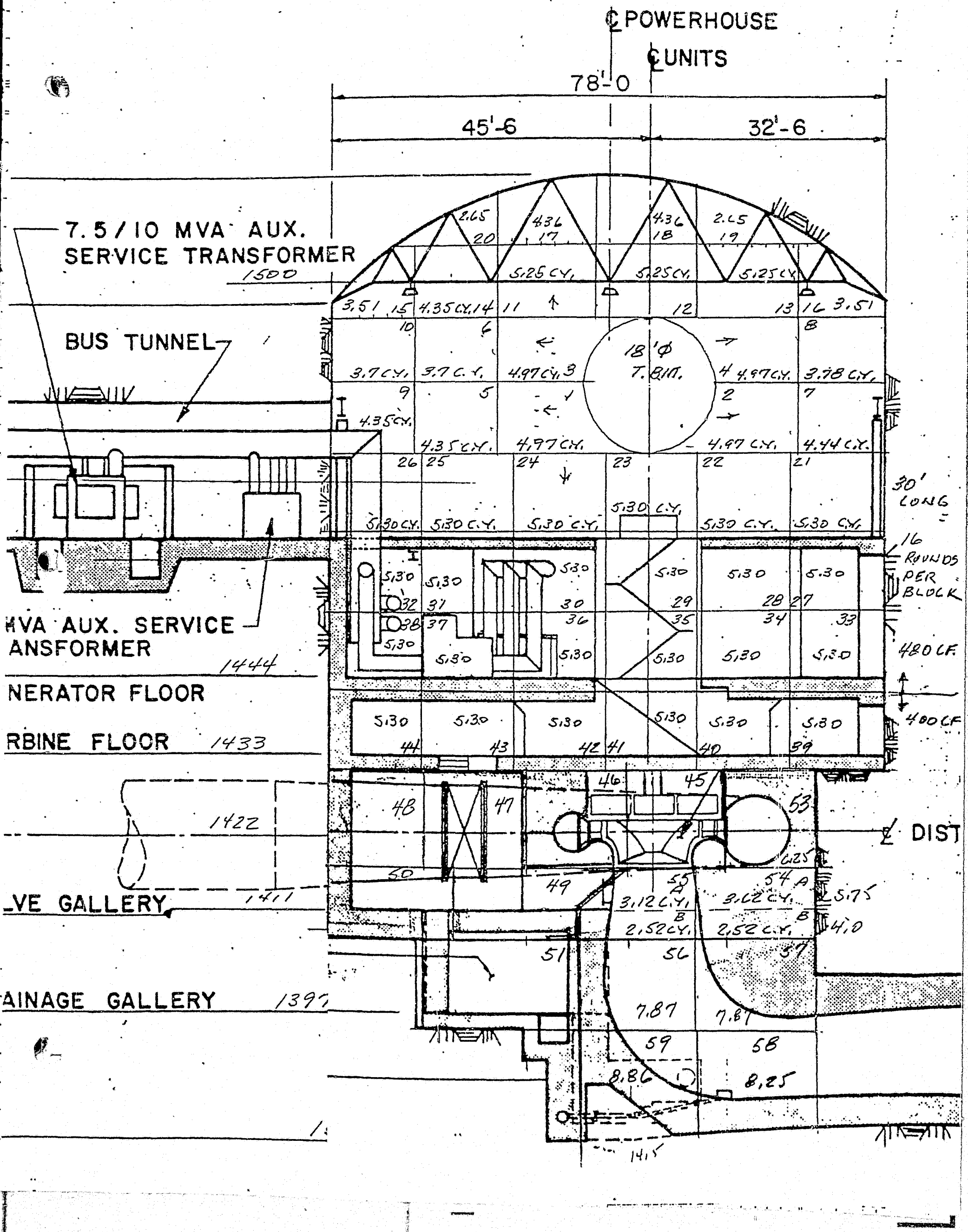
BLOCK 17
FIGURE 15.5 L.F. LONG X 18' WIDE
7.75 (18) = 139.50 CU. YDS
13.5 (18)
3.5 = 69 DRILL HOLES - AVERAGE DEPTH = 15.5 L.F.
OVERDRILL 1 L.F.

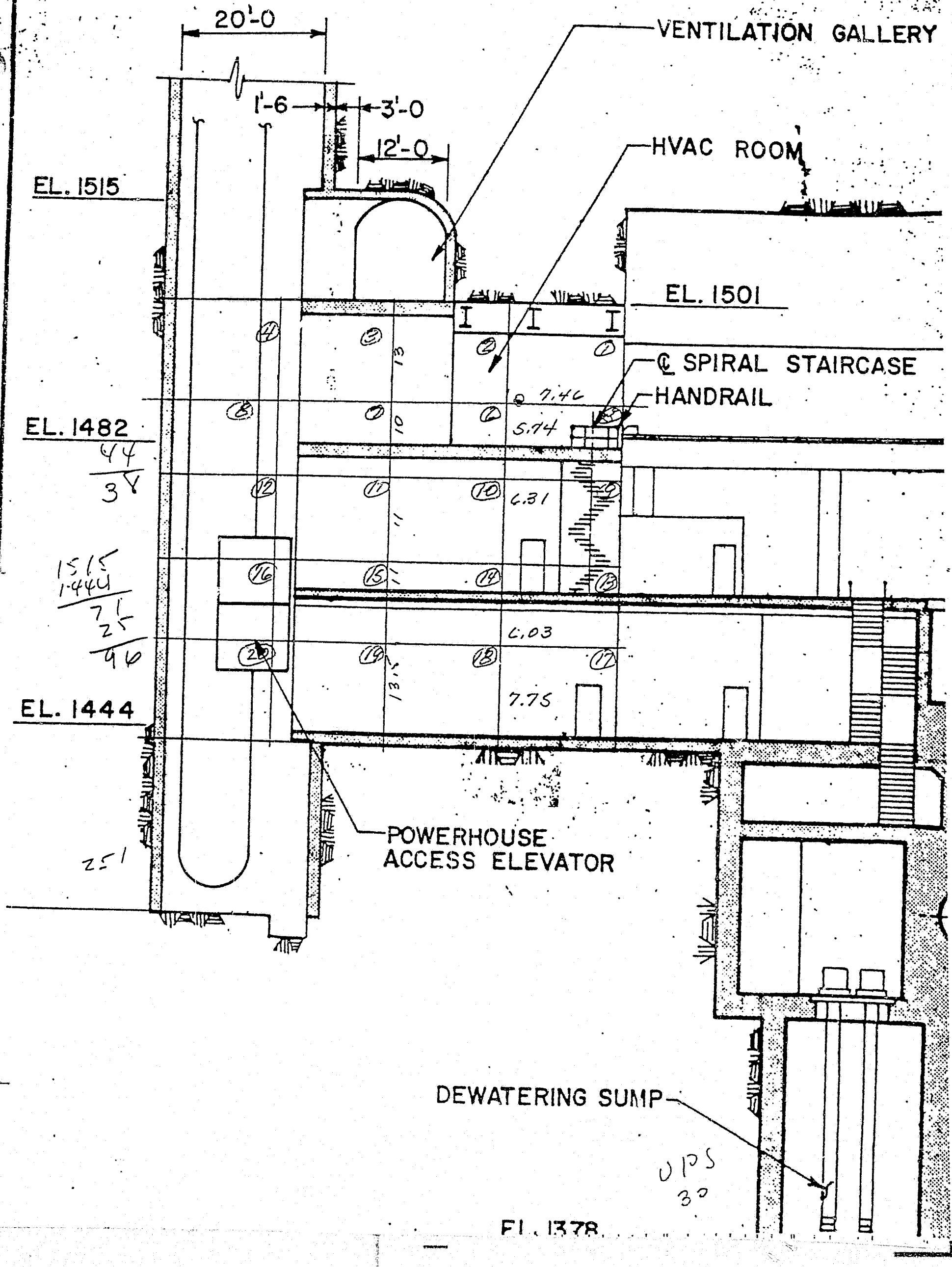
BLOCK 18
SAME AS BLOCK 17

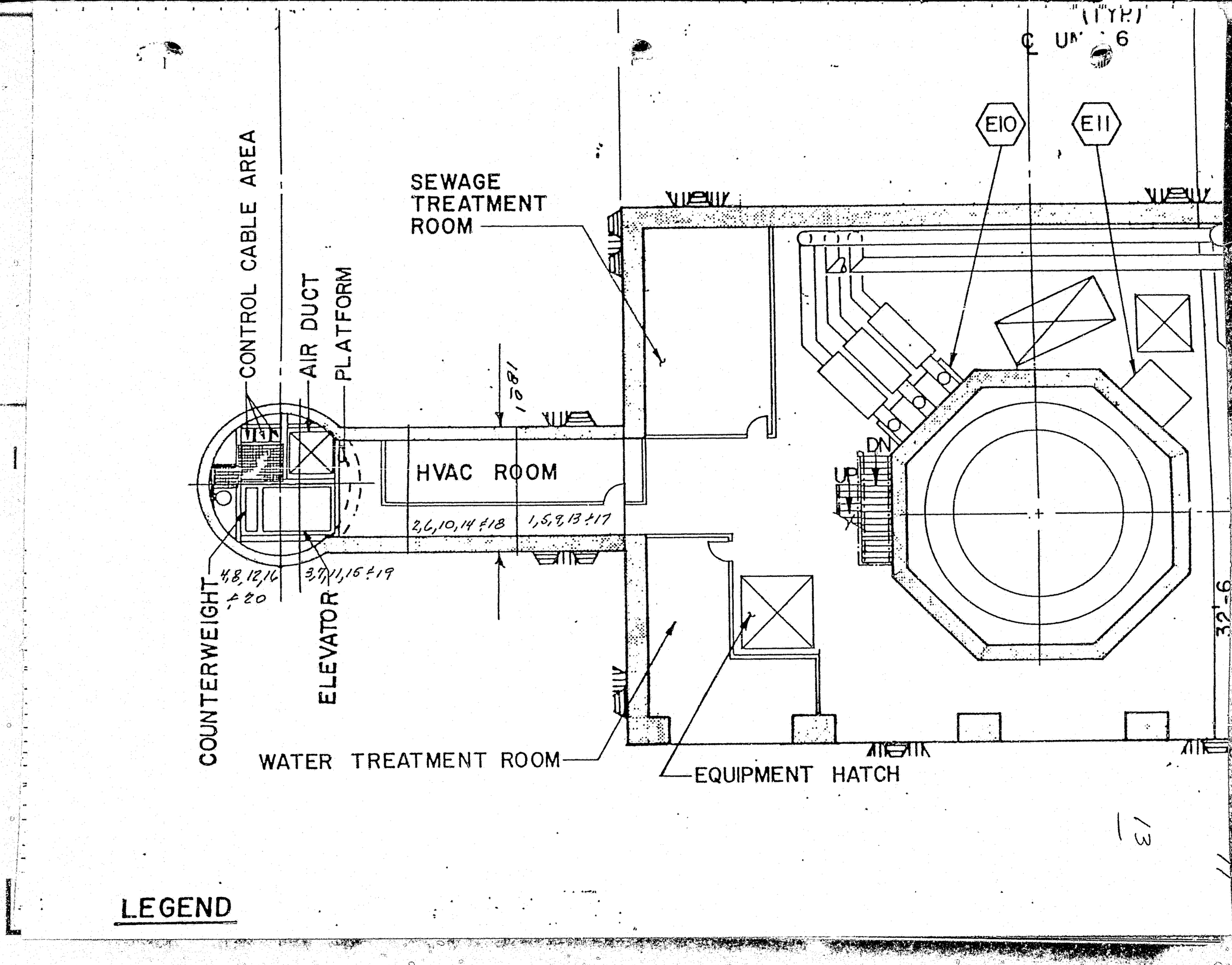
BLOCK 19
SAME AS BLOCK 17

BLOCK 20
SAME AS BLOCK 17

0 0 0 2 4 9


℄ POWERHOUSE
℄ UNITS
78'-0
45'-6
32'-6
7.5/10 MVA AUX.
SERVICE TRANSFORMER
1500
BUS TUNNEL
MVA AUX. SERVICE
ANSFORMER
1444
NERATOR FLOOR
RBINE FLOOR 1433
1422
VE GALLERY 1411
AINAGE GALLERY 1397
18'Ø
T. BIT.
30' LONG
16 ROUNDS PER BLOCK
480 CF.
400 CF.
℄ DIST
2.65
4.36
4.36
2.65
5.25 CY.
5.25 CY.
5.25 CY.
3.51
4.35 CY.
3.7 C.Y.
3.7 C.Y.
4.97 CY.
4.97 C.Y.
3.78 C.Y.
4.35 C.Y.
4.35 C.Y.
4.97 C.Y.
4.97 C.Y.
4.44 C.Y.
5.30 C.Y.
5.30
3.12 C.Y.
3.12 C.Y.
2.52 C.Y.
2.52 C.Y.
7.87
7.87
8.86
8.25
5.75
4.0
14.5


20'-0
1'-6
3'-0
12'-0
VENTILATION GALLERY
HVAC ROOM
EL. 1515
EL. 1501
℄ SPIRAL STAIRCASE
HANDRAIL
EL. 1482
EL. 1444
POWERHOUSE
ACCESS ELEVATOR
DEWATERING SUMP
EL. 1378
7.46
5.74
6.31
6.03
7.75
10
11
13
13.5


CONTROL CABLE AREA
AIR DUCT
PLATFORM
SEWAGE TREATMENT ROOM
HVAC ROOM
E10
E11
DN
UP
2,6,10,14 ±18
1,5,9,13 ±17
4,8,12,16 ±20
3,7,11,15 ±19
COUNTERWEIGHT
ELEVATOR
WATER TREATMENT ROOM
EQUIPMENT HATCH
32'-6

LEGEND

DIVERSIFIED CONSTRUCTORS, INC.

1-L

OPERATION ITEM NO. SHEET 12 OF PAGE

JOB

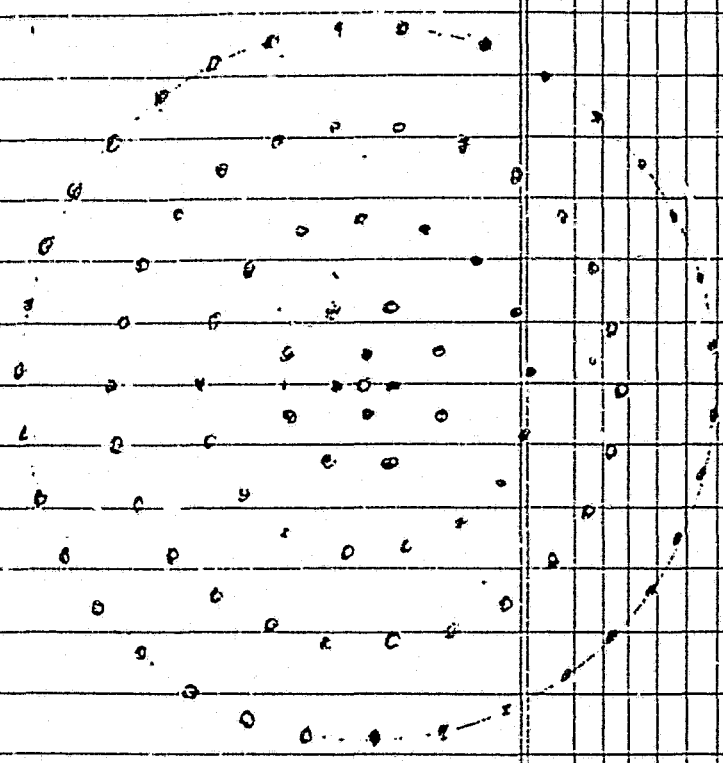
QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

TAILRACE - POWERHOUSE TO SURGE CHAMBER

6 - TUNNELS 135 L.F. LONG

AVERAGE DIAMETER = 22.69 FEET



90 HOLES PER ROUND

14.99 CU. YDS. / L.F.

TOTAL YARDAGE = 12,142 CU. YDS.

DRILL 12 L.F. & PULL 10 L.F

OPERATION ITEM NO. SHEET 13 OF PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	PER ROUND	ROUNDS	LENGTH
DRILL & SHOOT		11 5'	
HOLES PER ROUND	1282		
BLOCK 1 POWERHOUSE	77	16	15.33
" 2,3 & 4	77	48	15.33
" 5	86	16	13.00
" 6	69	16	13.06
" 7	86	16	13.00
" 8	69	16	13.00
" 9	86	16	13.00
" 10	69	16	13.06
" 11	120	16	11.00
" 12	120	16	11.00
" 13	120	16	11.00
" 14	103	16	11.00
" 15	99	16	7.71
" 16	99	16	7.71
" 17	120	16	9.50
" 18	120	16	9.50
" 19	146	16	5.65
" 20	146	16	5.65
" 21	111	16	12.00
" 22	111	16	12.00
" 23	111	16	12.00
" 24	111	16	12.00
" 25	111	16	12.00
" 26	111	16	12.00
" 27	111	16	12.00
" 28	111	16	12.00
" 29	111	16	12.00
" 30	111	16	12.00
" 31	111	16	12.00
" 32	111	16	12.00
" 33	111	16	12.00
" 34	111	16	12.00
" 35	111	16	12.00
" 36	111	16	12.00
" 37	111	16	12.00
" 38	111	16	12.00

OPERATION ITEM NO. SHEET 14 OF PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	PER ROUND	ROUNDS	LENGTH
BLOCK 39	93	16	12.00
" 40	93	16	12.00
" 41	93	16	12.00
" 42	93	16	12.00
" 43	93	16	12.00
" 44	93	16	12.00
" 45	96	16	14.00
" 46	96	16	14.00
" 47	96	16	14.00
" 48	96	16	14.00
" 49	145	16	10.00
" 50	129	16	10.00
" 51	168	16	15.00
" 52	54	16	16.00
" 53	89	16	14.50
" 54A	121	16	6.75
" 54B	126	8	5.00
" 55A	105	16	6.75
" 55B	126	8	5.00
" 56	126	8	13.50
" 57	126	8	13.50
" 58	123	8	14.50
" 59	123	8	15.50
POWERHOUSE TO ACCESS ELEVATOR			
BLOCK 1	67	1	16.5
" 2	67	1	16.5
" 3	67	1	16.5
" 4	67	1	16.5
" 5	51	1	16.5
" 6	51	1	16.5
" 7	51	1	16.5
" 8	51	1	16.5
" 9	57	1	16.5
" 10	57	1	16.5
" 11	57	1	16.5
" 12	57	1	16.5
" 13	57	1	16.5
" 14	57	1	16.5

DIVERSIFIED CONSTRUCTORS, INC.

17

OPERATION ITEM NO. SHEET 15 OF PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	PER ROUND	ROUNDS	LENGTH
BLOCK 15	57	1	16.5
" 16	57	1	16.5
" 17	69	1	16.5
" 18	69	1	16.5
" 19	69	1	16.5
" 20	69	1	16.5
TAILRACE TUNNELS	90	84	12.00
PER ROUND (ROUNDS)			
ROUNDS = 103 HOLES		1032	
PER ROUNDS (ROUNDS) (LENGTH)			
PER ROUNDS (ROUNDS) = 11.13 L.F. / HOLE			

MUCKING	C.Y. / ROUND	ROUNDS	CUBIC YARDS
POWERHOUSE			
BLOCK 1	149.1	16	2386
2,3+4	130.5	48	6264
5	130.5	16	2088
6	111	16	1776
7	133.2	16	2131
8	113.4	16	1814
9	130.5	16	2088
10	111	16	1776
11	157.5	16	2520
12	157.5	16	2520
13	157.5	16	2520
14	130.5	16	2088
15	105.3	16	1685
16	105.3	16	1685
17	130.8	16	2093
18	130.8	16	2093
19	79.5	16	1272
20	79.5	16	1272
21	159	16	2544
22	159	16	2544
23	159	16	2544
24	159	16	2544
25	159	16	2544
21	159	16	2544

DIVERSIFIED CONSTRUCTORS, INC.

18

OPERATION ITEM NO. SHEET 16 OF PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	C.Y./ROUND	ROUNDS	CUBIC YARDS
BLOCK 27	159	16	2544
28	159	16	2544
29	159	16	2544
30	159	16	2544
31	159	16	2544
32	159	16	2544
33	159	16	2544
34	159	16	2544
35	159	16	2544
36	159	16	2544
37	159	16	2544
38	159	16	2544
39	132.5	16	2120
40	132.5	16	2120
41	132.5	16	2120
42	132.5	16	2120
43	132.5	16	2120
44	132.5	16	2120
45	176.75	16	2828
46	176.75	16	2828
47	176.75	16	2828
48	176.75	16	2828
49	168	16	2688
50	150	16	2400
51	304.75	16	4876
52	104	16	1664
53	156.25	16	2500
54 A	90.5	16	1448
54 B	65.52	8	524
55 A	78	16	1248
55 B	65.52	8	524
56	204.62	8	1637
57	204.62	8	1637
58	214.5	8	1716
59	230.36	8	1843
POWERHOUSE TO ACCESS ELEVATOR			
BLOCK 1	1342B	1	134
"	1242B	1	125

DIVERSIFIED CONSTRUCTORS, INC.

19

OPERATION ITEM NO. SHEET 17 OF PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	CY/ROUND	ROUNDS	CUBIC YARDS
BLOCK 3	134.28	1	134
4	134.28	1	135
5	103.32	1	103
6	103.32	1	104
7	103.32	1	103
8	103.32	1	103
9	113.58	1	113
10	113.58	1	114
11	113.58	1	113
12	113.58	1	114
13	108.54	1	108
14	108.54	1	109
15	108.54	1	108
16	108.54	1	109
17	139.50	1	139
18	139.50	1	140
19	139.50	1	139
20	139.50	1	140
TAILRACE TUNNELS	144.55	84	12142
		1032	149139

149139
1032 = 144.51 CU. YDS. / ROUND

DIVERSIFIED CONSTRUCTORS, INC.

20

OPERATION ITEM NO. SHEET 18 OF PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

DRILLING

AVERAGE ROUND = 103 HOLES @ 11.13 L.F.

USE A 3 DRILL JOY JUMBO FOR ALL BLOCKS

WEIGHTED AVERAGE HOLE DEPTH = 11.13 L.F.

WEIGHTED AVERAGE HOLES PER ROUND = 103 EA.

RETRACT & SET-UP DRILL 0.80 MINUTES

2.20 "

3.00 MINUTES / HOLE

103 HOLES

3 DRILLS = 34.33 (3) = 102.99 MIN.

CHANGE BITS EVERY 3 HOLES

103/3 = 34.33 (0.25) 8.58 "

112 MINUTES

50 MIN. HOUR = 2.24 HOURS

LOAD & SHOOT

BRING UP EXPLOSIVES 5.0 MINUTES

LOAD HOLES

103 @ 8/M.H. (5 MEN)

60 MIN. HOUR 129.0 "

MOVE OUT 5.0 "

134.0

60 = 2.32 HOURS.

MUCKING

USE ST 13 SCOOP TRAMS

HAUL AT 5 M.P.H. HAUL DISTANCE = 1800 L.F.

RETURN AT 10 M.P.H.

11 C.Y.S / CYCLE - BULK.

DIVERSIFIED CONSTRUCTORS, INC.

21

OPERATION ITEM NO. SHEET 19 OF PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

CYCLE TIME

LOAD	0.50	MINUTES
HAUL	4.09	"
DUMP & TURN	1.00	"
RETURN	2.05	"
	7.64	MINUTES / CYCLE

50 MINUTE HOUR

7.64 MIN. / CYCLE = 6.54 (11) = 72 CU YDS. BULK / HOUR.

144.51 (1.45) = 210 CU. YDS. BULK

72 CU. YDS. / UNIT = 2.92 HOURS

2 UNITS = 1.46 HOURS.

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location WATANA
Description POWERHOUSE EXCAVATION

Date
Dr. Ch.
Ref.

CYCLES

1. Drill In & Out	2.24
2. Load & Shoot	2.32
3. Smoke Time	0.50
4. Muck Time	1.46
5. Supports (average time/rd.)	0.50
6. Services (average time/rd.)	0.25
Sub Total Hrs. Per Round	7.27
Lost Time @ 10 %	.73
Total Hours Per Round/Cycle	8.00
Crew Hours Worked Per Day	20.0
Rounds Per Day	2.50
Peak L.F. Per Day	-0-

PRODUCTION	~~L. F.~~	ROUNDS, ~~L.F.~~ /Day	W/Days
ROUNDS	1032	2.5	413
TIGHTS			15
MISC			24
Total Work Days			452
Total L. F.			-0-
Ave. L. F. Per Day			-0-

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location WATANA
Description POWERHOUSE

Date .....
Dr .....Ch .....
Ref .....

Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
	SAME AS BUS TUNNEL					
	Total	14	14		28	1003.06

Cost Per/Day	10030.60
Cost Per M/Hr. Average	35.82
Cost Per M/Day Average	358.24
Total L. F. Or Cu. Yds.	
Production	
Total Days Required	452
Total Cost - No. Days X Cost/Day	4,533,831.20
Cost Per/L. F.	
Cost Per/Cu. Yd.	30.40
Total Man Days	12656
Total Man Hours	126560

OPERATION ITEM NO. SHEET 22 OF PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	QUANTITY	UNIT	TOTAL
SUPPLIES			
DRILL STEEL	1,183074 L.F.	0.20	236615
EXPLOSIVES 149,88 C.Y. @ 4#	596552 LB.	1.50	894828
DETONATORS 106296 (1.05 LOSS)	111614 EA.	1.00	111611
AIR & WATER LINES	540 L.F.	12.00	6480
VENT LINE	540 L.F.	30.00	16200
LIGHT & ELECTRIC LINES	540 L.F.	5.00	2700
FOUL WEATHER GEAR	125560 M.H.	2.50	313900
			1532334
SUPPORTS			
ALLOW $24.23 PER CU. YD. OF EXCAVATION			
149,138 CU. YDS.			3613614

OPERATION EQUIPMENT SUMMARY ITEM NO. 331-111 SHEET 23 OF ____ PAGE ____

POWERHOUSE EXCAVATION JOB WATANA

BID QUANTITY 160000 UNIT CY TAKE OFF QUANTITY 154225 EST. BY ____ DATE ____

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
1-3 DRILL JUMBO	9040	HRS			50.88 459955	48- 433920	42.07 379861			140.90 1273736
3- FANS	27120	"			3.89 105497	2.35 63732	2.35 63732			8.59 232961
1-300 KW GENERATOR	9040	"			17.63 159375	2.78 25131	27.11 245074			47.52 429580
2- PUMPS	18080	"			7.40 43392	0.27 4882	1.83 33086			4.50 81360
2-ST 13 SCOOP TRAMS	18080	"			30.05 543304	38- 687040	38.93 703854			106.98 1934198
1- PICKUP	9040	"			2.40 21696	0.97 8769	5.71 51618			9.08 82083
1- FLATBED	9040	"			4.01 36250	4.17 37697	11.04 99802			19.22 173749
1- D7 DOZER	9040	"			24.04 217322	17.23 155759	22.57 204033			63.84 577114
	149138	CY			10.64 1586791	9.56 1426930	11.94 1781060			32.08 4784781

FOLD LENGTH
12 IN
11 IN
8.5 IN
8 IN
AUTO
MANUAL
FEED

OPERATION Drill & Grout U/S of Powerhouse ITEM NO. 331.113 SHEET OF PAGE

JOB Watana Dam

BID QUANTITY 44,730 UNIT L.F. TAKE OFF QUANTITY -0- EST. BY A. Lee DATE

FOR		QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS	TOTAL DIRECT COST	
	DRILLING	44730	LF.	2.78	124443	0.21	9393	1.13	50638	0.43	19387	0.86	38662				5.41	242323
	GROUTING	44730	LF.	1.75	78292	0.14	6135	0.76	33804	0.23	10405	0.42	18994	1.19	53037		4.49	200657
		44730		4.53	202725	0.34	15338	1.89	84442	0.67	29792	1.29	57656	1.19	53037		9.91	442990

FOLD LENGTH
12
11
8.5
8

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MANUAL

FEED

OPERATION: ITEM NO. SHEET 2 OF 2 PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

GROUTING

MATERIAL

SAY 4 SACKS CEMENT PER HOLE AT @ 8.50/EACH =

4 (8.50) (1278) = 43452

GROUT NIPPLES

1278 @ 7.50/EACH. 9585

53037

1227 HOURS.

	LABOR	EQUIPMENT	SUPPLIES
SPREAD			
1 - GROUT PUMP	25.15	7.51	9.77
1 - PICKUP	2.40	0.97	5.71
1 - GROUTMAN	32.52		
1 - " HELPER	31.28		5.00
COST PER HOUR	91.35	8.48	20.48
COST 1227 HOURS.	112086	10405	25129

SUMMARY	TOTAL	UNIT PRICE
DIRECT LABOR	78282	1.75
SUPPLIES	6135	0.14
REPAIR LABOR	33804	0.76
EQUIPMENT	10405	0.23
EQUIP. SUPPLIES	18994	0.42
PERM. MATERIAL	53037	1.19
	200657	4.49

OPERATION Concrete ITEM NO. 331.114 SHEET OF PAGE

JOB Watana Dam

BID QUANTITY 43,500 UNIT C.Y. TAKE OFF QUANTITY EST. BY A. Lee DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS		TOTAL DIRECT COST	
AVERAGE POUR 252 CU.YDS																		
FURNISH CONCRETE	46164	CY.	17 71	817564	0 38	17547	9 26	427017	8 44	389424	10 24	472719	35 00	1615740			81 02	3740206
PLACE CONCRETE	45819	CY.	7 71	353264	0 42	19244	0 60	27491	0 53	24284	1 33	60939					10 59	485222
WASTE CONCRETE	345	CY.																
OVERBREAK CONCRETE	2319	CY.																
FABRICATE FORMS	39674	SF.	4 47	177343	3 00	119020	0 07	2777	0 23	9125	0 14	5554					7 91	313821
ERECT FORMS	199368	SF	7 34	1456021	0 21	41657	0 34	67445	0 46	91249	0 44	87282					8 79	1743654
STRIP & CLEAN FORMS	198368	SF	3 23	640779	0 10	19837	0 17	33723	0 23	45625	0 22	43641					3 95	783555
FORM HARDWARE	198368	SF			0 75	148776											0 75	148776
CONCRETE FINISH	128169	SF	0 98	125606	0 08	10254	0 06	7690	0 08	10254	0 09	11535					1 29	165339
POINT & PATCH	198368	SF	0 78	154727	0 06	11902	0 05	9918	0 06	11902	0 07	13886					1 02	202335
CONSTRUCTION JOINT CLEANUP	8323	SF	1 08	8989	0 07	583	0 10	832	0 08	666	0 17	1415					1 50	12485
ROCK CLEANUP	88907	SF	2 15	191139	0 13	11557	0 20	17780	0 16	14227	0 34	30227					2 98	264927
CONCRETE CURE	45819	CY.	5 34	244623	0 83	38030	0 20	9164	0 08	3666	0 47	21535					6 92	317068
REINFORCING STEEL	4,250,000	LB.											0 25	1062500	0 15	637500	0 40	1740000
	43500	CY.	95 81	4170055	10 08	438404	13 88	603837	13 81	600619	17 21	748733	62 14	2703240	15 00	652500	227 98	9917388

FOLD LENGTH
12
11
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AUTO
MANUAL
FEED

OPERATION Drain Holes ITEM NO. 331.117 SHEET ___ OF ___ PAGE ___

JOB Watana Dam

BID QUANTITY 44,430 UNIT L.F. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
PER DETAIL	44430	LF	2.78 123515	0.21 9330	1.13 50206	0.43 19105	0.86 38210			5.41 240366

12
11
FOLD
LENGTH
12
11
8.5
8
AUTO
MANUAL
FEED

OPERATION DRAIN HOLES ITEM NO. 117 SHEET 1 OF 1 PAGE

JOB VIETNAM

QUANTITY 44,430 UNIT CF EST. BY CK'D. BY DATE

FORM 2

FIGURE THE SAME UNIT COST AS FOR DRILLING & BOOTING.

SUMMARY	TOTAL	UNIT
DIRECT LABOR	123515	2.78
SUPPLIES	9330	0.21
REPAIR LABOR	50296	1.13
EQUIPMENT	19105	0.43
EQUIP. SUPPLIES	38210	0.86
	240366	5.41

12

11

OPERATION Metalwork ITEM NO. 331.118 SHEET ___ OF ___ PAGE ___

JOB Watana Dam

BID QUANTITY 1 UNIT L.S. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SUB-CONTRACT "ALLOW"	1	LS.							LS. 2100000	LS. 2100000

FOLD LENGTH
12
11
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8
AUTO
MANUAL
FEED

OPERATION Architectural ITEM NO. 331.119 SHEET ___ OF ___ PAGE ___

JOB Watana Dam

BID QUANTITY 1 UNIT L.S. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SUB CONTRACT "ALLOW"	1	LS.							L.S. 865,000	L.S. 865,000

OPERATION Mechanical ITEM NO. 331.110 SHEET ___ OF ___ PAGE ___

JOB Watana Dam

BID QUANTITY 1 UNIT L.S. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SUB CONTRACT	1	LS.							L.S. 1005250	L.S. 1005250

DIVERSIFIED CONSTRUCTORS, INC.

U. [redacted] AKE-OFF

JOB NAME WATANA DATE SHEET OF

DESCRIPTION	MATERIAL						LABOR		SHIPPING	
	SIZE	QUANTITY	MATERIAL LIST PRICE	MATERIAL SUB TOTAL	DISC.	MATERIAL EXTENSION	LABOR UNIT	TOTAL HOURS	UNIT WT.	TOTAL WT.
Draft Tubes Gates/ 4 Sets		4 sets								
TOTAL THIS SHEET						21 0000 =		600		

DIVERSIFIED CONSTRUCTORS, INC.

UN[illegible]AKE-OFF

JOB NAME WATANA DATE SHEET OF

DESCRIPTION	MATERIAL						LABOR		SHIPPING	
	SIZE	QUANTITY	MATERIAL LIST PRICE	MATERIAL SUB TOTAL	DISC.	MATERIAL EXTENSION	LABOR UNIT	TOTAL HOURS	UNIT WT.	TOTAL WT.
Draft Tube Gate Guides 6 Sets		6 sets								
TOTAL THIS SHEET						3600		3600		

DIVERSIFIED CONSTRUCTORS, INC.

U TAKE-OFF

JOB NAME WATANA DATE SHEET OF

DESCRIPTION	SIZE	QUANTITY	MATERIAL LIST PRICE	MATERIAL SUB TOTAL	DISC.	MATERIAL EXTENSION	LABOR UNIT	LABOR TOTAL HOURS	SHIPPING UNIT WT.	SHIPPING TOTAL WT.
Draft Tube Crane		1 LS								

0 0 2 4 9 3

OPERATION 35' x 20' Excavation ITEM NO. 331.120 SHEET ____ OF ____ PAGE ____

JOB Watana Dam

BID QUANTITY 2,970 UNIT L.F. TAKE OFF QUANTITY ____ EST. BY A.Lee DATE ____

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
TBM	2970	L.F.	281.74 / 836768	70.09 / 208167	60.68 / 180220	242.34 / 719809	103.94 / 308702			758.81 / 2253666
SLASH HERDING	2970	L.F.	412.03 / 1223733							412.03 / 1223733
BENCH	2970	L.F.	212.77 / 631929							212.77 / 631929
SUPPLIES	2970	L.F.		270.63 / 803761						270.63 / 803761
EQUIPMENT	2970	L.F.			242.73 / 720900	189.94 / 564117	257.27 / 764089			689.94 / 2049101
SUPPORTS	2970	L.F.						618.62 / 1837304		618.62 / 1837304
	2970	L.F.	906.54 / 2692430	340.72 / 1011925	303.41 / 901120	432.20 / 1283921	361.21 / 1072791	618.62 / 1837304		2962.70 / 8799494

FOLD LENGTH
12
11
8.5
8

AUTO

MANUAL

FEED

OPERATION TUNNEL EXCAVATION, DIVERSION & POWERHOUSE PORTAL JOB WATTLE

QUANTITY 2970 UNIT L.F. EST. BY CK'D. BY DATE

ITEM NO. SHEET 1 OF PAGE

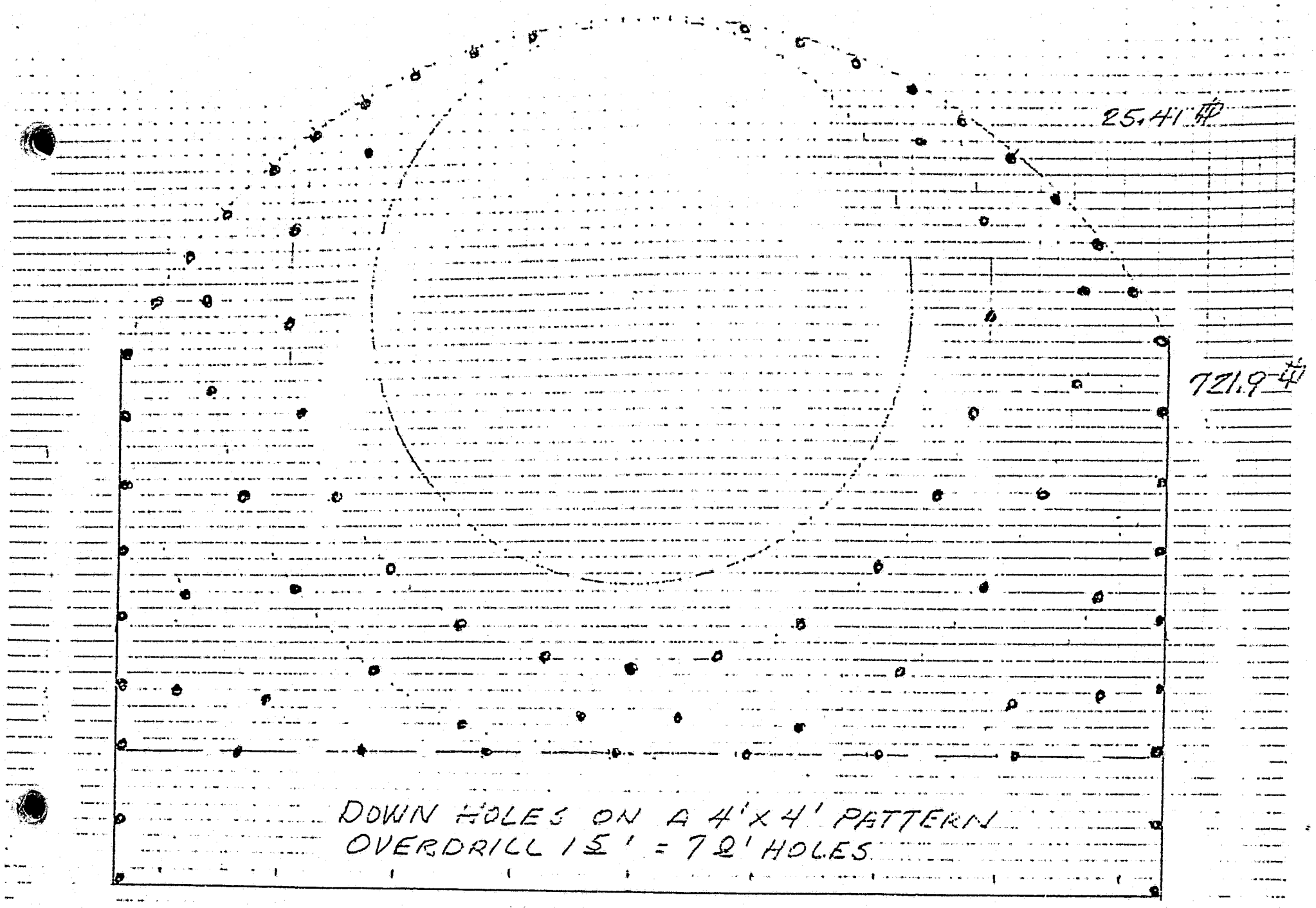
FORM 2

THIS IS THE ONLY ITEM INDICATED AS 28'X21'.
DRAWING SHEET 3 INDICATES 2610 L.F.
DRIVE TUNNEL AS INDICATED IN SHEET 2
INITIAL 18'Ø TBM
SLASH - HEADING
DOWN DRIFT - EACH

COST ESTIMATE TO BE BASED ON 2970 L.F.

ITEMS OF WORK

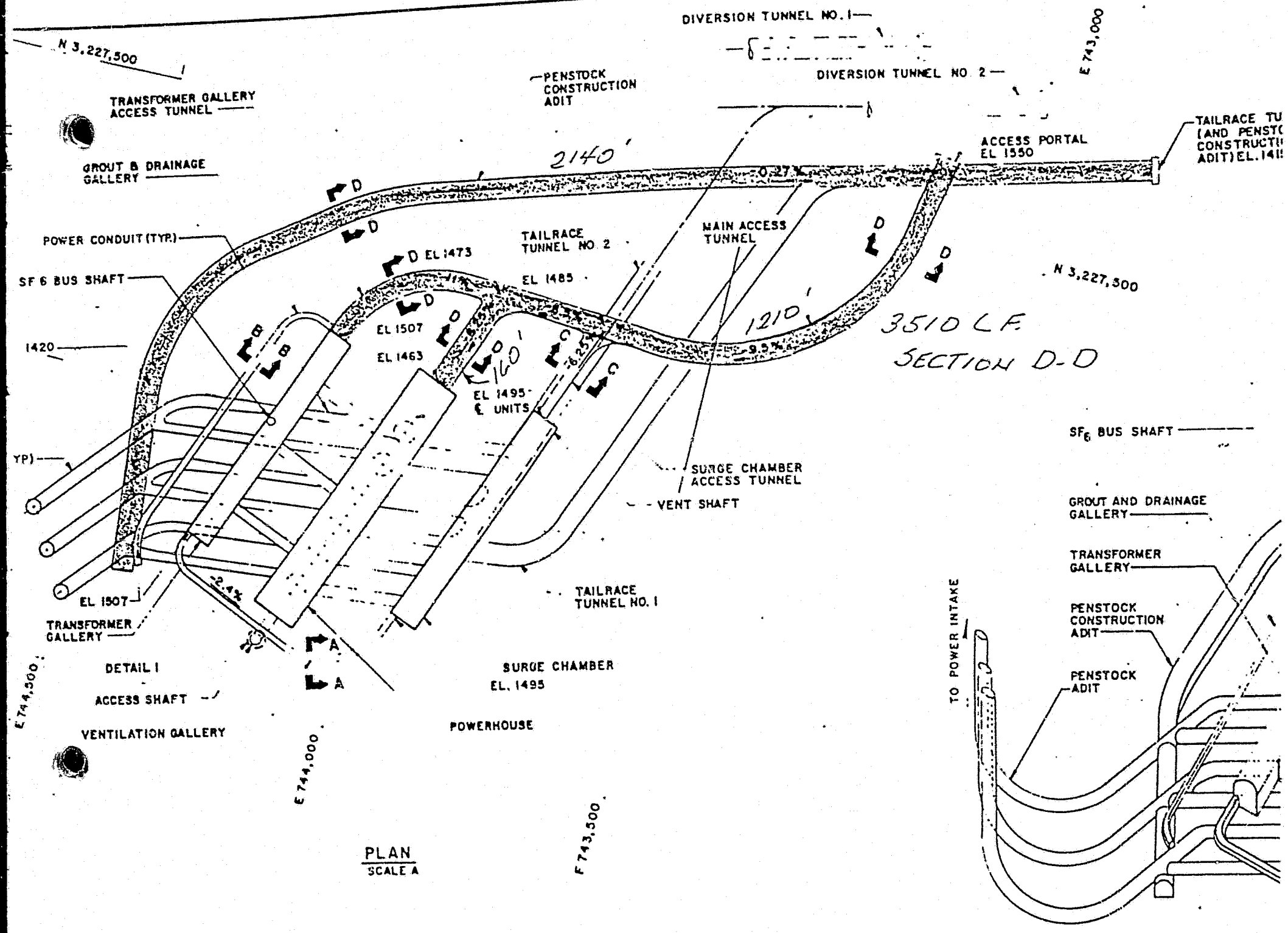
1. TBM	2970	L.F.
2. SLASH	"	"
3. BENCH	"	"
4. SUPPORTS	"	"

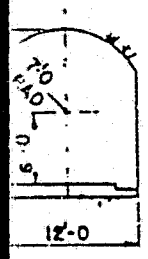


MAIN ACCESS TUNNEL - PENSTOCK CONSTRUCTION
ADIT & POWERHOUSE ADIT
28'H X 36'W.

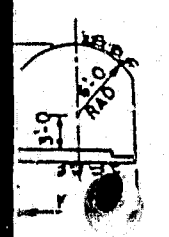
UPPER SLASH = 467.45 S.F. = 17.31 C.Y./L.F.
BENCH = 192.5 S.F. = 7.13 C.Y./L.F.

0 0 2 4 9 3

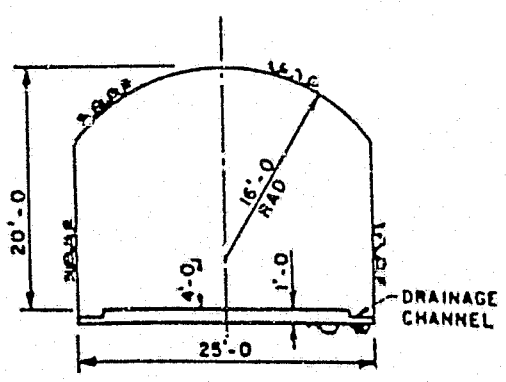




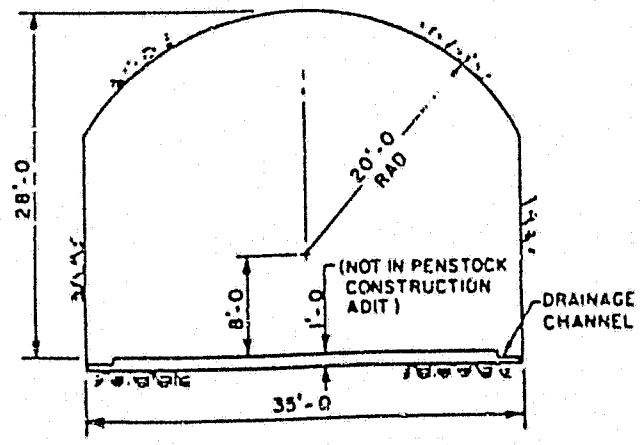
CTION A-A
SCALE B



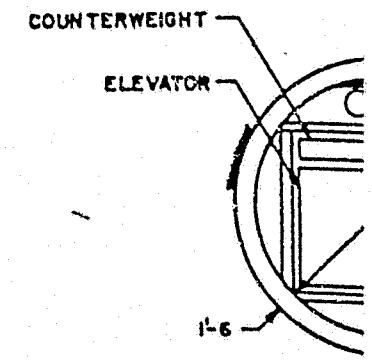
CTION B-B
SCALE B



SECTION C-C
SCALE B



SECTION D-D
SCALE B



DET
SC

OPERATION ITEM NO. SHEET 4 OF PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

TBM

FROM ITEM 332.21 DIVERSION TUNNEL 7320 LF

SUMMARY	TOTAL	UNIT PRICE	TOTAL
DIRECT LABOR	2034137	281.74	836768
SUPPLIES	506055	70.09	208167
REPAIR LABOR	435089	60.28	180220
EQUIPMENT	1749366	242.36	719809
EQUIP. SUPPLIES.	750463	103.94	308702
	5478660	758.81	2253666

SLASH.

76 HOLES PER ROUND

DRILL 12 FEET & PULL 10 FEET

USE SAME PRODUCTION AS DIVERSION TUNNEL USING 3 DRILL JOY JUMBO

RETRACT & SETUP	0.80	MINUTES
DRILL	2.20	"
	3.00	MINUTES / HOLE

DRILLING

76 HOLES

3 DRILLS = 2533 (3 MINUTES) 76 MINUTES

CHANGE BITS EVERY 3 HOLES

$\frac{76}{3}$ = 25 CHANGES (0.25) 6 "

82 MINUTES

50 MIN. HOUR =

1.64 HOURS.

DRILL CYCLE TIME

MOVE UP & HOOK UP JUMBO	5.0	MINUTES
SCALE	5.0	"
DRILL OUT	98.0	"
UNHOOK	5.0	"
	$\frac{113.0}{60}$ =	1.89 HOURS

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location KATANA
Description 22'X35' DRIFT - UPPER HEARING

Date 8-11-'84
Dr A.O.L. Ch.
Ref.

CYCLES

1. Drill In & Out	1,88
2. Load & Shoot	1,75
3. Smoke Time	0,50
4. Muck Time	2,60
5. Supports (average time/rd.)	0,50
6. Services (average time/rd.)	0,25
Sub Total Hrs. Per Round	7,48
Lost Time @ 10 %	,75
Total Hours Per Round/Cycle	8,23
Crew Hours Worked Per Day	20,0
Rounds Per Day	2,43
Peak L. F. Per Day	24,30

PRODUCTION	L. F.	L. F. /Day	W/Days
	2970	24,30	122

Total Work Days 122
Total L. F. 1970
Ave. L. F. Per Day 24,30

0024 9

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING
COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location . KIATANA
Description 28'x35' DRIFT - UPPER HERDING

Date 8-11-'84
Dr AOC ... Ch .....
Ref .....

Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
36.67	SHIFTERS	1	1		2	73.34
35.56	DRILLERS	3	3		6	213.36
34.84	TENDERS	3	3		6	209.04
35.95	POWDERMAN	1	1		2	71.90
31.28	TOPMAN	1	1		2	62.56
31.28	DUMPMAN	1	1		2	62.56
41.58	ELECTRICIAN	1	1		2	83.16
38.80	MUCKER OPERATOR	2	2		4	155.20
35.97	DOZER OPERATOR	1	1		2	71.94
	Total	14	14		28	1003.06

Cost Per/Day 10030.60
Cost Per M/Hr. Average 35.82
Cost Per M/Day Average 358.24

Total L. F. Or Cu. Yds. ..... 2990 LF.
Production ..... 24.30 LF
Total Days Required 122

Total Cost - No. Days X Cost/Day 1223,733.20
Cost Per/L. F. 412.03
Cost Per/Cu. Yd. .....

Total Man Days 3416
Total Man Hours 34160

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location KIATANA
Description 28'x35' DRIFT - UPPER HERDING

Date 8-11-'84
Dr AOC Ch
Ref

Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
36.67	SHIFTERS	1	1		2	73.34
35.56	DRILLERS	3	3		6	213.36
34.84	TENDERS	3	3		6	209.04
35.95	POWDERMAN	1	1		2	71.90
31.28	TOPMAN	1	1		2	62.56
31.28	DUMPMAN	1	1		2	62.56
41.58	ELECTRICIAN	1	1		2	83.16
38.80	MUCKER OPERATOR	2	2		4	155.20
35.97	DOZER OPERATOR	1	1		2	71.94
	Total	14	14		28	1003.06

Cost Per/Day 10030.60
Cost Per M/Hr. Average 35.82
Cost Per M/Day Average 358.24

Total L. F. Or Cu. Yds. ..... 2990 LF.
Production ..... 24.30 LF
Total Days Required 122

Total Cost - No. Days X Cost/Day 1,223,733.20
Cost Per/L. F. 412.03
Cost Per/Cu. Yd. .....

Total Man Days 3416
Total Man Hours 34160

OPERATION ITEM NO. SHEET 9 OF PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

MUCKING

SAME METHOD & CYCLE TIME AS SLASHING, SHEET 5.

$\frac{6.5\,(30)\,(50)}{27} = 421\,(1.45)$ 611 BUCK YARDS

$\frac{611}{11} = 56$ CYCLES

$\frac{11.28\,(56)}{50\text{ MIN. HOUR}} = \frac{12.63}{2\text{ UNITS}} = 6.32$ HOURS

LOAD & SHOOT

BRING UP EXPLOSIVES	5.0	MINUTES
LOAD HOLES		
116 @ 8/M.H. (5 MEN)	145.0	"
60 MINUTE HOUR		
MOVE OUT	5.0	"
	155.0	

$\frac{155.0}{60} = 2.58$ HRS.

OPERATION ITEM NO. SHEET 9 OF PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

MUCKING

SAME METHOD & CYCLE TIME AS CLEARING, SHEET 5.

$\frac{6.5(30)(50)}{27} = 421 (1.45)$ 611 PER KWIKSET

$\frac{611}{11} = 56$ CYCLES

$\frac{11.23(56)}{50 \text{ MIN. HOUR}} = \frac{12.63}{2 \text{ UNITS}} = 6.32$ MANHRS

LOAD & SHOOT

BRING UP EXPLOSIVES	5.0	MINUTES
LOAD HOLES		
116 @ 8/10 M.H. (SIDEH)	145.0	"
60 MINUTE HOUR		
MOVE OUT	5.0	"
	155.0	

$\frac{155.0}{60} = 2.58$ HRS.

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC. 9 No. Royal Avenue Eagle Point, Oregon	ENGINEERING COMPUTATIONS
Company ALASKA POWER AUTHORITY Location WATANA Description 28'X35' DRIFT - BENCH	Date Dr. Ch. Ref.

CYCLES

1. Drill In & Out	8.99
2. Load & Shoot	2.58
3. Smoke Time	0.50
4. Muck Time	6.32
5. Supports (average time/rd.)	0.50
6. Services (average time/rd.)	0.25
Sub Total Hrs. Per Round	19.14
Lost Time @ 10 %	1.91
Total Hours Per Round/Cycle	21.05
Crew Hours Worked Per Day	20.00
Rounds Per Day	0.95
Peak L.F. Per Day	47.50

PRODUCTION	L. F.	L.F./Day	W/Days
	2970	47.50	63
Total Work Days			63
Total L. F.			2970
Ave. L. F. Per Day			47.14

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHARITY
Location KIATAINA
Description 28'X35' DRIFT.... BENCH....

Date .....
Dr .....Ch .....
Ref .....

Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
36.67	SHIFTERS	1	1		2	73.34
35.56	DRILLERS	3	3		6	213.36
34.84	TENDERS	3	3		6	209.04
35.95	POWDERMAN	1	1		2	71.90
31.28	TOPMAN	1	1		2	62.56
31.28	DUMPMAN	1	1		2	62.56
41.58	ELECTRICIAN	1	1		2	83.16
38.80	MUCKER OPERATOR	2	2		4	155.20
35.97	DOZER OPERATOR	1	1		2	71.94
	Total	14	14		28	

Cost Per/Day 1003.06
Cost Per M/Hr. Average 10030.60
Cost Per M/Day Average 35.82

Total L. F. Or Cu. Yds. 358.24
Production 47.14
Total Days Required 63.0

Total Cost - No. Days X Cost/Day 63,928.80
Cost Per/L. F. 212.77
Cost Per/Cu. Yd. .....

Total Man Days 1764
Total Man Hours 17640

OPERATION

ITEM NO. SHEET 12 OF 50 PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	QUANTITY	UNIT	TOTAL
SUPPLIES			
DRILL STEEL	319297 LF.	0.20	63859
EXPLOSIVES			
HEADING 51412 @ 4.0#	205648 LB.	1.50	308472
BENCH 25037 @ 3.5#	87630 LB.	1.50	131445
DETONATORS 29,462 + 5% LOSS	30935 EA.	1.00	30935
AIR & WATER LINES	2970 LF.	12.00	35640
FAN LINE	2970 LF.	30.00	89100
LIGHTS & ELECTRIC LINES	2970 LF.	5.00	14850
FOUL WEATHER GEAR	51800 MH	2.50	129500
			803761

OPERATION EQUIPPING TUNNEL
-2C NOR LINE

BID QUANTITY 2970 UNIT L.F. TAKE OF

		PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST	
SLASH HEADING					
1-3 DRILL JOY JUNBO	29			140 90	3433 97
2-FANS	8			8 59	4719
1-300 KW GENERATOR	48			47 52	11557 48
2-PUMPS	20			4 50	21960
2-ST 8 SCOOP TRAMS	78			106 98	52062
1-PICKUP	37			9 08	22155
1-FLATBED	38			19 22	46897
1-D7 DOZER	71			63 84	155770
BENCH					
3-AIR TRACS	13			49 12	18574
1-1200 CFM COMPRESSOR	37			32 78	41503
1-600 CFM COMPRESSOR	25			57 99	73067
2-PUMPS	12			4 50	11340
2-ST 8 SCOOP TRAMS	74			106 98	269590
1-300 KW GENERATOR	59			47 52	59576
1-PICKUP	25			9 08	11441
1-FLATBED	10			19 22	24220
1-D7 DOZER	38			63 84	80438
2-FANS	22			8 59	21647
	99			189 94	2049101

OPERATION EXCAVATION - SURFACE ITEM NO. 221.1.3 SHEET 12 OF ____ PAGE ____

SURFACE PIT JOB WESTLAKE

BID QUANTITY 2970 UNIT LF TAKE OFF QUANTITY ____ EST. BY ____ DATE ____

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SLASH HEADING										
1-3 DRILL JOY JUMBO	2440	Hrs			50.89 124148	48- 117120	42.02 102529			140.99 343797
2- FANS	4880	Hrs			2.89 14063	2.35 11468	2.35 11468			8.59 41917
1- 300 KW GENERATOR	2440	Hrs			17.63 43017	2.78 6783	27.11 66148			47.52 116948
2- PUMPS	4880	Hrs			2.40 11712	0.27 1318	1.83 8930			4.50 21960
2- STR SCOOP TRAMS	4880	Hrs			30.05 146644	28- 136640	38.93 189972			106.98 522006
1- PICKUP	2440	Hrs			2.40 5856	0.97 2367	5.71 13937			9.08 22155
1- FLATBED	2440	Hrs			4.01 9784	4.17 10175	11.04 26938			19.22 46897
1- D7 DOZER	2440	Hrs			24.04 58658	17.23 42041	22.59 55091			63.84 155770
BENCH										
3- AIR TRACS	3780	Hrs			30.05 113589	8.22 31072	10.85 41013			49.12 185674
1- 1200 CFM COMPRESSOR	1260	Hrs			11.22 14137	6.61 8329	14.95 18837			32.78 41303
1- 650 CFM COMPRESSOR	1260	Hrs			17.63 22214	11.09 13968	29.29 36905			57.99 73087
2- PUMPS	2520	Hrs			2.40 6048	0.27 680	1.83 4612			4.50 11340
2- STR SCOOP TRAMS	2520	Hrs			30.05 75726	38- 95760	38.93 98104			106.98 269590
1- 300 KW GENERATOR	1260	Hrs			17.63 22214	2.78 3503	27.11 34159			47.52 59876
1- PICKUP	1260	Hrs			2.40 3024	0.97 1222	5.71 7195			9.08 11441
1- FLATBED	1260	Hrs			4.01 5053	4.17 5254	11.04 13910			19.22 24217
1- D7 DOZER	1260	Hrs			24.04 30290	17.23 21710	22.59 28458			63.84 80438
2- FANS	2520	Hrs			2.89 7283	2.35 5922	2.35 5922			8.59 21647
	2970	LF.			242.73 720900	189.94 564112	257.27 764089			689.94 2049101

FOLD LENGTH
12
11
8.5
8
AUTO
MANUAL
FEED

OPERATION ITEM NO. SHEET 14 OF 14 PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

SUPPORTS

ACRES AMERICA HAD #918,040.50

IN THEIR ESTIMATE FOR 50,250 CY.

EXCAVATION, OR #18.27/CU. YD.

THERE IS 100,564 CU. YDS. FOR

THIS ITEM (18.27) = #1,837,304.00

OPERATION 21'H x 25'W.H.S. Surge Chamber Access ITEM NO. 331.121 SHEET OF PAGE

JOB Watana Dam

BID QUANTITY 180 UNIT L.F. TAKE OFF QUANTITY EST. BY A. Lee DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS	TOTAL DIRECT COST	
TBM	180	LF.	281 74	50713	70 09	12616	60 68	10922	242 36	43625	103 94	18709				758 81	136585
SLASHING	180	LF.	278 63	50153												278 63	50153
EQUIPMENT	180	LF.					95 36	17164	85 77	15439	108 15	19467				289 28	52070
SUPPLIES	180	LF.			132 14	23786										132 14	23786
SUPPORT	180	LF.											452 02	81363		452 02	81363
	180	LF.	560 37	100816	202 23	36402	156 03	28086	328 13	59064	212 09	38176	452 02	81363		1910 87	343957

FOLD LENGTH
12
11
8.5
8
AUTO
MANUA
FEED

OPERATION SURGE CHAMBER EXCESS ITEM NO. 121 SHEET 1 OF PAGE

TUNNEL 21'X25'

QUANTITY 180 UNIT LF. EST. BY CK'D. BY DATE

FORM 2

DRAWING INDICATES 160 LF.

ITEMS OF WORK

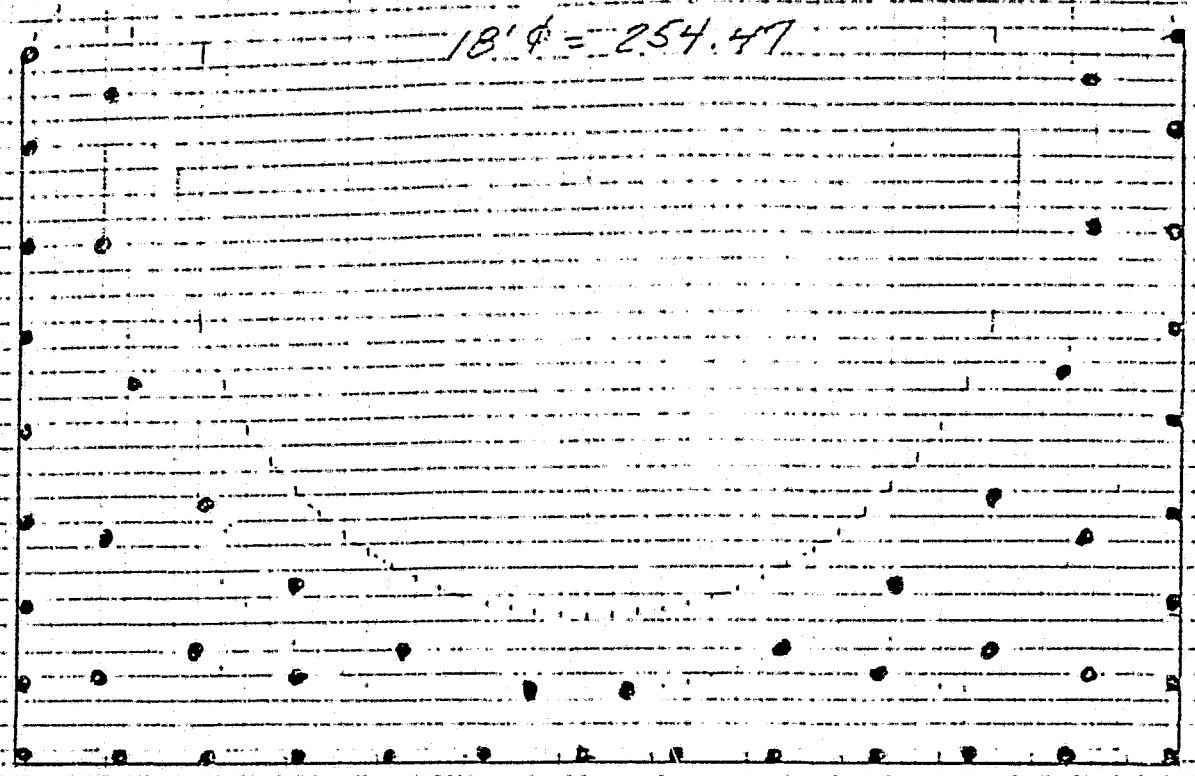
1- TRIM

2. SLASH

3. SUPPORTS

COST ESTIMATE TO BE BASED ON 180 LF.

480.41 ℄

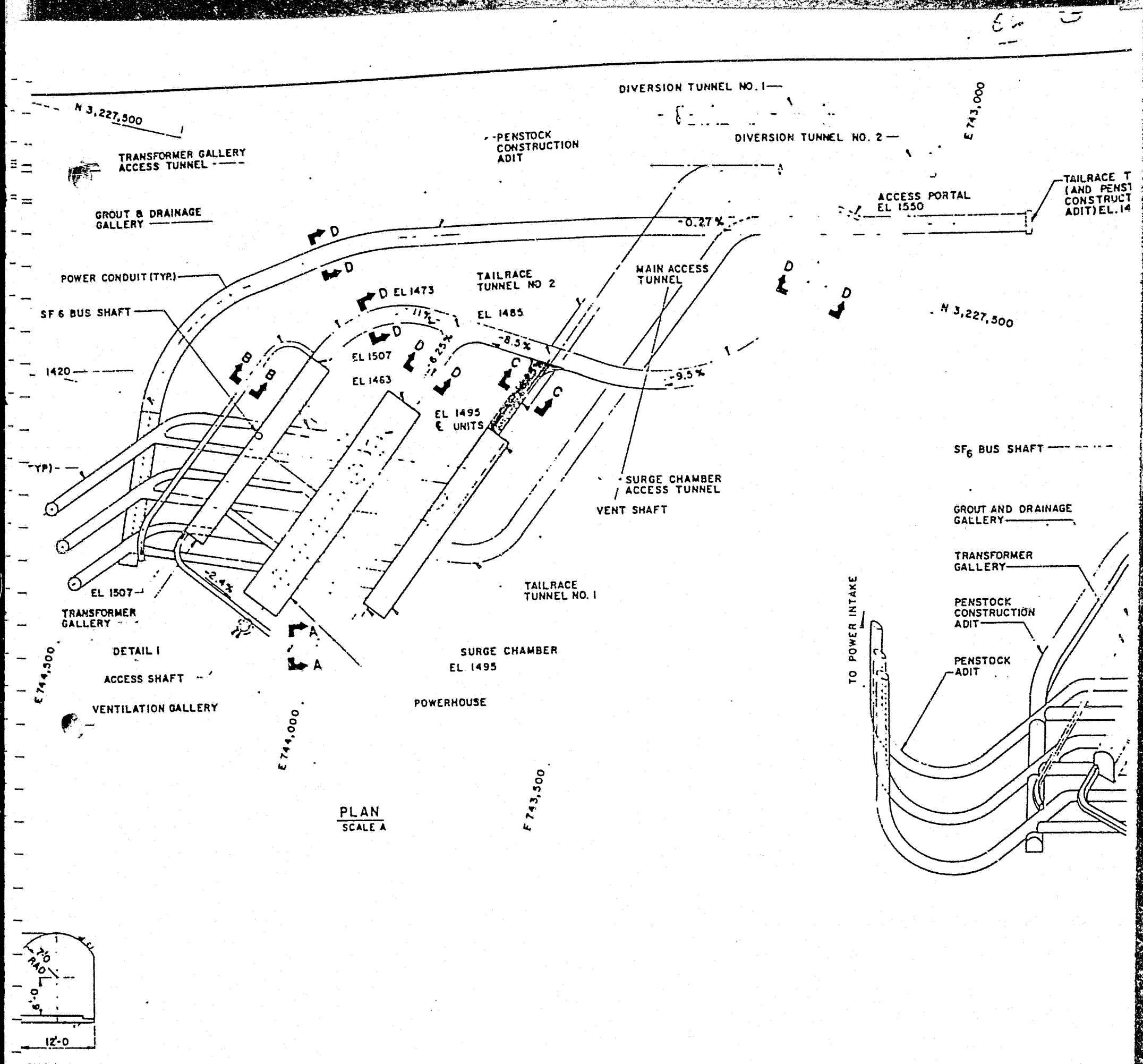


SURGE CHAMBER ACCESS

21' H X 25' W

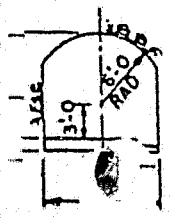
480.41
(254.47) TRIM
225.94
27 = 8.37 C.Y. / L.F.

PLAN INDICATES 160 L.F.

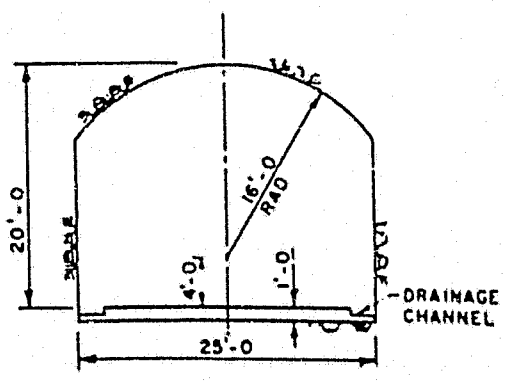


PLAN
SCALE A

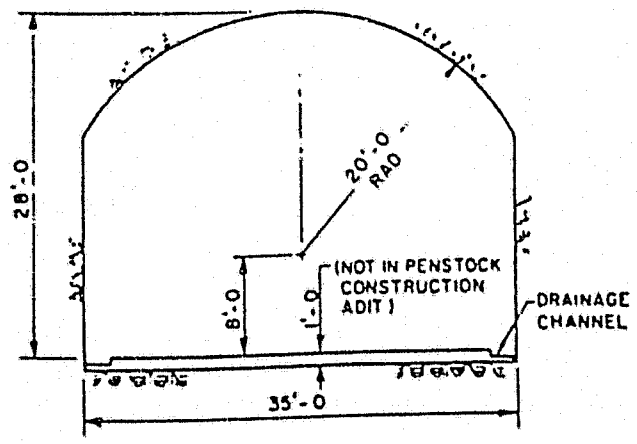
SECTION A-A
SCALE B



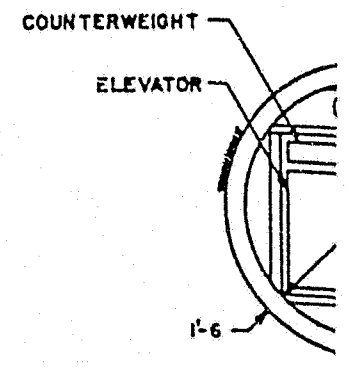
SECTION B-B
SCALE B



SECTION C-C
SCALE B



SECTION D-D
SCALE B



DE
SC

57

OPERATION ITEM NO. SHEET 4 OF PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

TBM

FROM ITEM 332.211 DIVERSION TUNNEL 1720 LF.

SUMMARY	TOTAL	UNIT PRICE	TOTAL
DIRECT LABOR	203487	284.74	50713
SUPPLIES	506055	70.09	12616
REPAIR LABOR	438089	60.68	10922
EQUIPMENT	1749866	242.36	43625
EQUIP. SUPPLIES	750413	103.94	18709
	5478660	758.81	136585

SLASH

63 HOLES PER ROUND

DRILL 12 FEET & PULL 10 FEET

USE SAME PRODUCTION AS DIVERSION TUNNEL USING 2 DRILL JOY JUMBO.

RETRACT & SETUP	0.80 MINUTES
DRILL	2.20 "
	3.00 MINUTES/HOLE

DRILLING

63 HOLES

3 DRILLS = 21 (3 MINUTES) 63 MINUTES

CHANGE BITS EVERY 9 HOLES

63

9 = 21 CHANGES (0.25) 5 "

68 MINUTES

50 MIN. HOUR. = 1.36 HOURS

DRILL CYCLE TIME

MOVE UP & HOOK UP JUMBO	5.0 MINUTES
SCALE	5.0 "
DRILL OUT	9.20 "
UNHOOK	5.0 "
	97.0 / 60 = 1.62 HOURS

OPERATION ITEM NO. SHEET 5 OF — PAGE —

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

LOAD & SHOOT
BRING UP EXPLOSIVES =
LOAD HOLES
63 @ 8/MIN. (GIVEN)
60 MINUTE HOUR =
MAKE OUT =

5.0 MINUTES
79.0 "
5.0 "
84.0
.60 = 1.48 HOURS.

SERVICES
AIR, WATER & POWER
EVERY ROUND / ROUND
60 MIN. HOUR =

0.25 HOUR

MUCKING
USE ST13 SCOOP TRAM
HAUL AT 6 MPH
RETURN AT 10 MPH

HAUL DISTANCE = 1300 L.F.

FIGURE 11 CU.YDS. PER CYCLE.

480.41
(254.47) TRIM
225.94
27 = 8.37 (10) (1.45) = 121 CU. YDS.

121
11 = 11 CYCLES

CYCLE TIME

LOAD	0.50 MINUTES
HAUL	2.95 "
DUMP & TURN	1.00 "
RETURN	1.48 "
	5.93 (11)
	60 MIN. HOUR = 1.30
	2 UNITS = 0.65 HOURS

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location WATANA
Description SLASH - 21'X25' SURGE CHAMBER ACCESS

Date
Dr. Ch.
Ref.

CYCLES

1. Drill In & Out	1.62
2. Load & Shoot	1.48
3. Smoke Time	0.50
4. Muck Time	0.65
5. Supports (average time/rd.)	0.50
6. Services (average time/rd.)	0.25
Sub Total Hrs. Per Round	5.00
Lost Time @ 10 %	.50
Total Hours Per Round/Cycle	5.50
Crew Hours Worked Per Day	20.0
Rounds Per Day	3.64
Peak L.F. Per Day	36.40

PRODUCTION	L. F.	L.F./Day	W/Days
	180	36.40	5.0

Total Work Days 5.0
Total L. F. 180
Ave. L. F. Per Day 36

60 71

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location WATANA
Description SLASH-21'X25' SURGE CHAMBER ACCESS

Date .....
Dr .....Ch .....
Ref .....

Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
36.67	SHIFTERS	1	1		2	73.34
35.56	DRILLERS	3	3		6	213.36
34.84	TENDERS	3	3		6	209.04
35.95	POWDERMAN	1	1		2	71.90
31.28	TOPMAN	1	1		2	62.56
31.28	DUMPMAN	1	1		2	62.56
41.58	ELECTRICIAN	1	1		2	83.16
38.80	MUCKER OPERATOR	2	2		4	155.20
35.97	DOZER OPERATOR	1	1		2	71.94
	Total	14	14		28	1003.06

Cost Per/Day	10,030.60
Cost Per M/Hr. Average	35.82
Cost Per M/Day Average	358.24
Total L. F. Or Cu. Yds.	180
Production	36
Total Days Required	5
Total Cost - No. Days X Cost/Day	50153.00
Cost Per/L. F.	278.63
Cost Per/Cu. Yd.	
Total Man Days	140
Total Man Hours	1400

0002493

OPERATION

ITEM NO. SHEET 5 OF PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	QUANTITY	UNIT	TOTAL
SUPPLIES			
DRILL STEEL	13608 L.F.	0.20	2722
EXPLOSIVES 1507 CY. @ 3.5	5275 LB.	1.50	7913
DETONATORS 1134 + 5% LOSS	1191 EA.	1.00	1191
AIR & WATER LINES	180 L.F.	12.00	2160
FAN LINE	180 L.F.	30.00	5400
LIGHT & ELECTRIC LINES	180 L.F.	5.00	900
FOUL WEATHER GEAR	1400 MH	2.50	3500
			23786
SUPPORTS			
ACRES AMERICA HAS $184,252.10 IN THEIR ESTIMATE FOR 7250 CU. YDS. EXCAVATION OR $25.41 / CU. YD.			
THERE IS 7202 CU. YDS. FOR THIS ITEM (25.41) = $81363.00			

OPERATION [illegible] ITEM NO. 331.121 SHEET 9 OF 9 PAGE

JOB WATANA

BID QUANTITY 180 UNIT LF. TAKE OFF QUANTITY EST. BY DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST	
1- 3 DRILL JUMBO	100	HRS			50.88	5088	48-	4800	42.02	4202			140.90	14090
2- FANS	200	HRS			3.89	778	2.35	470	2.35	470			8.59	1718
1- 300 KW GENERATOR	100	HRS			17.63	1763	2.78	278	27.11	2711			47.52	4752
2- PUMPS	200	HRS.			2.40	480	0.27	54	1.83	366			4.50	900
2- ST 13 SCOOP TRAMS	200	HRS			30.05	6010	38-	7600	38.93	7786			106.98	21396
1- PICKUP	100	HRS.			2.40	240	0.97	97	5.71	571			9.08	908
1- FLATBED	100	HRS			4.01	401	4.17	417	11.04	1104			19.22	1922
1- D7 DOZER	100	HRS.			24.04	2404	17.23	1723	22.57	2257			63.84	6384
	180	LF.			95.36	17164	85.77	15439	108.15	19467			289.28	52070

FOLD LENGTH

12

11

8.5

8

AUTO

MANUAL

FEED

OPERATION Drainage Gallery 10' x 10' ITEM NO. 331.123 SHEET OF PAGE

JOB Watana Dam

BID QUANTITY 570 UNIT L.F. TAKE OFF QUANTITY EST. BY A. Lee DATE

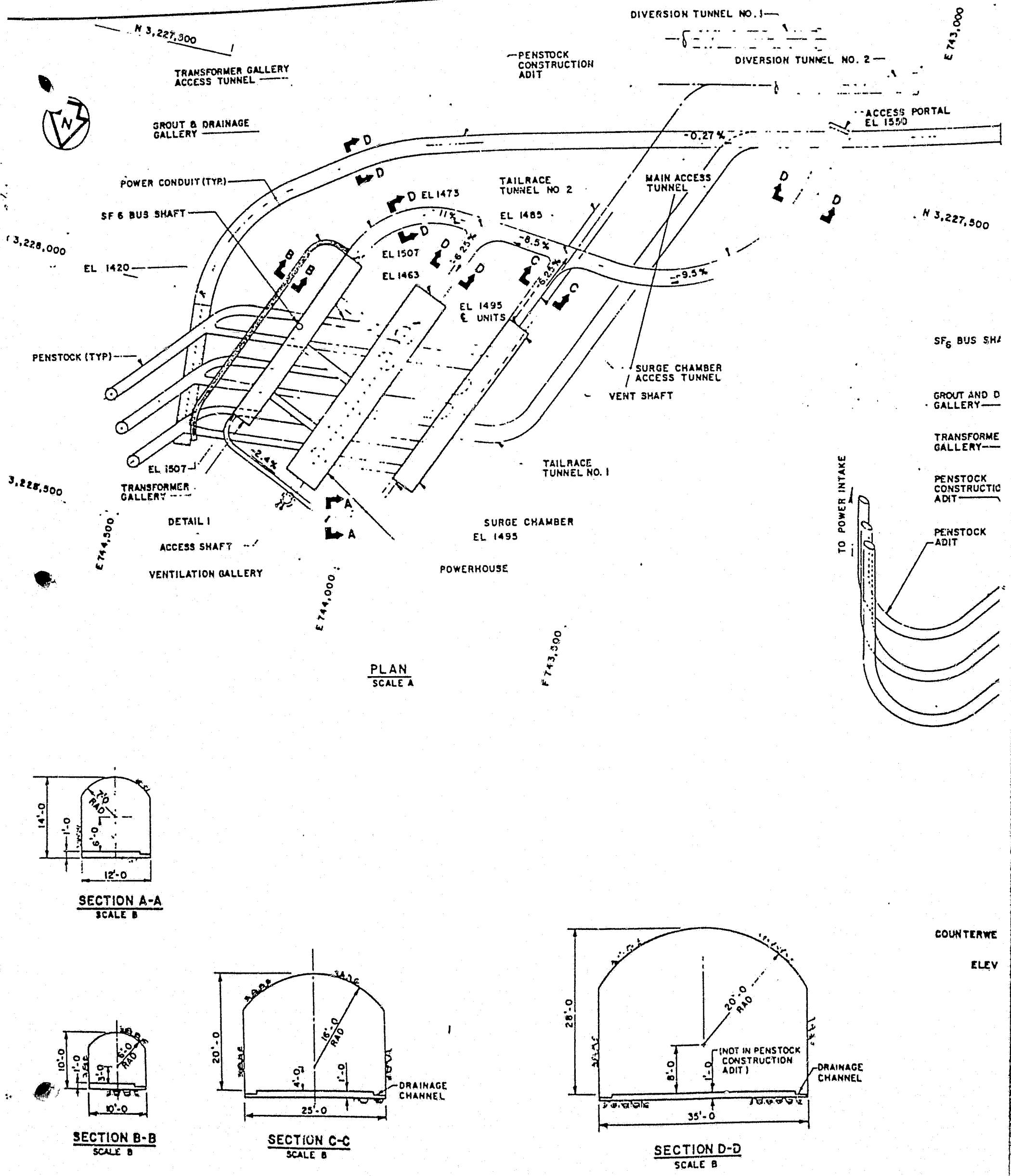
	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR	EQUIPMENT RENT		EQUIPMENT SUPPLIES	PERMANENT MATERIALS		SUB-CONTRACTS	TOTAL DIRECT COST	
EXCAVATION	570	L.F.	247.79	141239										247.79	141239
SUPPLIES	570	L.F.			103.74	59130								103.74	59130
SUPPORTS	570	L.F.									62.67	35720		62.67	35720
EQUIPMENT	570	L.F.					73.27	4176.35	08	19997.67	42	38427		175.91	100188
	570	L.F.	247.79	141239	103.74	59130	73.27	4176.35	08	19997.67	42	38427	62.67	35720	589.91	336277

FOLD LENGTH
12
11
8.5
8

AUTO

MANUAL

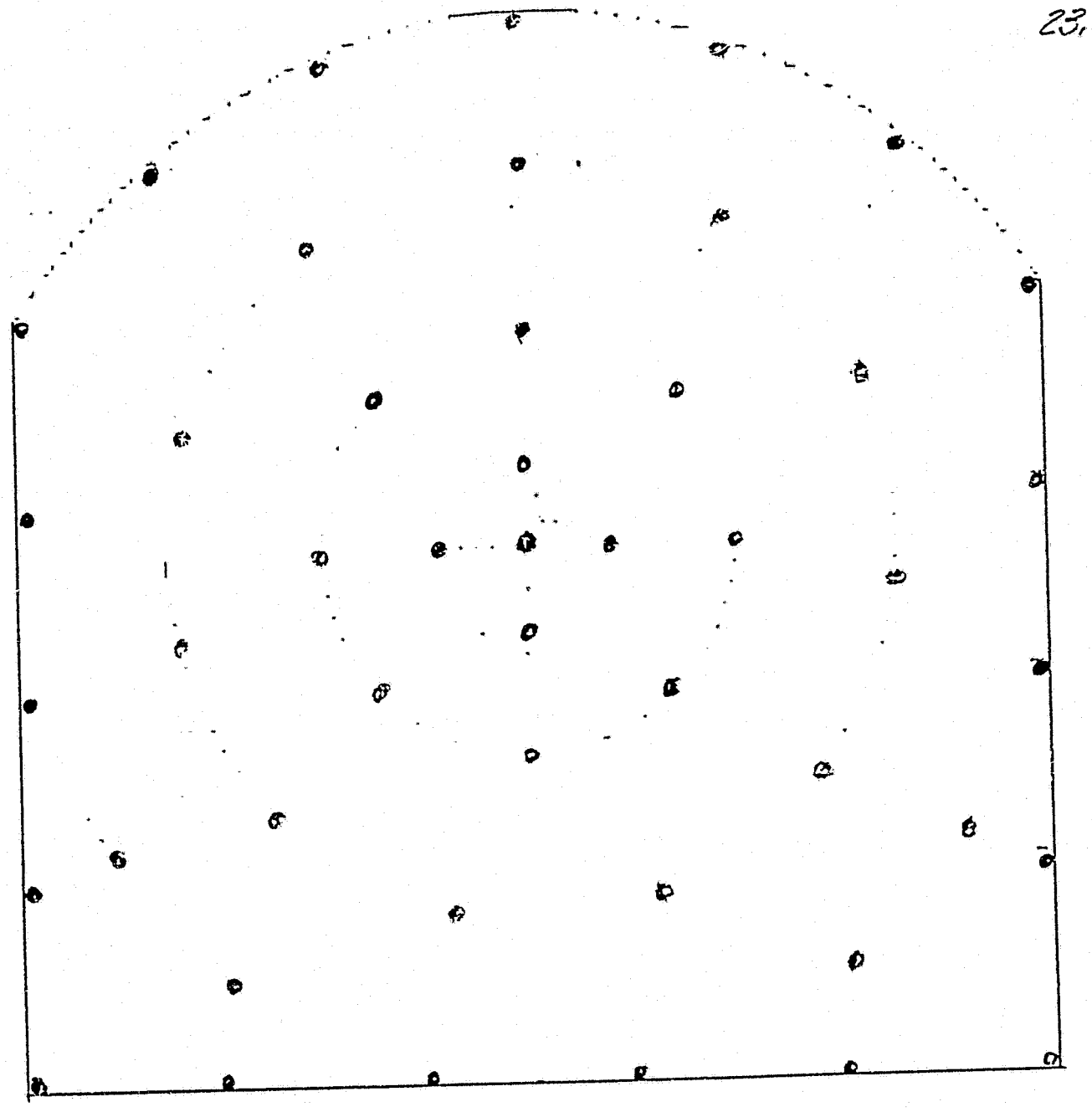
FEED


N 3,227,300
TRANSFORMER GALLERY ACCESS TUNNEL
PENSTOCK CONSTRUCTION ADIT
DIVERSION TUNNEL NO. 1
DIVERSION TUNNEL NO. 2
E 743,000
GROUT & DRAINAGE GALLERY
ACCESS PORTAL EL 1550
-0.27%
POWER CONDUIT (TYP)
SF 6 BUS SHAFT
TAILRACE TUNNEL NO 2
MAIN ACCESS TUNNEL
EL 1485
N 3,227,500
3,228,000
EL 1420
EL 1507
EL 1463
EL 1495 ℄ UNITS
-8.5%
-9.5%
PENSTOCK (TYP)
SURGE CHAMBER ACCESS TUNNEL
VENT SHAFT
EL 1507
TAILRACE TUNNEL NO. 1
3,228,500
TRANSFORMER GALLERY
DETAIL I
ACCESS SHAFT
VENTILATION GALLERY
SURGE CHAMBER
EL 1495
POWERHOUSE
E 744,500
E 744,000
E 743,500
PLAN
SCALE A
SF6 BUS SHA
GROUT AND D GALLERY
TRANSFORME GALLERY
PENSTOCK CONSTRUCTIO ADIT
PENSTOCK ADIT
TO POWER INTAKE
14'-0
1'-0
7'-0 RAD
9'-0
12'-0
SECTION A-A
SCALE B
10'-0
1'-0
3'-0
8'-0 RAD
10'-0
SECTION B-B
SCALE B
20'-0
16'-0 RAD
4'-0
1'-0
DRAINAGE CHANNEL
25'-0
SECTION C-C
SCALE B
28'-0
20'-0 RAD
8'-0
1'-0
(NOT IN PENSTOCK CONSTRUCTION ADIT)
DRAINAGE CHANNEL
35'-0
SECTION D-D
SCALE B
COUNTERWE
ELEV

0024933

45 2

23,14 #ft



10' x 10' DRAINAGE GALLERY

$\frac{92.56 \text{ S.F.}}{27} = 3.43$ CU. YDS. / L.F.

47 DRILL HOLES.

0 0 2 4 9 3

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION DRAINAGE GALLERY 10'X10' ITEM NO. 331-123 SHEET 2 OF 11 PAGE

JOB

QUANTITY 540 UNIT LF EST. BY CK'D. BY DATE

FORM 2

TAKEOFF QUANTITY = 560 CF

METHOD

FULL FACE USING A JOY 2 DRILL JUMBO

DRILL 12 FEET & POLL 10 FEET

USE SAME PRODUCTION AS DIVERSION TUNNEL.

RETRACT & SET-UP	2.80 MINUTES
DRILL	2.20 "
	5.0 MINUTES / HOLE

DRILLING

47 HOLES

2 CIRCLES = 23.5 (3) =

CHANGE BITS EVERY 3 HOLES

47 / 3 = 16 (0.25)

	71 MINUTES
	4 "
	75 MINUTES

75 MINUTES

50 MIN. HOUR =

1.50 HOURS

DRILL CYCLE TIME

MOVE UP & HOOK UP JUMBO	5.0	MINUTES
SCALE	5.0	"
DRILL OUT	90.0	"
UNHOOK	5.0	"
	105.0	

60 = 1.75 HOURS.

LOAD & SHOOT

BRING UP EXPLOSIVES =	5.0	MINUTES
LOAD HOLES		
47 @ 8/M.H. (5 MEN)		
60 MINUTE HOUR =	59.0	"
MOVE OUT =	5.0	"
	69.0	

60 = 1.15 HOURS

OPERATION ITEM NO. SHEET 4 OF PAGE 67

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

SERVICES

AIR, WATER & POWER

ALLOW 15 MIN. / ROUND

60 MIN. HOUR = 0.25 HOURS

HAULING

USE ST 4A SCOOP TRAM

CL6 HAUL AT 7 M.P.H. HAUL DISTANCE = 1990 C.F.

1056 RETURN AT 12 M.P.H.

FIGURE 4 CU. YDS. / CYCLE, BUCK.

3.43 (10) (1.45) = 50 CU. YDS. / POUND

$\frac{50}{4}$ = 13 CYCLES

CYCLE TIME

LOAD	0.50 MINUTES
HAUL	3.23 "
DUMP & TURN	1.00 "
RETURN	1.88 "

$\frac{6.61\ (13)}{50}$ = 1.60 HOURS

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location WATANA
Description DRAINAGE GALLERY 10'X10'

Date
Dr. Ch.
Ref.

CYCLES

1. Drill In & Out	1.75
2. Load & Shoot	1.15
3. Smoke Time	0.50
4. Muck Time	1.60
5. Supports (average time/rd.)	0.50
6. Services (average time/rd.)	0.25
Sub Total Hrs. Per Round	5.75
Lost Time @ 10 %	.58
Total Hours Per Round/Cycle	6.33
Crew Hours Worked Per Day	20
Rounds Per Day	3.16
Peak L.F. Per Day	31.60

PRODUCTION	L. F.	L.F./Day	W/Days
	570	31.60	18

Total Work Days 18
Total L. F. 570
Ave. L. F. Per Day 31.60

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location . WATANA
Description DRAINAGE GALLERY 10'X10'

Date .....
Dr .....Ch .....
Ref .....

Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
36.67	SHIFTERS	1	1		2	73.34
35.56	DRILLERS	2	2		4	142.24
34.84	TENDERS	2	2		4	139.36
35.95	POWDERMAN	1	1		2	71.90
31.28	TOPMAN	1	1		2	62.56
31.28	DOMPMAN	1	1		2	62.56
41.58	ELECTRICIAN	1	1		2	83.16
38.80	MUCKER OPERATOR	1	1		2	77.60
35.97	DOZER OPERATOR	1	1		2	71.94
	Total	11	11		22	784.66

Cost Per/Day	784.60
Cost Per M/Hr. Average	35.67
Cost Per M/Day Average	356.66
Total L. F. Or Cu. Yds.	570
Production	31.60
Total Days Required	18
Total Cost - No. Days X Cost/Day	14,238.80
Cost Per/L. F.	247.79
Cost Per/Cu. Yd.	
Total Man Days	396
Total Man Hours	3960

OPERATION ITEM NO. SHEET 7 OF PAGE 72

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	QUANTITY	UNIT	TOTAL
SUPPLIES			
DRILL STEEL	32148 LF.	0.20	6430
EXPLOSIVES	8798 LB.	1.50	13197
DETONATORS 2679 + 5% LOSS	2813 EA.	1.00	2813
AIR & WATER LINE	570 LF.	12.00	6840
FAN LINE	570 LF.	30.00	17100
LIGHTS & ELECTRIC LINES	570 LF.	5.00	2850
FOUL WEATHER GEAR	3960 M.H.	2.50	9900
			59130
SUPPORTS			
ALLOW $18.27/CU. YD. OF EXCAVATION =			35720

	QUANTITY	UNIT	LABOR & INSURANCE	SUPPLIES	REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-C
DRILL JUMBO	360	HRS			32.50 / 11700	11.79 / 4244	8.55 / 3078		
NS	1080	HRS.			3.89 / 4201	2.35 / 2538	2.35 / 2538		
OKKI GENERATOR	360	HRS.			17.63 / 6347	2.78 / 1001	27.11 / 9760		
MPS	720	HRS			2.40 / 1728	0.27 / 194	1.83 / 1318		
4A SCOOP TRAM	360	HRS			18.94 / 6818	11.02 / 3967	21.05 / 7578		
CKUP	360	HRS.			2.40 / 864	0.97 / 349	5.71 / 2056		
ATBED	360	HRS.			4.01 / 1444	4.17 / 1501	11.04 / 3974		
DOZER	360	HRS			24.04 / 8654	17.23 / 6203	22.57 / 8125		
	570	L.F.			73.27 / 41764	35.08 / 19997	67.45 / 38427		

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION EQUIPMENT SUMMARY ITEM NO. 331-123 SHEET 8 OF 8 PAGE 71

JOB WATANA

BID QUANTITY 570 UNIT LF. TAKE OFF QUANTITY _____ EST. BY _____ DATE _____

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST	
1-2 DRILL JUMBO	360	HRS			32.50	11700	11.79	4244	8.55	3078			52.84	19022
3-FANS	1080	HRS.			3.89	4201	2.35	2538	2.35	2538			8.59	9277
1-300 KW GENERATOR	360	HRS.			17.63	6347	2.78	1001	27.11	9760			47.52	17108
2-PUMPS	720	HRS			2.40	1728	0.27	194	1.83	1318			4.50	3240
1-ST4A SCOOP TRAM	360	HRS			18.96	6826	11.02	3967	21.05	7578			51.03	18371
1-PICKUP	360	HRS			2.40	864	0.97	349	5.71	2056			9.08	3269
1-FLATBED	360	HRS.			4.01	1444	4.17	1501	11.04	3974			19.22	6919
1-D7 DOZER	360	HRS			24.04	8654	17.23	6203	22.57	8125			63.84	22982
	570	LF.			73.27	41764	35.08	19997	67.42	38427			175.77	100188

OPERATION Access Portal & Road, Common Excavation ITEM NO. 331.12A SHEET ____ OF ____ PAGE 72

JOB Watana Dam

BID QUANTITY 94,420 UNIT L.F. TAKE OFF QUANTITY ____ EST. BY A. Lee DATE ____

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
PER DETAIL	94420	CY.	1.12 105750	0.02 1888	0.04 4043	0.71 67038	0.83 78369			3.32 313474

FOLD LENGTH
12
11
8.5
8
AUTO
MANUAL
FEED

OPERATION ACCESS PORTAL & POND ITEM NO. 12A SHEET 1 OF 2 PAGE 73

COMMON EXCAVATION JOB WATANA

QUANTITY 94420 UNIT CY. EST. BY CK'D. BY DATE

FORM 2

METHOD

EXCAVATE WITH F.E.C. & HAUL TO WASTE.

HAUL DISTANCE = 10000 LF.

USE 769 END SPILLS.

SWELL FOR HAULAGE AT 15%

HAUL SPEED	15 MPH.
RETURN SPEED	20 "

988 EFL. AT 6 CU. YDS / CYCLE

LOADER CYCLE

LOAD	0.10 SECONDS.
BACK & TURN	0.05 "
FORWARD & DUMP	0.10 "
BACK & TURN	0.05 "
FORWARD	0.05 "
	0.35 SECONDS / CYCLE

4 PASSES TO LOAD 769 = 1.40 MINUTES

TRUCK CYCLE

LOAD	1.40 MINUTES
HAUL	7.58 "
DUMP & TURN	1.00 "
RETURN	5.68 "
SPOT	1.00 "
	16.66 MINUTES / CYCLE

50 MINUTE HOUR

16.66 MIN. / CYCLE = 3 CYCLES / HOUR (24) = 72 CU. YDS.

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 2 OF 2 PAGE 74

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

FIGURE A 4 TRUCK SPREADER OPERATORS PER HOUR

SPREAD	LABOR	EQUIPMENT	SUPPLIES
1-988 F.E.L.	30.05	33.00	45.85
1-D8 FEED CAT	40.06	25.91	33.85
1-D7 LOAD CAT R/L = 18+67	24.04	17.23	22.57
4-769 END SPILLS	88.12	126.00	129.64
1-PICKUP	2.40	0.97	5.71
1-LOADER OPERATOR	38.04		
2-CAT OPERATORS	71.94		
4 TEAMSTERS	140.44		
1-FOREMAN	31.28		5.00
1-MAN	39.59		
COST PER HOUR	$505.96	203.11	242.62

SUMMARY	HOURLY COST	UNIT	TOTAL
DIRECT LABOR	321.29	1.12	105750
SUPPLIES	5.00	0.02	1808
REPAIR LABOR	184.67	0.64	60429
EQUIPMENT	203.11	0.71	67038
EQUIP. SUPPLIES	237.62	0.83	78369
	951.69	3.32	313474

OPERATION Access Portal & Road, Rock Excavation ITEM NO. 331.12B SHEET ___ OF ___ PAGE 76

JOB Watana Dam

BID QUANTITY 71,790 UNIT C.Y. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
DRILL & SHOOT	71790	CY	4.29 308248	0.11 7975	1.74 124602	0.62 44286	1.23 88169			7.99 573080
SUPPLIES	71790	CY		2.16 155416						2.16 155416
LOAD & HAUL	71790	CY	1.51 108275	0.02 1285	0.87 62234	0.95 68448	1.12 80078			4.47 320720
	71790	CY	5.80 416573	2.30 164876	2.60 186836	1.57 112734	2.34 168247			14.61 1049216

FOLD LENGTH
12
11
8.5
8
AUTO
MANUAL
FEED

OPERATION ACCESS ROADS & RAMP ITEM NO. 128 SHEET 1 OF PAGE 77

ROCK EXCAVATION JOB WATANA

QUANTITY 71790 UNIT C.Y. EST. BY CK'D. BY DATE

FORM 2

FIGURE AN AVERAGE DRILLING PATTERN OF 4'x5' OR 2.14 EQ. YDS. / L.F. OF DRILL HOLE.
ALSO FIGURE AVERAGE DRILL HOLE DEPTH OF 15 L.F.

71790
.14 = 97014 L.F.

97014
15 = 6468 HOLES.

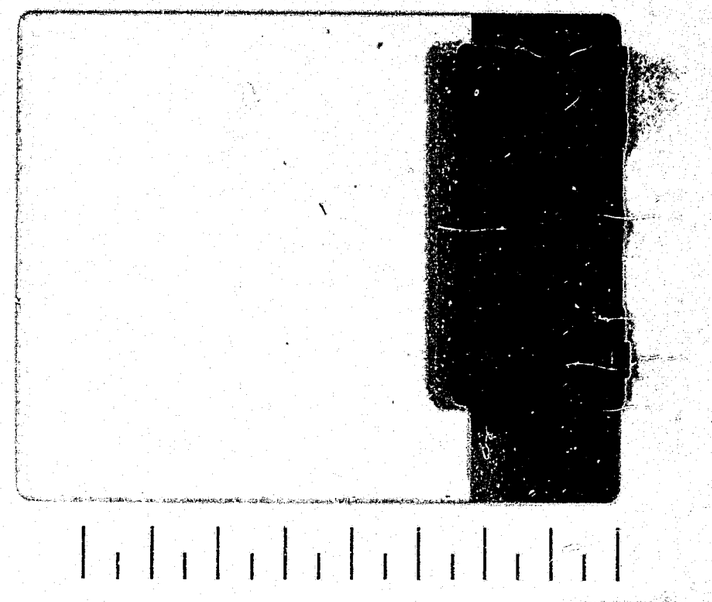
USE AIR TRACS @ 50 L.F. / HOUR

DRILL CYCLE

SET-UP	2.0 MINUTES	6468	
DRILL	18.0 "	2108 = 3V1 C	
RETRACT	1.0 "	2	= 1555 HRS.
MOVE	3.0 "		
	24.0 MIN. / HOLE		

50 MINUTE HOUR
24 MIN. / HOLE = 2.05 HOLES / HOUR.

SPREAD	LABOR	EQUIPMENT	SUPPLIES
2- AIR TRACS	60.10	16.44	21.70
1- 1200 CFM COMPRESSOR	17.63	11.07	29.29
1- PICKUP R/L = 80.13	2.40	0.97	5.71
2- DRILLER	15.68		
2- CHUCK TENDERS	14.36		5.00
1- OPERATOR	35.00		
1- POWDERMAN	33.19		
COST PER HOUR	278.36	28.48	61.70
COST 1555 HOURS	432850	44286	9594



OPERATION ITEM NO. SHEET 2 OF PAGE 78

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	Total	Unit
SUMMARY		
DIRECT LABOR	308248	4.39
SUPPLIES	7775	0.11
PERSONAL EXPENSE	124607	1.74
EQUIPMENT	44286	0.62
EQUIP. SUPPLIES	88169	1.23
	573085	7.99
SUPPLIES		
DRILL STEEL & BITS		
97014 L.F. @ 0.20	19403	
EXPLOSIVES		
71790 C.Y. (1.2F) @ 1.50	129222	
DETONATORS		
6468 (LOSS) @ 1.05	6791	
	155416	
	2.16	

LOAD & HAUL

USE MATERIAL AS ROAD FILL AND PLATING.

FIGURE HAUL DISTANCE OF 5000 C.F.

HAUL SPEED AT 10 MPH = 880'/MIN.
RETURN SPEED AT 15 MPH = 1320'/MIN.

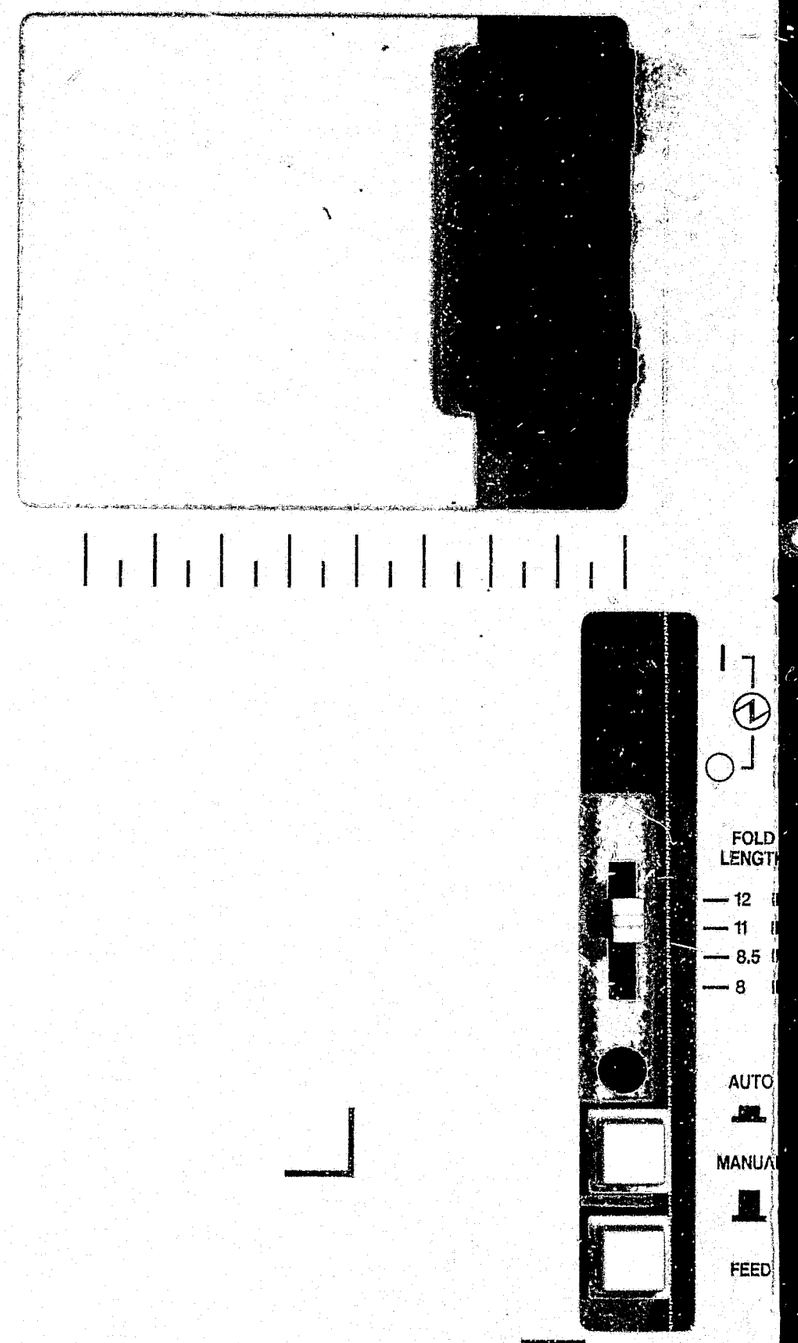
SWELL AT 1.25

988 FEL AT 6 CU. YD.

4 PASSES TO LOAD 769 = 1.40 MINUTES

TRUCK CYCLE

LOAD	1.40	MINUTES
HAUL	5.68	"
DUMP & TURN	1.00	"
RETURN	3.79	"
SPOT	1.00	"
	12.87	MINUTES / CYCLE



OPERATION ITEM NO SHEET 5 OF PAGE 70

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

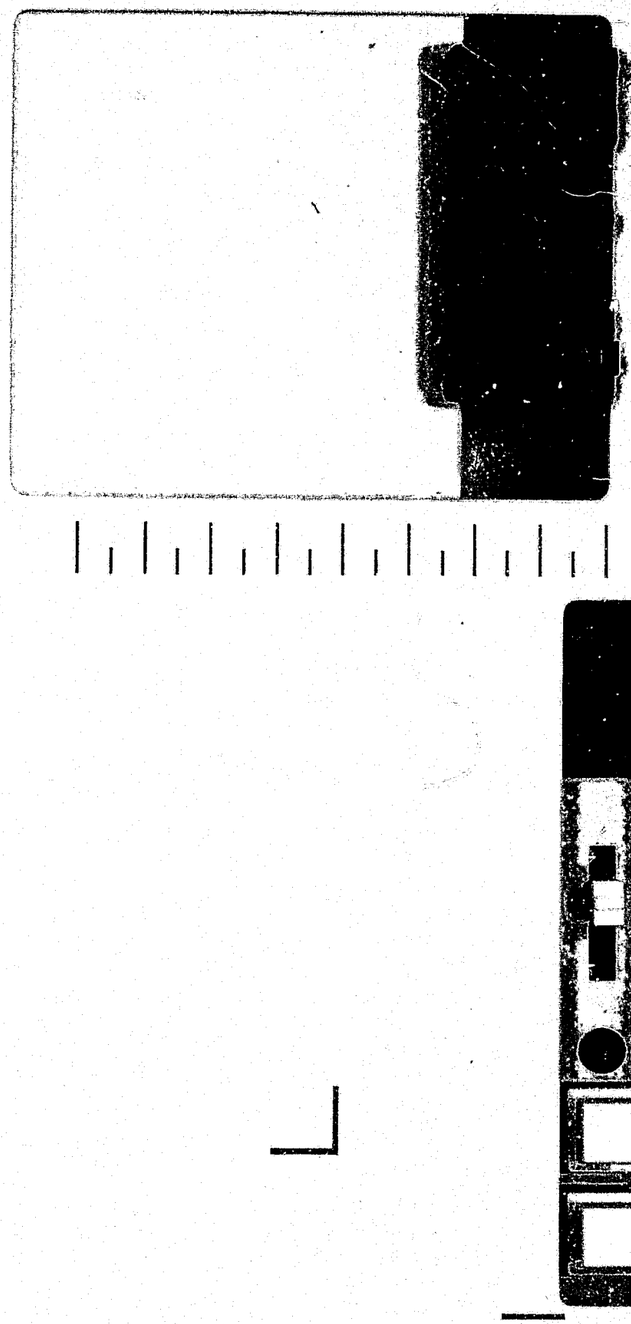
50 MINUTE HOUR
12.87 MIN./CYCLE = 3.89 CYCLES/HOUR (24) = 93.36 CU. YDS.

FIGURE A 4 TRUCK SPREAD
FOR 288 CU YDS / HOUR

$\frac{71790\ (1.35)}{288} = 337$ HOURS.

SPREAD	LABOR	EQUIPMENT	SUPPLIES
SAME AS ITEM 321-12A			
COST PER HOUR	50546	70811	24762
COST 337 HOURS.	170509	18448	81763

SUMMARY	TOTAL	UNIT PRICE
DIRECT LABOR	108275	1.51
SUPPLIES	16695	0.02
REPAIR LABOR	122234	1.87
EQUIPMENT	18448	0.25
EQUIP. SUPPLIES	80078	1.12
	320720	4.47



DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Ventilation Gallery, 14'H x 12'WH.S. ITEM NO. 331.12C SHEET OF PAGE 27

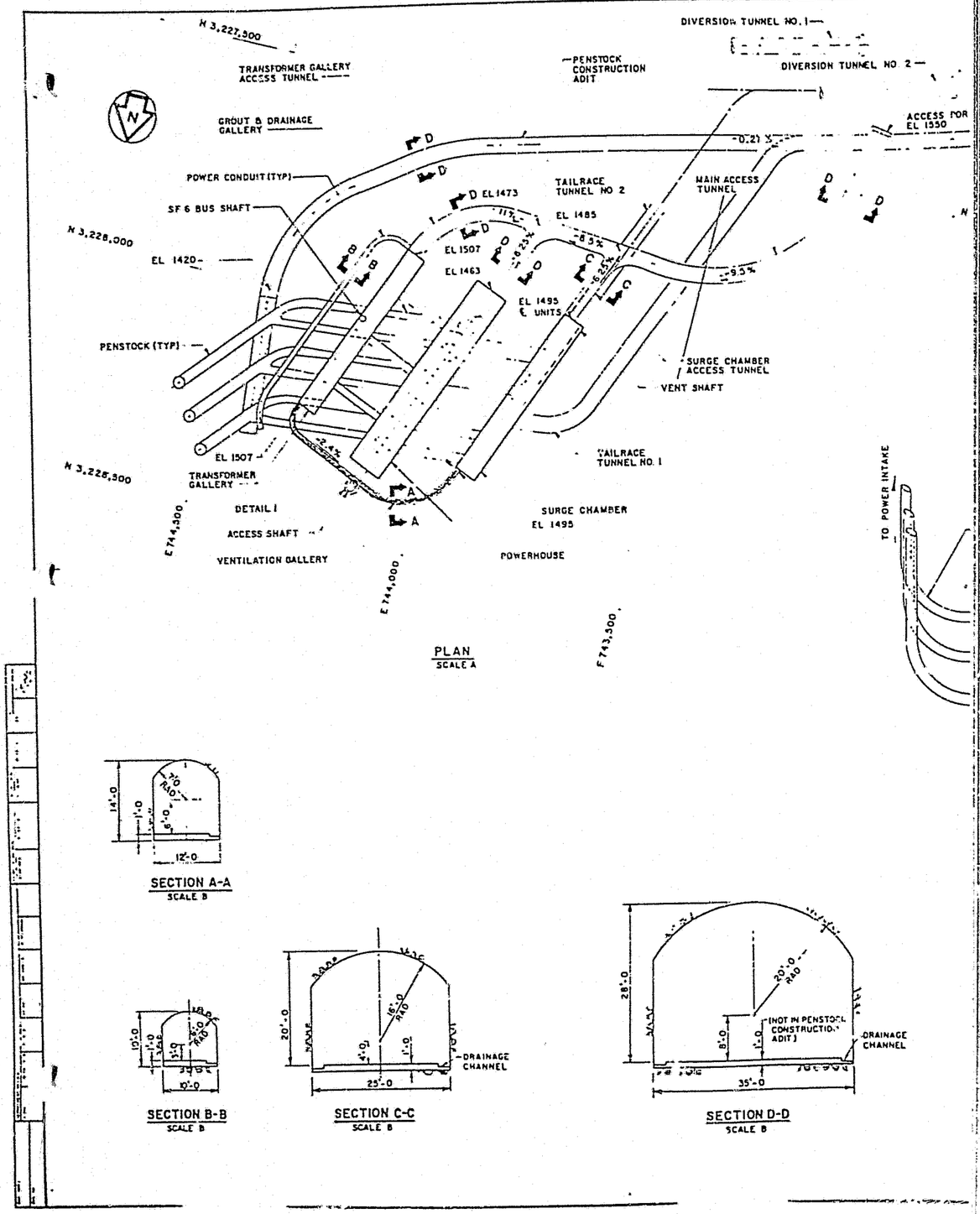
JOB Watana Dam

BID QUANTITY 560 UNIT L.F. TAKE OFF QUANTITY EST. BY A. Lee DATE

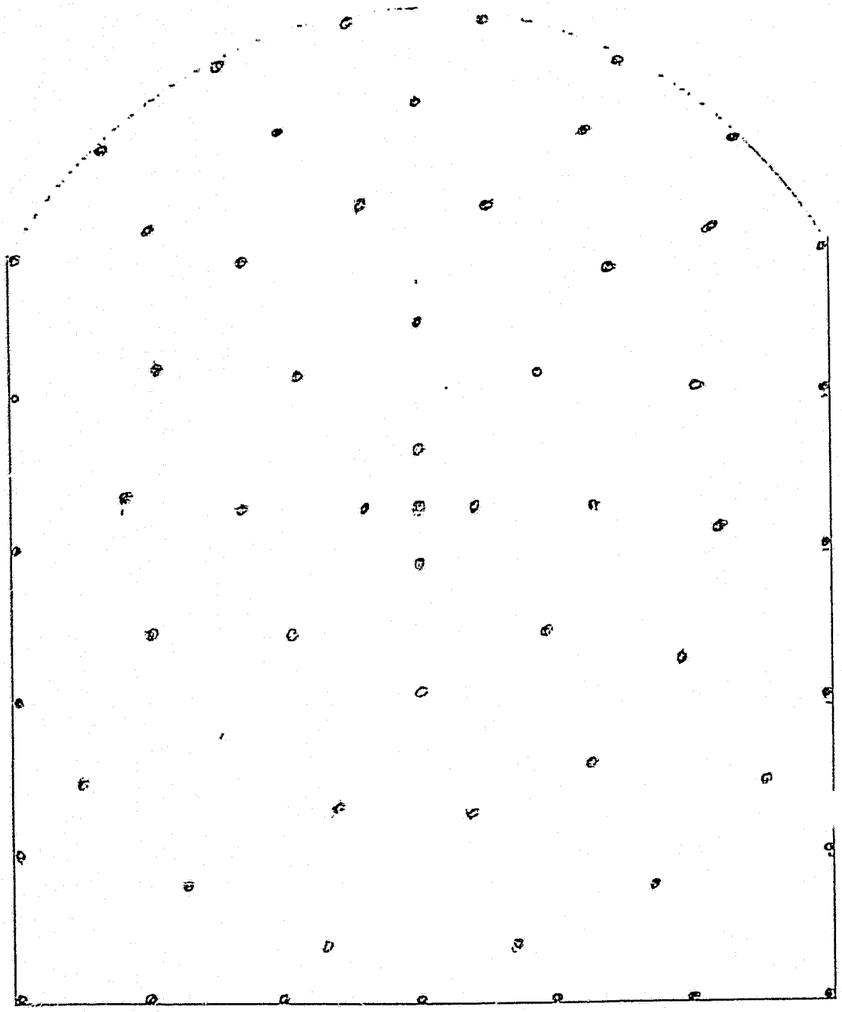
	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR	EQUIPMENT RENT		EQUIPMENT SUPPLIES	PERMANENT MATERIALS		SUB-CONTRACTS	TOTAL DIRECT COST	
EXCAVATION	560	LF.	323.35	181075										323.35	181075
SUPPLIES	560	LF.			129.54	72540								129.54	72540
SUPPORTS	560	LF.									178.50	99959		178.50	99959
EQUIPMENT	560	LF.					101.78	56.87	49.93	279.095.84	53.671			247.00	138318
	560	LF.	323.35	181075	129.54	72540	101.23	56.87	49.95	279.095.84	53.671	178.50	99959	878.39	491892

FOLD LENGTH
12
11
8.5
8
AUTO
MANUAL
FEED

0 0 2 4 9 3


N 3,227,300
TRANSFORMER GALLERY ACCESS TUNNEL
PENSTOCK CONSTRUCTION ADIT
DIVERSION TUNNEL NO. 1
DIVERSION TUNNEL NO. 2
GROUT & DRAINAGE GALLERY
ACCESS FOR EL 1550
POWER CONDUIT (TYP)
SF 6 BUS SHAFT
N 3,228,000
EL 1420
TAILRACE TUNNEL NO 2
MAIN ACCESS TUNNEL
EL 1473
EL 1485
EL 1507
EL 1463
EL 1495 ℄ UNITS
PENSTOCK (TYP)
SURGE CHAMBER ACCESS TUNNEL
VENT SHAFT
EL 1507
TRANSFORMER GALLERY
N 3,228,300
TAILRACE TUNNEL NO. 1
DETAIL I
ACCESS SHAFT
VENTILATION GALLERY
SURGE CHAMBER EL 1495
POWERHOUSE
E 744,000
E 743,500
TO POWER INTAKE
PLAN
SCALE A
SECTION A-A
SCALE B
SECTION B-B
SCALE B
SECTION C-C
SCALE B
SECTION D-D
SCALE B
DRAINAGE CHANNEL
(NOT IN PENSTOCK CONSTRUCTION ADIT)

E-2



14'x12' VENTILATION GALLERY

156 S.F. = 5.78 CU.YDS./L.F.

5.78 (560 L.F.) = 3237 CU.YDS.

61 HOLES

OPERATION Ventilation Gallery 14'x12'
ITEM NO. 331-12C SHEET 3 OF PAGE 23
JOB Vitalia
QUANTITY 560 UNIT L.F. EST. BY CK'D. BY DATE
FORM 2

TAKEOFF QUANTITY = 520 LF

METHOD
FULL FACE USING A JOY
2 DRILL JUMBO

DRILL 10 FEET & PULL 10 FEET
USE SAME PRODUCTION AS
DIVERSION TUNNEL

RETRACT & SETUP	0.80 MINUTES
DRILL	2.20 "
	3.00 MINUTES / HOLE

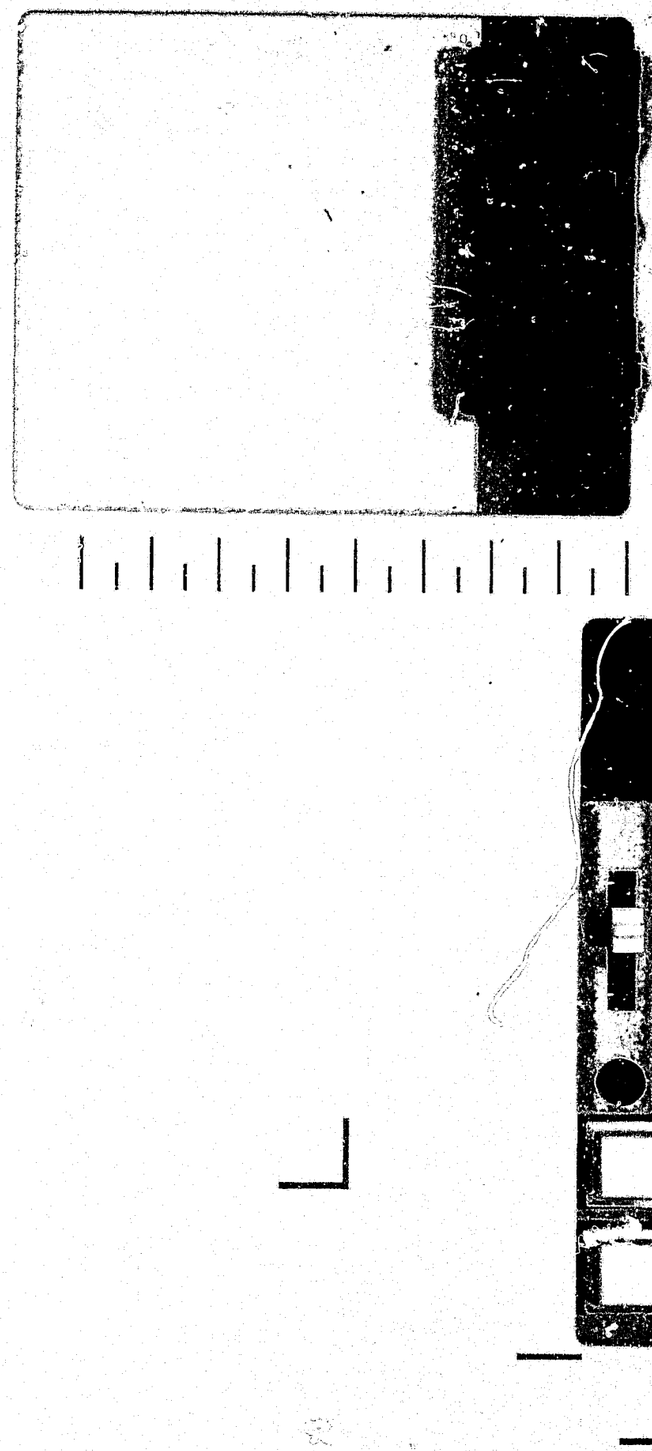
DRILLING
61 HOLES
2 DRILLS = 21 (3) = 93 MINUTES
CHANGE BITS EVERY 3 HOLES
61
3 = 21 (0.25) 5 "
98 MINUTES

98 MINUTES
50 MIN. HOUR = 1.96 HOURS.

DRILL CYCLE TIME

MOVE UP & HOOK UP JUMBO	5.0 MINUTES
SCALE	5.0 "
DRILL OUT	118.0 "
UNHOOK	5.0 "
	133.0
	60 = 2.22 HOURS.

LOAD & SHOOT
BRING UP EXPLOSIVES 5.0 MINUTES
LOAD HOLES
61 @ 8/M.H. (5 MEN)
60 MINUTE HOUR = 77.0 "
MOVE OUT = 5.0 "
87.0
60 = 1.45 HOURS.



OPERATION | ITEM NO. | SHEET 4 OF | PAGE 34

JOB

QUANTITY | UNIT | EST. BY | CK'D. BY | DATE

FORM 2

SERVICES

AIR, WATER & POWER

ALLOW 15 MIN./ROUND

60 MIN. HOUR = 0.25 HOURS.

MUCKING

USE ST 4A SCOOP TRAM

HAUL AT 7 M.P.H. HAUL DISTANCE = 2570 LF.

RETURN AT 12 M.P.H.

FIGURE 4 CU.YDS./CYCLE, BULK =

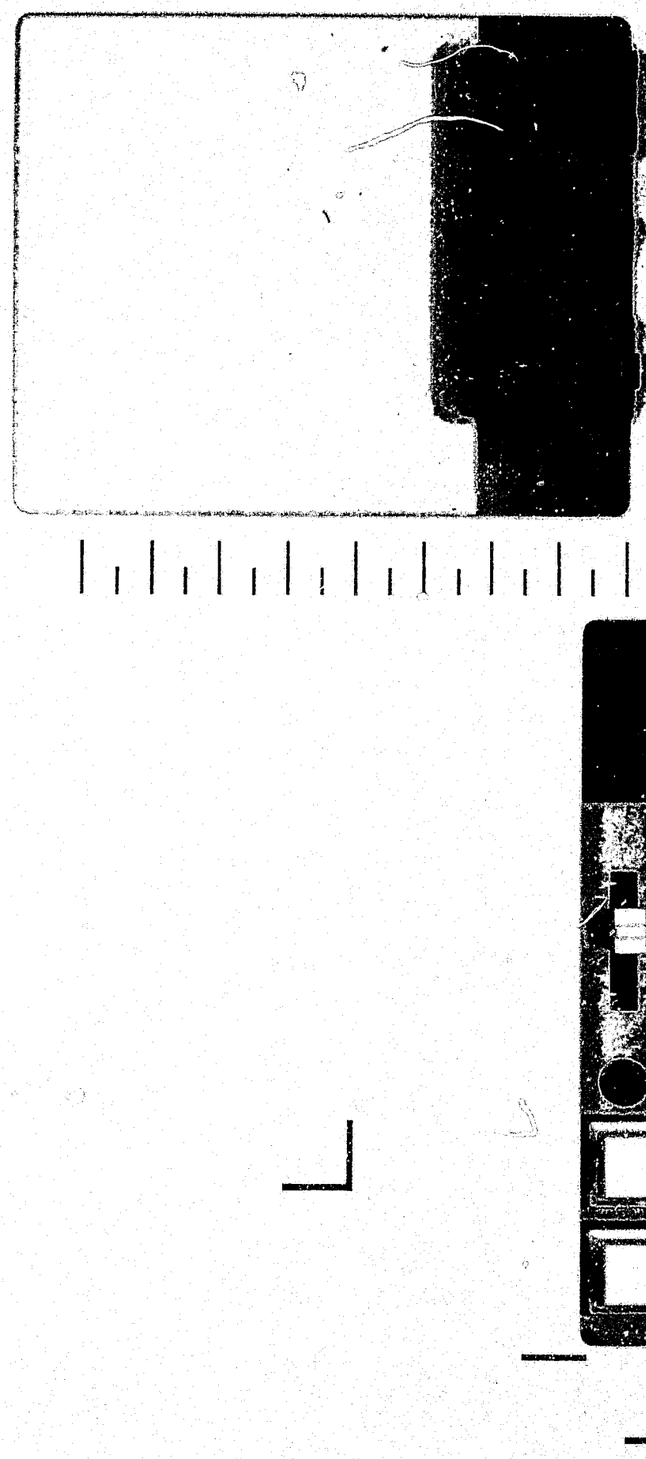
5.78 (10) (1.45) = 84 CU.YDS

$\frac{84}{4}$ = 21 CYCLES.

CYCLE TIME

LOAD	0.50 MINUTES
HAUL	4.17 "
DUMP & TURN	1.00 "
RETURN	2.43 "
	8.10 (21)
	50 = 3.40

2 UNITS = 1.70 HOURS.



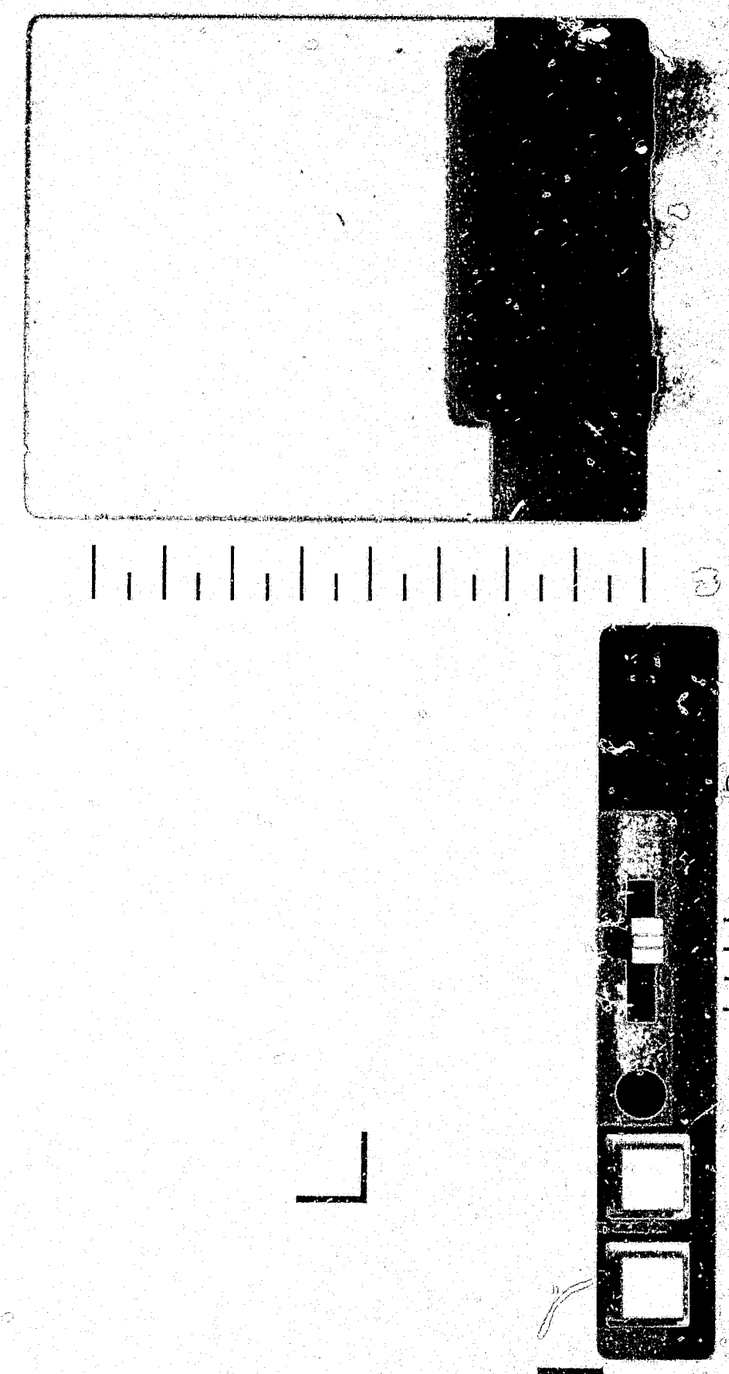
5 86

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC. 9 No. Royal Avenue Eagle Point, Oregon	ENGINEERING COMPUTATIONS
Company ALASKA POWER AUTHORITY Location WATANA Description VENTILATION GALLERY 14'X12'	Date Dr. Ch. Ref.

CYCLES

1. Drill In & Cut	2.22
2. Load & Shoot	1.45
3. Smoke Time	0.50
4. Muck Time	1.70
5. Supports (average time/rd.)	0.50
6. Services (average time/rd.)	0.25
Sub Total Hrs. Per Round	6.62
Lost Time @ 10 %	.66
Total Hours Per Round/Cycle	7.28
Crew Hours Worked Per Day	20
Rounds Per Day	2.75
Peak L.F. Per Day	27.50

PRODUCTION	L. F.	L. F./Day	W/Days
	560	27.5	21
Total Work Days			21
Total L. F.			560
Ave. L. F. Per Day			26.67



6 84

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

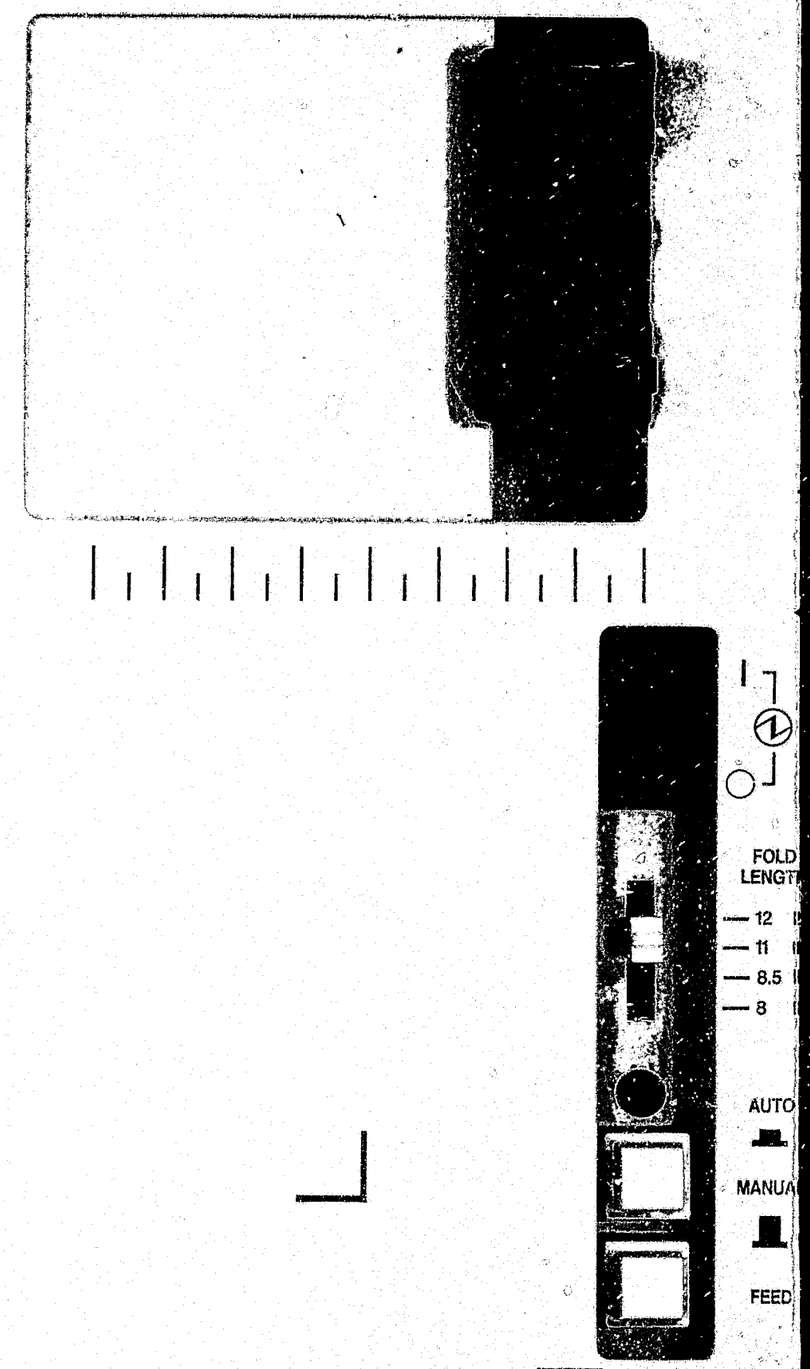
ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location WATANA
Description DRAINAGE GALLERY 14'X12'

Date .....
Dr .....Ch .....
Ref .....

Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
36.67	SHIFTERS	1	1		2	73.34
35.56	DRILLERS	2	2		4	142.24
34.84	TENDERS	2	2		4	139.36
35.95	POWDERMAN	1	1		2	71.90
31.28	TOPMAN	1	1		2	62.56
31.28	DUMPMAN	1	1		2	62.56
41.58	ELECTRICIAN	1	1		2	83.16
38.80	MUCKER OPERATOR	2	2		4	155.20
35.97	DOZER OPERATOR	1	1		2	71.94
	Total	12	12		24	862.26

Cost Per/Day	8622.60
Cost Per M/Hr. Average	35.93
Cost Per M/Day Average	359.28
Total L. F. Or Cu. Yds.	560
Production	26.67
Total Days Required	21
Total Cost - No. Days X Cost/Day	181074.60
Cost Per/L. F.	323.35
Cost Per/Cu. Yd.	
Total Man Days	504
Total Man Hours	5040



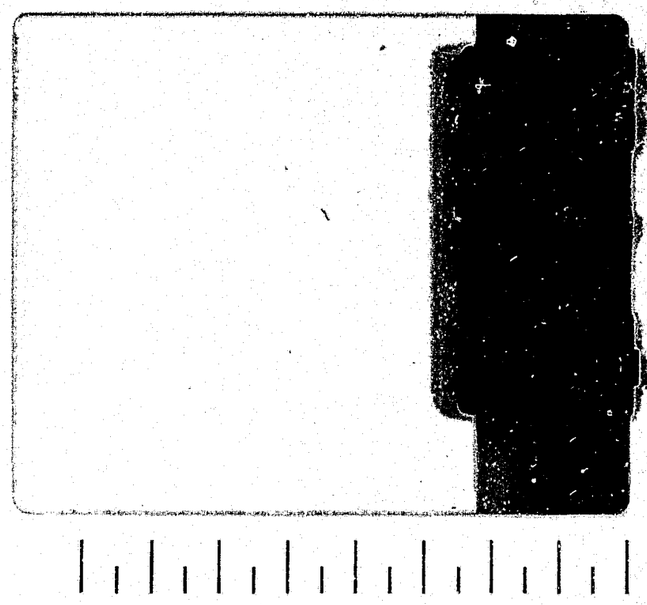
OPERATION ITEM NO. SHEET 7 OF PAGE 87

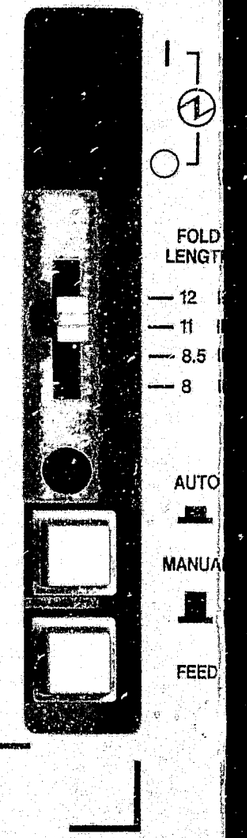
JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	QUANTITY	UNIT	TOTAL
SUPPLIES			
DRILL STEEL	40992 LF	0.20	8198
EXPLOSIVES	14559 LB	1.50	21836
DETONATORS 3586+5% LOSS	3586 EA	1.00	3586
AIR & WATER LINE	560 LF	12.00	6720
FAN LINE	560 LF	30.00	16800
LIGHTS & ELECTRIC LINES	560 LF	5.00	2800
FOUL WEATHER GEAR	5040 M.H.	2.50	12600
			72540
		U.P. =	129.54
SUPPORTS			
ALLOW $ 90.88 / CU. YD. OF EXCAVATION =			99959
		U.P. =	178.50





OPERATION [illegible] ITEM NO. 33.12F. SHEET 5 OF 5 PAGE [illegible]

JOB [illegible]

BID QUANTITY [illegible] UNIT LF TAKE OFF QUANTITY [illegible] EST. BY [illegible] DATE [illegible]

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
1-2 DRILL JUMBO	420	Hrs			32.50 13650	11.79 4952	8.55 3591			52.84 22193
2- FANS	1260	Hrs			3.89 4901	2.35 2961	2.35 2961			8.59 10823
1-300 KW GENERATOR	420	Hrs			17.63 7405	2.78 1168	27.11 11386			47.52 19959
2- DUMPS	840	Hrs			2.40 2016	0.27 227	1.83 1537			4.50 3780
2- 5TH SCOOP TRAMS	340	Hrs			18.96 15926	11.02 9257	21.05 17682			51.03 42865
1- DICKOR	420	Hrs			2.40 1008	0.97 407	5.71 2398			9.08 3813
1- FLAT BED	420	Hrs			4.01 1684	4.17 1751	11.04 4637			19.22 8072
1- D7 LOADER	420	Hrs			24.04 10097	17.23 7237	22.59 9479			63.84 26813
	560	LF.			101.23 56687	49.93 27960	95.84 53671			247.00 138318

FOLD
LENGTH
12
11
8.5
8
AUTO
MANUA
FEED

OPERATION Portals Concrete ITEM NO. 331.124 SHEET ___ OF ___ PAGE 89

JOB Watana Dam

BID QUANTITY 600 UNIT C.Y. TAKE OFF QUANTITY 600 EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS		TOTAL DIRECT COST	
FURNISH CONCRETE	675	CY	17.71	11954	0.38	257	9.25	6244	8.44	5697	10.24	6912	35.00	23625			81.02	54689
PLACE CONCRETE	659	CY	7.92	5219	0.33	217	1.28	844	1.77	1166	1.67	1068					12.97	8514
WASTE CONCRETE	16	CY																
CONCRETE OVERBREAK	59	CY																
FABRICATE FORMS	3243	SF	4.47	14496	3.00	9729	0.07	227	0.23	746	0.14	454					7.91	25652
ERECT FORMS	6486	SF	7.34	47607	0.21	1362	0.34	2205	0.46	2984	0.44	2854					8.79	57012
STRIP & CLEAN FORMS	6486	SF	3.23	20950	0.10	649	0.17	1103	0.23	1492	0.22	1427					3.95	25621
FORM HARDWARE	6486	SF			0.75	4865											0.75	4865
CONCRETE FINISH	420	SF	0.78	412	0.08	34	0.06	25	0.08	34	0.09	38					1.29	543
POINT & PATCH	6486	SF	0.78	5059	0.06	389	0.05	324	0.06	389	0.07	454					1.02	6615
CONCRETE CURE	659	CY.	6.34	3519	0.83	547	0.20	132	0.08	53	0.47	310					6.92	4561
CONSTRUCTION JOINT PREPARATION	208	SF	1.08	225	0.07	15	0.10	21	0.08	17	0.17	35					1.50	313
ROCK CLEANUP	1600	SF.	2.15	3440	0.13	208	0.20	320	0.16	256	0.34	544					2.98	4768
REINFORCING STEEL	600000	LB											0.25	150000	0.15	9000	0.40	24000
	600	CY.	188.14	112881	30.45	18272	19.08	11445	21.39	12834	23.49	14096	64.38	38625	15.00	9000	361.93	217153

FOLD LENGT 12 11 8.5 8 AUTO MANUA FEED

OPERATION Tunnel Slab Concrete ITEM NO. 331.125 SHEET ___ OF ___ PAGE 50

JOB Watana Dam

BID QUANTITY 1,690 UNIT C.Y. TAKE OFF QUANTITY 2245 EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
1840 L.F. LONG										
NET S.F./L.F. = 22 S.F. = 1.22CY/L.F.										
FURNISH CONCRETE	4070	CY.	17.71 72080	0.38 1547	9.25 37648	8.44 34351	10.24 41677	35.00 142450		81.02 329753
PLACE CONCRETE	4034	CY.	5.89 23760	0.25 1009	0.99 3994	1.69 6817	1.52 6132			10.34 41712
WASTE CONCRETE	36	CY.								
CONCRETE OVERBREAK	1789	CY.								
FABRICATE FORMS	1840	S.F.	4.47 8225	3.00 5520	0.07 129	0.23 423	0.14 258			7.91 14555
ERECT FORMS	1840	SF.	7.34 13506	0.21 386	0.34 626	0.46 846	0.44 810			8.79 16174
STRIP & CLEAN FORMS	1840	SF.	3.23 5943	0.10 184	0.17 313	0.23 423	0.22 405			3.95 7268
FORM HARDWARE	1840	SF.		0.75 1380						0.75 1380
CONCRETE FINISH	64,400	SF.	0.98 63112	0.08 5152	0.06 3864	0.08 5152	0.09 5796			1.29 83076
CONCRETE CURE	4034	CY.	5.34 21542	0.83 3348	0.20 807	0.08 323	0.47 1896			6.92 27916
ROCK CLEANUP	64400	SF.	2.15 138460	0.13 8372	0.20 12880	0.16 10304	0.34 21896			2.98 191912
REINFORCING STEEL	-0-									
	2245	CY.	154.40 346628	11.98 26898	26.84 60261	26.12 58639	35.13 78870	63.45 142450		317.92 713746
	1690	CY.	154.40 260936	11.98 20246	26.84 45360	26.12 44143	35.13 59370	13.45 107231		917.92 537286

FOLD LENGTH
12
11
8.5
8
AUTO
MANUAL
FEED

OPERATION Penstock Access Plug Concrete ITEM NO. 331.126 SHEET ___ OF ___ PAGE 9

JOB Watana Dam

BID QUANTITY 7,275 UNIT C.Y. TAKE OFF QUANTITY 4403 EST. BY A. Lee DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
283 LF. LONG										
X SECTION = 659.93 S.F. = 24.44 C.Y.										
24.44 (283) = 6917 CU. YDS.										
PENSTOCK DEDUCTIONS =										
3-24'Ø (50 L.F.) = 2514 CU. YDS.										
OVERBREAK = 916 CU. YDS.										
6917										
916										
(2514)										
5319 CU. YDS										
FURNISH CONCRETE	5329	C.Y.	17 71	94377 0 38	2075 9 25	49293 8 44	44977 10 24	54569 35 00	186515	81 02 / 431756
PLACE CONCRETE	5319	C.Y.	7 71	41010 0 47	2234 0 60	3191 0 53	2819 1 33	7074		10 59 / 56328
WASTE CONCRETE	10	C.Y.								
CONCRETE OVERBREAK	916	C.Y.								
FABRICATE FORMS	726	S.F.	8 95	6498 3 25	2360 0 15	109 0 47	341 0 28	203		13 10 / 9511
ERECT FORMS	726	S.F.	7 34	5329 0 21	152 0 34	247 0 46	334 0 44	319		8 79 / 6381
STRIP & CLEAN FORMS	726	S.F.	3 23	2345 0 10	73 0 17	123 0 23	167 0 22	160		3 95 / 2868
FORM HARDWARE	726	S.F.		0 75	545					0 75 / 545
FOUNDATION PREPARATION	32970	S.F.	2 15	70886 0 13	4286 0 20	6594 0 16	5275 0 34	11210		2 98 / 98251
REINFORCING STEEL	-0-									
	4403	C.Y.	50 07	220445 2 65	11675 13 53	59557 12 24	53913 16 70	73535 47 36	186515	187 55 / 805640
	7275	C.Y.	50 07	364259 2 65	19279 13 53	98431 12 24	89046 16 70	121493 47 36	308169	137 55 / 1000677

FOLD LENGTH
12
11
8.5
8
AUTO
MANUAL
FEED

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Main Portal Doors ITEM NO. 331.129 SHEET ___ OF ___ PAGE 72

JOB Watana Dam

BID QUANTITY 2 UNIT Ea. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SUB-CONTRACT	2	Ea.							49500 99000	49500 99000

FOLD
LENGT
12
11
8.5
8

AUTO

MANUA

FEED

OPERATION Rock Excavation, 23' Diameter ITEM NO. 331.131 SHEET ___ OF ___ PAGE 93

JOB Watana Dam

BID QUANTITY 740 UNIT L.F. TAKE OFF QUANTITY 615 EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
RAISE	590	LF.	164.41 97002							164.41 97002
SLASH	590	LF.	729.20 430227							729.20 430227
SHAFT	25	LF.	1475.06 36877							1475.06 36877
SUPPLIES	615	LF.		242- 148833						242- 148833
SUPPORTS	615	LF.						372.91 229337		372.91 229337
EQUIPMENT	615	LF.			184.11 113227	126.26 77649	227.44 139876			537.81 330752
	615	LF.	917.25 564106	242- 148833	184.11 113227	126.26 77649	227.44 139876	372.91 229337		2069.97 1273028
	740	LF.	917.25 678765	242- 179080	184.11 136241	126.26 93432	227.44 168306	372.91 275953		2069.97 1531777

OPERATION ACCESS SHAFT - POWERHOUSE ITEM NO. 331-131 SHEET 1 OF ____ PAGE 94

23'ϕ JOB

QUANTITY 740 UNIT C.F. EST. BY CK'D. BY DATE

FORM 2

TAKEOFF QUANTITY

PIT TO P.H. ROOF 96 C.F.

P.H. ROOF TO O.G. ROCK 590 "

686 C.F.

METHOD

1- FROM ROOF OF P.H., EL 1515 TO O.G. ROCK, DRIVE RAISE & SLASH DOWN = 590 C.F.

2. FROM EL 1515 DOWN TO EL 1444, REMOVE WITH POWERHOUSE EXCAVATION = 71 "

3. FROM EL 1444 TO BOTTOM IS SHAFT EXCAVATION = 25 "

686 C.F.

RAISE

USE ALIMAK RAISE CLIMBER TO DRILL & SHOOT A 5'X7' RAISE.

BLAST HOLES AT 3 S.F./HOLE PLUS 1 BURN AND 3 RELIEF HOLES = 16 HOLES.

DRILL 10 FT & PULL 8 FT.

590 / 8 = 74 ROUNDS

RAISE CYCLE

LOAD TROLLEY & CLIMBER (3 MEN)	10	MINUTES
TRAVEL TO FACE = 295 FT. AVE. @ 40 FPM	8	"
SCALE LOOSE MATERIAL & HOOK-UP	60	"
INSTALL GUIDE RAIL & VENT PIPE	60	"
SURVEY - CHECK ON DIRECTION	10	"
DRILL ROUND - 2 DRILLS, 16 HOLES - 5 MIN./HOLE	40	"
EXPLOSIVES BROUGHT UP BY THIRD MAN	5	"
LOAD HOLES - 16 @ 8/M.H. - (3 MEN)	120	"
TRAVEL TO BOTTOM - SAME AS TO FACE.	8	"
SUB TOTAL	241	MINUTES

OPERATION ITEM NO. SHEET 2 OF PAGE 95

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

"FORWARD"
PARK UNIT & BLAST
SMOKE

241 MINUTES
15 "
30 "
286
60 = 4.77 HOURS

MUCKING HAUL DISTANCE = 2100 C.F.
LOAD 0.50 MINUTES
HAUL @ 4.5 M.P.H. 5.30 "
DUMP & TURN 1.00 "
RETURN @ 7.4 M.P.H. 3.23 "
10.03 MINUTES

3.6 CU. YDS. / CYCLE

50 MINUTE HOUR
10.03 MIN. / CYCLE = 4.99 CYCLES / HOUR (3.6) = 18 CU. YDS.

5 x 7 x 8
27 = 10.37 C.Y. (1.45) SWELL = 15 CU. YDS.

15
18 = .83 HOURS.

MUCKING DOES NOT DELAY
MOVING CLIMBER TO FACE

20 HOUR DAY
4.77 HRS. / CYCLE = 4.19 (8) = 33.52 C.F. / DAY

590
33.52 = 17.6 (SAY 18 DAYS)

0024933

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location . KIATANA
Description .....

Date .....
Dr .....Ch .....
Ref .....

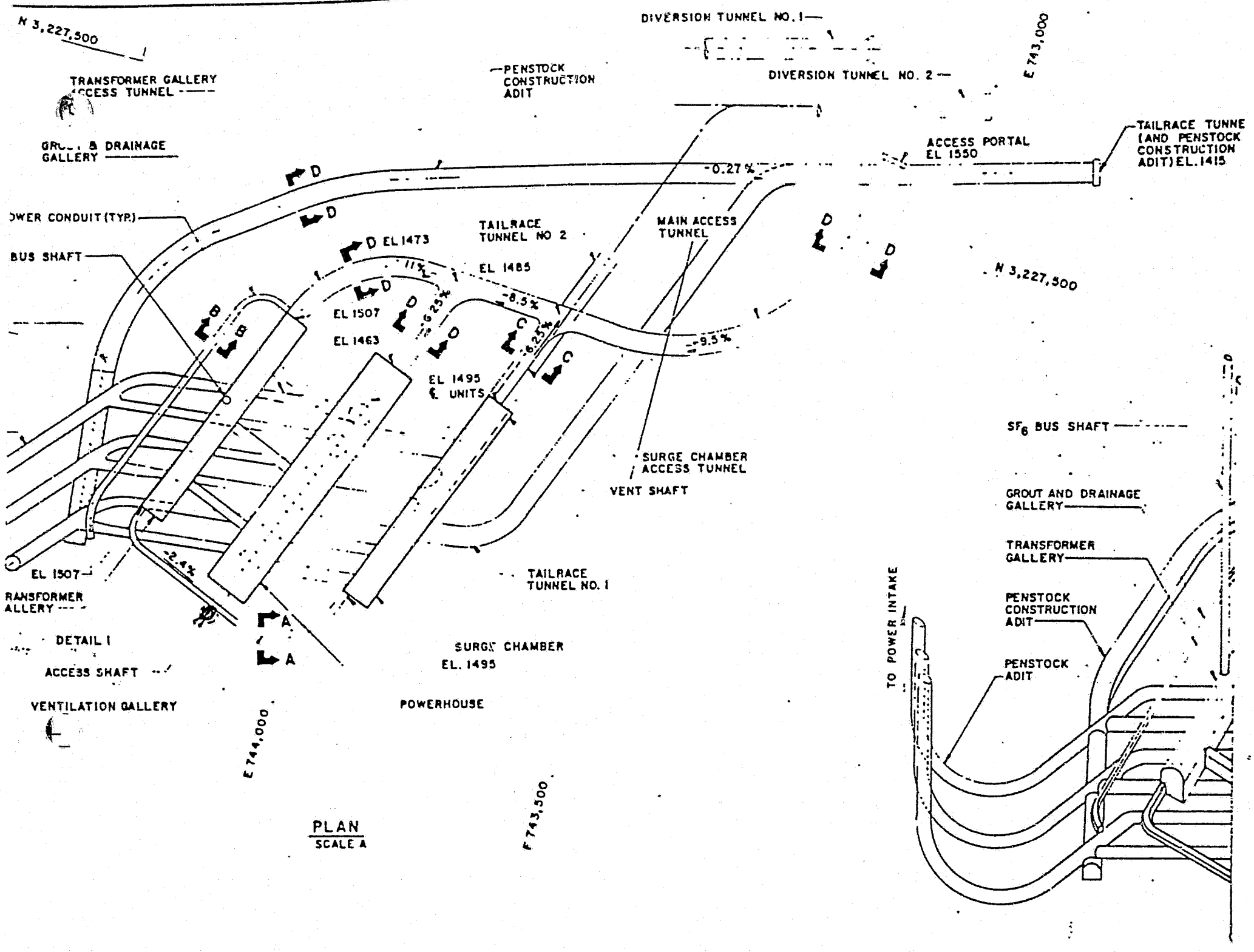
Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
36.67	SHIFTER	1	1		2	73.34
35.56	RAISE MINER	2	2		4	142.24
34.84	" TENDER	1	1		2	69.68
31.28	GROUNDMAN	1	1		2	62.56
38.80	MUCKER OPERATOR	1	1		2	77.60
35.95	POWDERMAN	1	1		2	71.90
41.58	ELECTRICIAN	1	0		1	41.58
Total		8	7		15	538.90

Cost Per/Day 5389.00
Cost Per M/Hr. Average 35.93
Cost Per M/Day Average 359.27

Total L. F. Or Cu. Yds. 590
Production 32.52
Total Days Required ..... 18.

Total Cost - No. Days X Cost/Day 97002.00
Cost Per/L. F. 164.41
Cost Per/Cu. Yd. .....

Total Man Days 270
Total Man Hours 2700


N 3,227,500
TRANSFORMER GALLERY ACCESS TUNNEL
GROUT & DRAINAGE GALLERY
POWER CONDUIT (TYP.)
SURGE SHAFT
PENSTOCK CONSTRUCTION ADIT
DIVERSION TUNNEL NO. 1
DIVERSION TUNNEL NO. 2
E 743,000
ACCESS PORTAL EL 1550
TAILRACE TUNNEL (AND PENSTOCK CONSTRUCTION ADIT) EL. 1415
-0.27%
TAILRACE TUNNEL NO 2
MAIN ACCESS TUNNEL
EL 1473
EL 1485
EL 1507
EL 1463
EL 1495
E UNITS
-8.5%
-9.5%
-6.25%
N 3,227,500
SURGE CHAMBER ACCESS TUNNEL
VENT SHAFT
EL 1507
TRANSFORMER GALLERY
DETAIL 1
ACCESS SHAFT
VENTILATION GALLERY
TAILRACE TUNNEL NO. 1
SURGE CHAMBER EL. 1495
POWERHOUSE
E 744,000
E 743,500
PLAN
SCALE A
SF6 BUS SHAFT
GROUT AND DRAINAGE GALLERY
TRANSFORMER GALLERY
PENSTOCK CONSTRUCTION ADIT
PENSTOCK ADIT
TO POWER INTAKE
N A-A
B-B
SECTION C-C
SCALE B
20'-0
16'-0 R
4'-0
1'-0
DRAINAGE CHANNEL
25'-0
SECTION D-D
SCALE B
28'-0
20'-0 R
8'-0
1'-0
(NOT IN PENSTOCK CONSTRUCTION ADIT)
DRAINAGE CHANNEL
35'-0
COUNTERWEIGHT
ELEVATOR
1'-6
DETAIL
SCALE 1

OPERATION ITEM NO. SHEET 5 OF PAGE 26

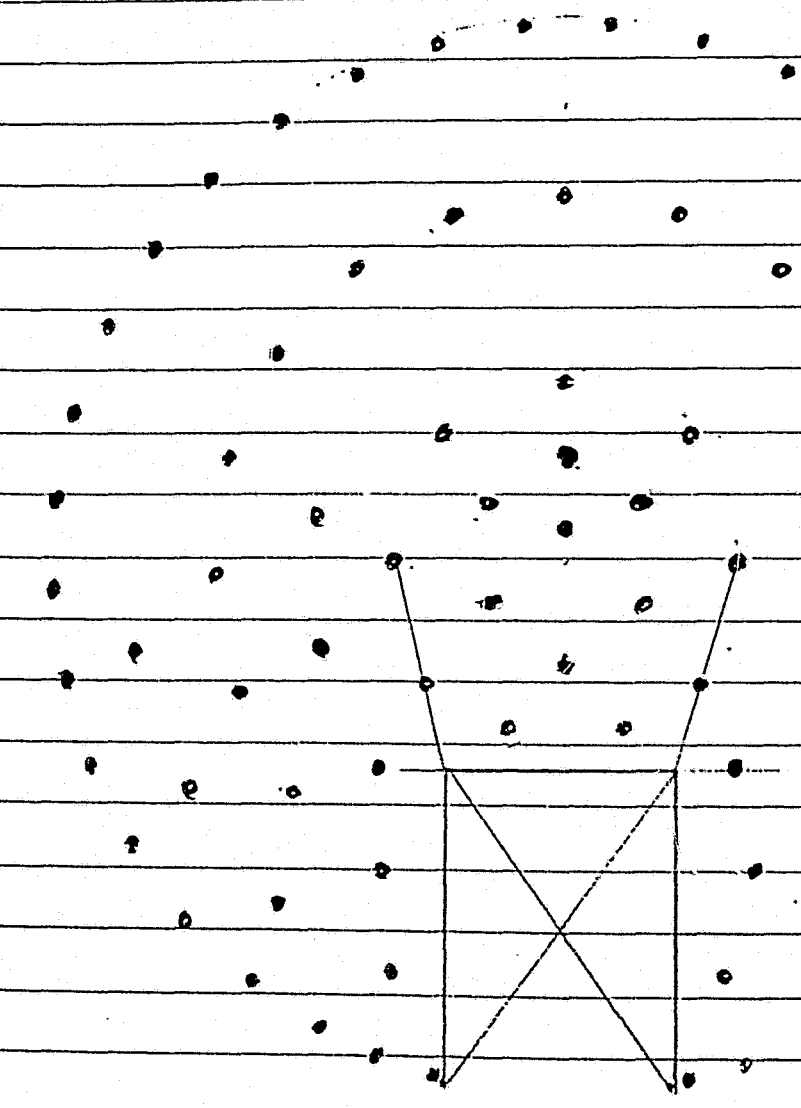
JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

SLASH DOWN 590 L.F.
DRILL 10 C.F. & POLL 8 L.F.

23'ϕ = 15.39 CU. YDS.
RAISE = (1.30) " "
14.09 CU. YDS (8) = 112.72 CU. YDS. (50.10)



DRILL & SHOOT
PERIMETER 36 HOLES
FACE 47 "
83 HOLES
USE SINKERS (FIGURE 5)
DRILL SPEED @ 12 MINUTES/HOLE
83 (12) = 996 MINUTES
50 MIN. HOUR = 19.92 HOURS
5 SINKERS = 3.98 HOURS.
1.00 "
4.98 HOURS

MOVE DRILLS IN & OUT

OPERATION ITEM NO. SHEET 6 OF PAGE 77

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

LOAD & SHOOT

BRING IN EXPLOSIVES = 5.0 MINUTES

LOAD HOLES

83 @ 8/M.H.: (5 MEN)

60 MINUTE HOUR = 1040 "

MOVE OUT = 5.0 "

1145.0

60 = 1.73 HOURS

CLEAN SHOT

ALLOW 1 1/2 HOURS

MUCKING

DOES NOT DELAY OR IMPACT DRILLING OR SHOOTING OPERATIONS

112.72 (1.45) = 163 CU. YDS.

4.99 CYCLES/HOUR (9.6 CU. YDS.) = 47.96 CU. YDS. / UNIT

163

35.9 = 4.54 HOURS. MUCKING (2 UNITS)

100

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location . WATANA
Description SLASH DOWN - SHAFT

Date
Dr. Ch.
Ref.

CYCLES

1. Drill In & Out	4.98
2. Load & Shoot	1.73
3. Smoke Time	.25
4. Muck Time NOT APPLICABLE	- 0 -
5. Supports (average time/rd.)	.50
6. Services (average time/rd.)	1.25
Sub Total Hrs. Per Round	8.71
Lost Time @ 10 %	.87
Total Hours Per Round/Cycle	9.58
Crew Hours Worked Per Day	20
Rounds Per Day	2.09
Peak L. F. Per Day	16.72

PRODUCTION	L. F.	L. F. /Day	W/Days
	590	16.72	35

Total Work Days 35
Total L. F. 590
Ave. L. F. Per Day 16.72

101

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC. 9 No. Royal Avenue Eagle Point, Oregon	ENGINEERING COMPUTATIONS
Company ALASKA POWER AUTHORITY Location WATANA Description	Date Dr ..... Ch ..... Ref

Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
36.67	SHIFTER	1	1		2	73.34
35.56	DRILLERS	5	5		10	355.60
34.84	CHUCK TENDERS	2	2		4	139.36
35.95	POWDERMAN	1	1		2	71.90
35.56	MINER	2	2		4	142.24
31.28	TOPMAN	1	1		2	62.56
38.80	MUCKER OPERATOR	2	2		4	155.20
41.58	ELECTRICIAN	1	1		2	83.16
37.84	OPERATOR	1	1		2	75.68
35.09	OILER	1	1		2	70.18
Total		17	17		34	1229.22

Cost Per/Day	12292.20
Cost Per M/Hr. Average	36.15
Cost Per M/Day Average	361.54
Total L. F. Or Cu. Yds.	590
Production	16.72
Total Days Required	35
Total Cost - No. Days X Cost/Day	430227.00
Cost Per/L. F.	729.20
Cost Per/Cu. Yd.	
Total Man Days	1190
Total Man Hours	11900

OPERATION ITEM NO. SHEET 9 OF PAGE 10a

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

ELEVATION 1444 DOWN TO BOTTOM = SHAFT EXCAVATION

DRILL & SHOOT

PERIMETER = 36 HOLES
FACE = 51 HOLES
87 HOLES

USE SAME METHOD & PRODUCTION AS SLASH DOWN

87 (12) = 1044 MINUTES
50 MIN. HOUR = 20.88 HOURS
5 SINKERS = 4.18 HOURS
1.00 "
5.18 HOURS

MOVE DRILLS IN & OUT

OPERATION ITEM NO. SHEET 10 OF PAGE 135

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

LOAD & SHOOT

BRING IN EXPLOSIVES = 5.0 MINUTES

LOAD HOLES

87 @ 8/MIN. H. (SIMEH)

60 MINUTE HOUR = 109.0 "

MOVE OUT = 5.0 "

114.0 MINUTES

60 = 1.98 HOURS.

MUCKING

15.39 (1.45) = 22.32 (8) = 179 CU. YDS.

4.99 CYCLES/HOUR (3.6 CU. YDS.) = 17.96 CU. YDS./UNIT

$\frac{179}{35.9}$ = 4.99 HOURS-MUCKING (2 UNITS)

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC. 9 No. Royal Avenue Eagle Point, Oregon	ENGINEERING COMPUTATIONS
Company ALASKA POWER AUTHORITY. Location .KATANA..... Description. SHAFT EXCAVATION.....	Date..... Dr.....Ch..... Ref.....

CYCLES

1. Drill In & Out	5.18
2. Load & Shoot	1.98
3. Smoke Time	0.25
4. Muck Time	4.99
5. Supports (average time/rd.)	0.50
6. Services (average time/rd.)	1.25
Sub Total Hrs. Per Round	14.15
Lost Time @ 10 %	1.42
Total Hours Per Round/Cycle	15.57
Crew Hours Worked Per Day	20
Rounds Per Day	1.28
Peak L.F. Per Day	10.24

PRODUCTION	L. F.	L. F. /Day	W/Days
	25	10.24	2.44
			SAY 3.0
Total Work Days			3.0
Total L. F.			25.0
Ave. L. F. Per Day			8.33

105 12

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location WATANA
Description SHAFT EXCAVATION

Date .....
Dr .....Ch .....
Ref .....

Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
	SAME AS SHEET 1					
	Total	17	17		34	1229.22

Cost Per/Day	12292.20
Cost Per M/Hr. Average	36.15
Cost Per M/Day Average	361.54
Total L. F. Or Cu. Yds.	25
Production	8.33
Total Days Required	3
Total Cost - No. Days X Cost/Day	36876.60
Cost Per/L. F.	1475.06
Cost Per/Cu. Yd.	
Total Man Days	102
Total Man Hours	1020

OPERATION ITEM NO. SHEET 13 OF PAGE 106

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	QUANTITY	UNIT	TOTAL
SUPPLIES			
DRILL STEEL	75870 LF.	0.20	15174
EXPLOSIVES 9465 C.Y. @ 4.5#	42592 LB.	1.50	63888
DETONATORS 7587 + 1.05 LOSS	7966 EA.	1.00	7966
AIR & WATER LINE	615 LF.	12.00	7380
FAN LINE	615 LF.	20.00	12300
LIGHTS & ELECTRIC LINES	615 LF.	5.00	3075
FOUL WEATHER GEAR	15620 M.H.	2.50	39050
			148833
SUPPORTS @ ALLOW 24.23 PER CU. YD. OF ROCK EXCAVATION. 9465 CU. YDS.		=	229337

OPERATION EQUIPMENT SUMMARY ITEM NO 331-131 SHEET 14 OF PAGE 117

ACCESS SHAFT JOB WATANA

BID QUANTITY 740 UNIT LF TAKE OFF QUANTITY 615 EST. BY DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
RAISE										
1 ALIMAK GROUNDHOG	360	HRS			8 65 / 3114	53 14 / 19130	7 98 / 2873			69 77 / 25117
3 - FANS	1080	"			3 89 / 4201	2 35 / 2538	2 35 / 2538			8 59 / 9277
1 - KNUCKER STHA	360	"			18 96 / 6826	11 02 / 3967	21 05 / 7578			51 03 / 18371
1 300 KW GENERATOR	360	"			17 63 / 6347	2 78 / 1001	27 11 / 9760			47 52 / 17108
1 FLATBED	360	"			4 01 / 1444	4 17 / 1501	11 04 / 3974			19 22 / 6919
1 - PICKUP	360	"			2 40 / 864	0 97 / 349	5 71 / 2056			9 08 / 3269
3 - FANS	720	"			3 89 / 2801	2 35 / 1692	2 35 / 1692			8 59 / 6185
SLASH										
3 - SINKERS	3500	HRS			3 65 / 12775	0 46 / 1610	1 27 / 4445			5 38 / 18830
1 - 1200 CFM COMPRESSORS	700	"			17 63 / 12341	11 07 / 7749	29 29 / 20503			57 99 / 40597
2 - KNUCKERS STHA	1400	"			18 96 / 26544	11 02 / 15428	21 05 / 29470			51 03 / 71442
1 - 300 KW GENERATOR	700	"			17 63 / 12341	2 78 / 1946	27 11 / 18977			47 52 / 33265
1 - 50 T TRUCK CRANE	700	"			14 42 / 10094	17 - / 11900	23 57 / 16499			54 99 / 38493
1 - FLATBED	700	"			4 01 / 2807	4 17 / 2919	11 04 / 7728			19 22 / 13454
1 - PICKUP	700	"			2 40 / 1680	0 97 / 679	5 71 / 3997			9 08 / 6356
2 - FANS	1400	"			3 89 / 5446	2 35 / 3290	2 35 / 3290			8 59 / 12028
SHAFT										
3 - SINKERS	150	HRS			3 65 / 548	0 46 / 69	1 27 / 191			5 38 / 808
1 - 1200 CFM COMPRESSOR	30	"			17 63 / 529	11 07 / 332	29 29 / 879			57 99 / 1741
2 - KNUCKERS	60	"			18 96 / 1138	11 02 / 661	21 05 / 1263			51 03 / 3062
1 300 KW GENERATOR	30	"			17 63 / 529	2 78 / 83	27 11 / 813			47 52 / 1425
1 50 T TRUCK CRANE	30	"			14 42 / 433	17 - / 510	23 57 / 707			54 99 / 1650
1 - FLATBED	30	"			4 01 / 120	4 17 / 125	11 04 / 331			19 22 / 576
1 - PICKUP	30	"			2 40 / 72	0 97 / 29	5 71 / 171			9 08 / 272
2 - FANS	60	"			3 89 / 233	2 35 / 141	2 35 / 141			8 59 / 518
					113227	77649	139876			330752

FOLD LENGTH
12 IN
11 IN
8.5 IN
8 IN

AUTO

MANUAL

FEED

OPERATION Concrete Lining, 20' Diameter ITEM NO. 331.134 SHEET ___ OF ___ PAGE 155

JOB Watana Dam

BID QUANTITY 740 UNIT L.F. TAKE OFF QUANTITY 740 EST. BY A. Lee DATE ___

37 POURS	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS		TOTAL DIRECT COST	
FURNISH CONCRETE	3841	CY.	17 71	68024	0 38	1460	9 25	35529	8 44	32418	10 24	39332	35 00	134435			81 02	311198
PLACE CONCRETE	3767	CY.	11 89	44790	0 50	1884	1 92	7233	2 66	10020	2 43	9154					19 40	73081
WASTE CONCRETE	74	CY.																
CONCRETE OVERBREAK	990	CY.																
FABRICATE FORMS	1257	SF.	11 93	14996	3 42	4299	0 19	239	0 62	779	0 37	465					16 63	20728
ERECT FORMS	46494	SF.	7 34	341766	0 21	9764	0 34	15808	0 46	21387	0 44	20457					8 79	408682
STRIP & CLEAN FORMS	46494	SF.	3 23	150176	0 10	4649	0 17	7904	0 23	10694	0 22	10229					3 95	183652
FORM HURRIVIBE	46494	SF.			0 75	34871											0 75	34871
POINT & PATCH	46494	SF.	0 78	36265	0 06	2790	0 05	8325	0 06	2790	0 07	3255					1 02	47425
CONSTRUCTION JOINT PREPARATION	3748	SF.	1 08	4048	0 07	262	0 10	375	0 08	300	0 17	637					1 50	5622
ROCK CLEANUP	53472	CY.	21 5	114965	0 13	6951	0 20	10694	0 16	8556	0 34	18180					2 98	159346
CONCRETE CURE	3767	CY.	5 34	20116	0 83	3127	0 20	753	0 08	301	0 47	1770					6 92	26067
REINFORCING STEEL	277700	LB.											0 25	69425	0 15	41655	0 40	111080
	740	CF.	107 85	794646	9 47	70057	109 27	80860	117 50	86945	13 84	103479	275 49	203860	56 29	41655	1867 31	1381802

FOLD LENGTH
12 in
11 in
8.5 in
8 in
AUTO
MANUAL
FEED

OPERATION Miscellaneous Metalwork ITEM NO. 331.138 SHEET OF PAGE

JOB Watana Dam

BID QUANTITY 50 UNIT Tns. TAKE OFF QUANTITY EST. BY A. Lee DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SUB-CONTRACT	50	Tns.							2500 - 125000	2500 - 125000

FOLD LENGTH
12
11
8.5
8

AUTO

MANUAL

FEED

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Elevators ITEM NO. 331.13C SHEET ___ OF ___ PAGE 110

JOB Watana Dam

BID QUANTITY 1 UNIT L.S. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

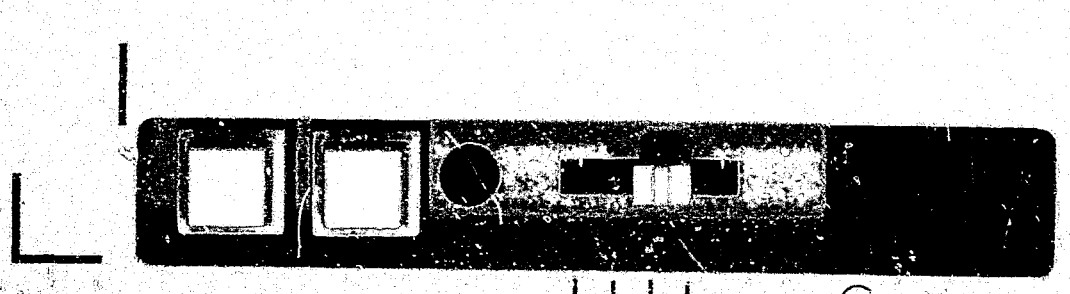
	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SUB-CONTRACT	1	LS.							LS. 284500	LS. 284500

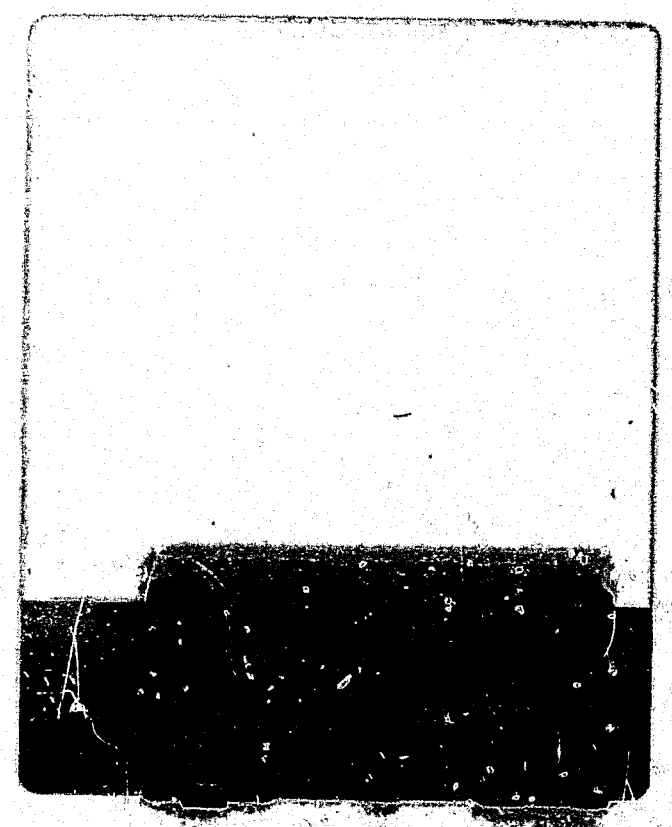
DIVERSIFIED CONSTRUCTORS, INC.

UN. TAKE-OFF

JOB NAME WATANA DATE SHEET OF

DESCRIPTION	MATERIAL						LABOR		SHIPPING	
	SIZE	QUANTITY	MATERIAL LIST PRICE	MATERIAL SUB TOTAL	DISC.	MATERIAL EXTENSION	LABOR UNIT	TOTAL HOURS	UNIT WT.	TOTAL WT.
Elevators		1 LS								
Section 5	6'x9'					130000		1600		
TOTAL THIS SHEET						130000=		1600		





11 12

0 0 2 4 9 3

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Fire Protection Headtank ITEM NO. 331.14 SHEET ___ OF ___ PAGE 112

JOB Watana Dam

BID QUANTITY 1 UNIT L.S. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

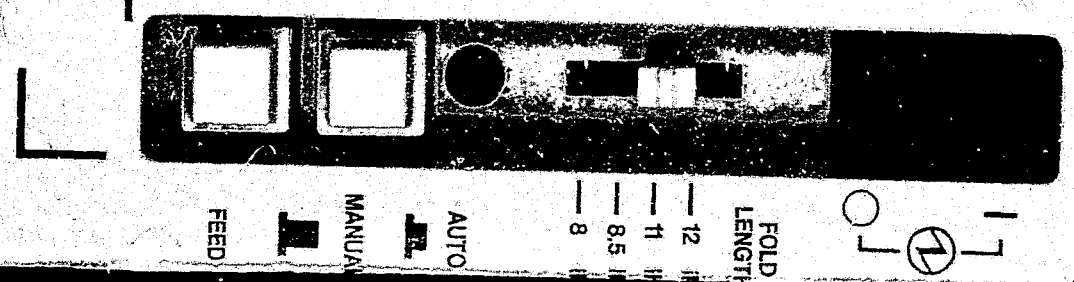
	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SUB-CONTRACT	1	LS.							LS. 90813	LS. 90813

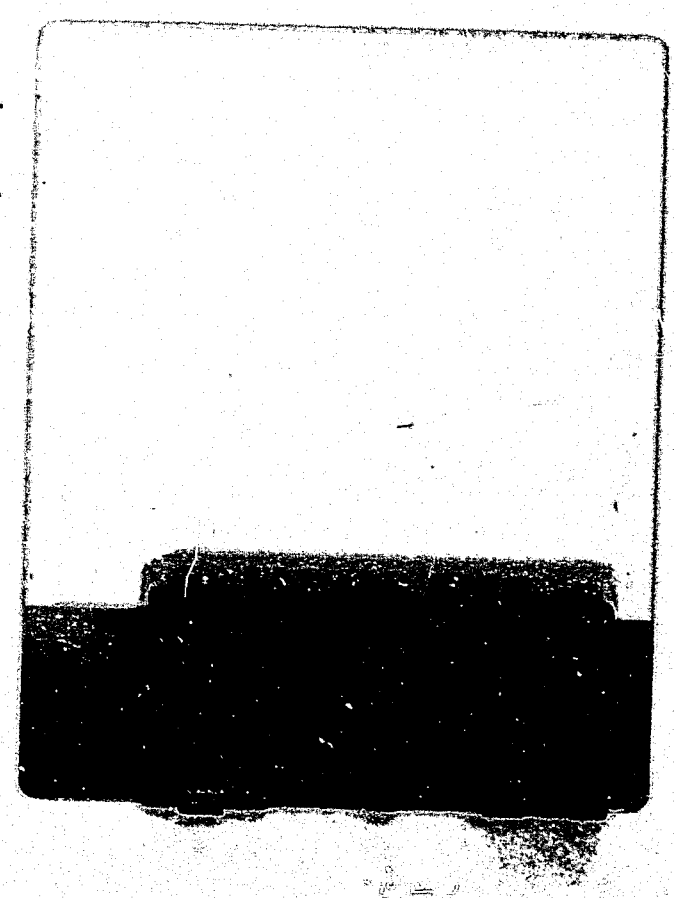
DIVERSIFIED CONSTRUCTORS, INC.

UNI. TAKE-OFF

JOB NAME WATANA DATE SHEET OF

DESCRIPTION	SIZE	QUANTITY	MATERIAL LIST PRICE	MATERIAL SUB TOTAL	DISC.	MATERIAL EXTENSION	LABOR UNIT	LABOR TOTAL HOURS	SHIPPING UNIT WT.	SHIPPING TOTAL WT.
Fire Protection Headtank		1 LS								
No HEIGHTNIK SHOWN - ESTIMATE										
BASED UPON 100,000 GAL. TANK						50000-		450		
TOTAL THIS SHEET						50000-		450		113





11

12

OPERATION Excavation Horizontal, 22' x 22' ITEM NO. 331.151 SHEET OF PAGE

JOB Watana Dam

BID QUANTITY 156 UNIT L.F. TAKE OFF QUANTITY EST. BY A. Lee DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
EXCAVATION	156	L.F.	964.43 150.451							964.43 150.451
SUPPLIES	156	L.F.		264.11 41.201						264.11 41.201
SUPPORTS	156	L.F.						418.12 65.227		418.12 65.227
EQUIPMENT	156	L.F.			372.10 50.325	292.38 45.612	369.85 57.696			984.83 153.633
	156	L.F.	964.43 150.451	264.11 41.201	372.10 50.325	292.38 45.612	369.85 57.696	418.12 65.227		2631.49 410.512

FOLD LENGTH
12
11
8.5
8

AUTO

MANUAL

FEED

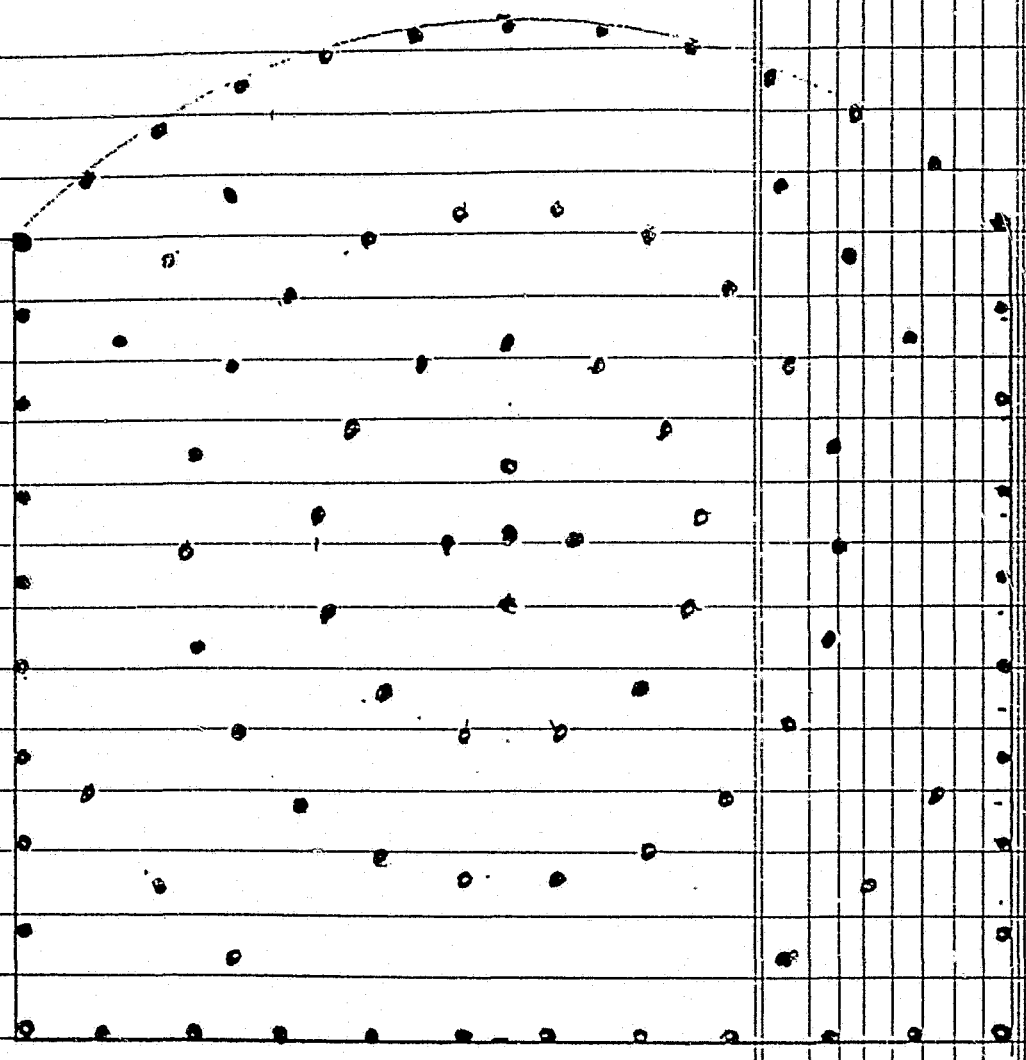
OPERATION EXCAVATION - BUS TUNNELS 931- ITEM NO. 151 SHEET 1 OF PAGE 115

HORIZONTAL 22'X22' JOB

QUANTITY 156 UNIT C.F. EST. BY CK'D. BY DATE

FORM 2

TAKE-OFF QUANTITY = 147 C.F.

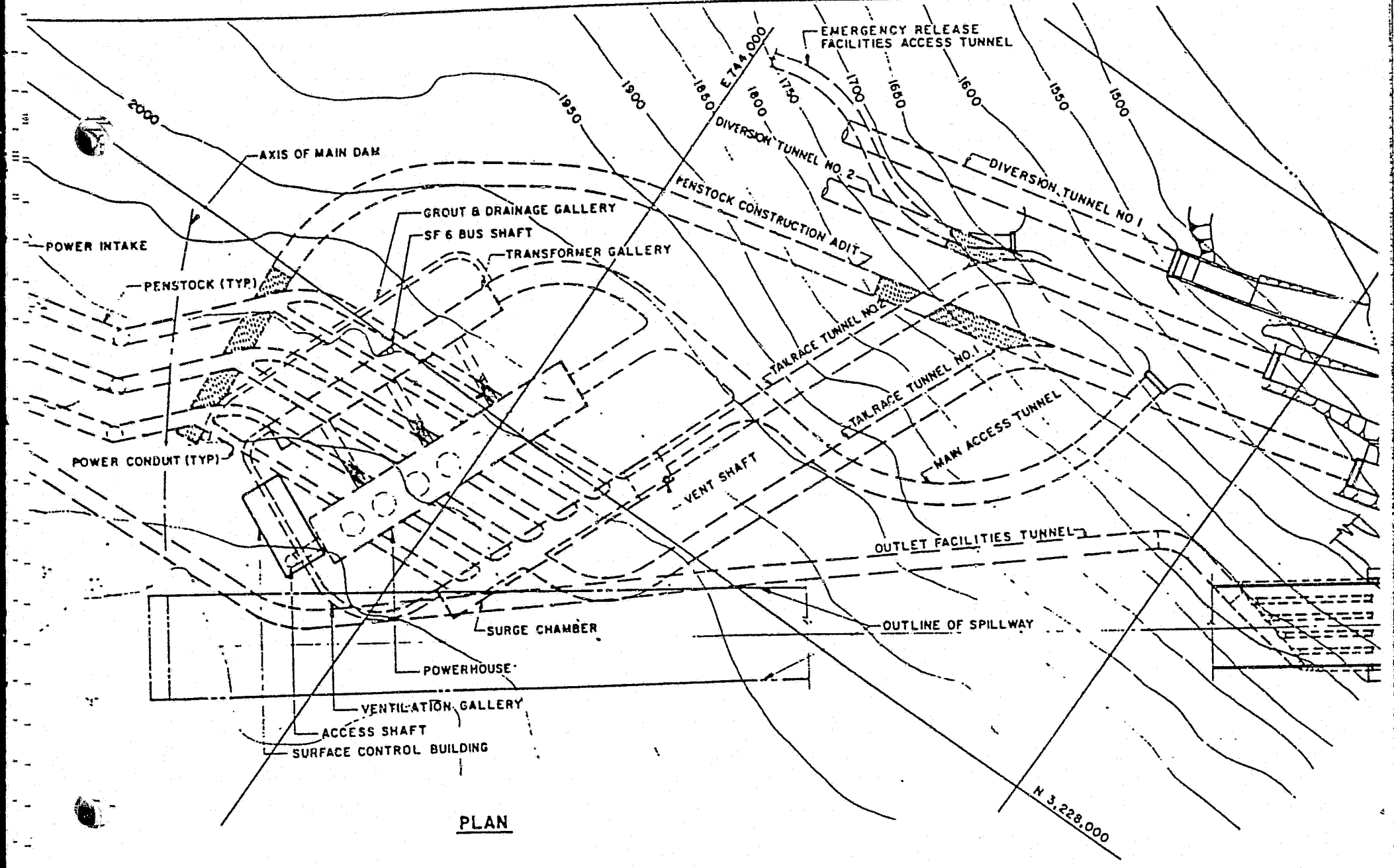


452 S.F. = 16.74 C.Y. / C.F.

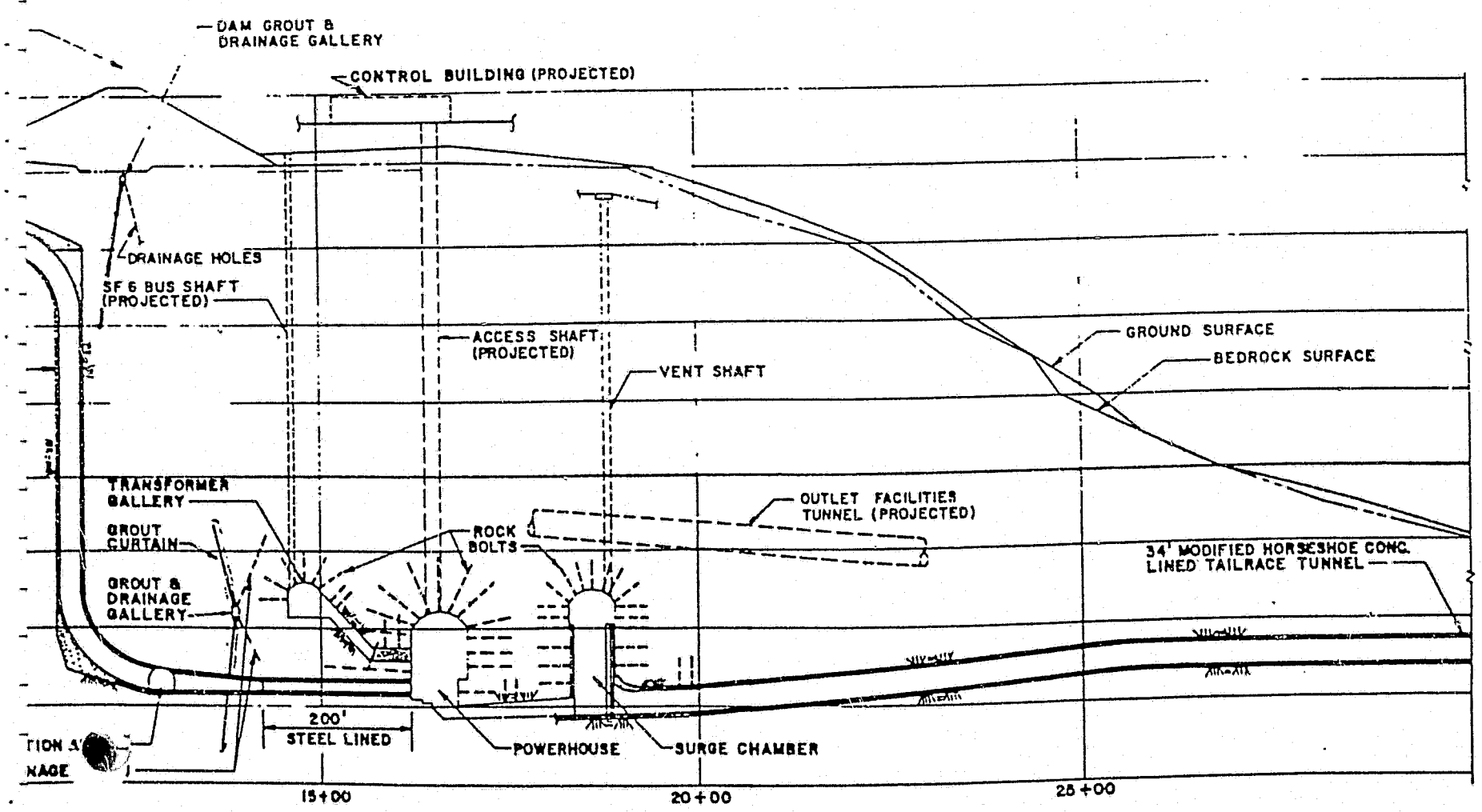
41 PERIMETER HOLES

52 AREA HOLES

15-91



PLAN



PROFILE

OPERATION ITEM NO. SHEET 3 OF PAGE 117

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

METHOD

DRIVE FULL FACE, USING A THREE DRILL HYDRAULIC JOY JUMBO - DRILL PRODUCTION SAME AS FOR DIVERSION TUNNEL

DRAWING F26R SHOWS APPROXIMATELY 26 L.F OF EACH TUNNEL ABOUT 4'-6" LOWER AT THE INVERT THAN 22'. FOR THIS ALLOW ALLOW THREE ADDITIONAL DAYS.

DRILLING

DRILL 12 FEET & PULL 10 FEET.

RETRACT & SETUP	0.80 MINUTES
DRILL	2.20 "
	3.00 MINUTES / HOLE

93 HOLES

3 DRILLS = 31 (3)

CHANGE BITS EVERY 3 HOLES

93 / 3 = 31 (0.25)

	93 MINUTES
	8 "
	101 MINUTES

101 MINUTES

50 MIN. HOUR =

		2.02 HOURS

DRILL CYCLE TIME

MOVE UP & HOOK UP JUMBO	5.0 MINUTES
SCALE	5.0 "
DRILL OUT	121.0 "
UNHOOK	5.0 "
	136.0
	60 = 2.27 HOURS

OPERATION ITEM NO. SHEET 4 OF PAGE 118

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

LOAD & SHOOT

BRING UP EXPLOSIVES =

LOAD HOLES

93 @ 8/M.H. (5 MEN)

60 MINUTE HOUR =

MOVE OUT

5.0 MINUTES

126.0 "

5.0 "

126.0

60 = 2.10 HOURS

MUCKING

USE ST 13 SCOOP TRAMS

HAUL AT 5 MPH HAUL DISTANCE 1850 C.F.

RETURN AT 10 MPH.

FIGURE 11 CU. YDS. BUCK PER CYCLE

16.74 CU. YDS. (10) (1.45) = 242.73

11 = 22 CYCLES

CYCLE TIME

LOAD	0.50 MINUTES
HAUL	4.20 "
DUMP & TURN	1.00 "
RETURN	2.10 "
	7.80 (22)

50 MIN HOUR = 3.43

2 UNITS = 1.72 HOURS

119

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location WATANA
Description 22'x22' BUS TUNNEL

Date
Dr. Ch.
Ref.

CYCLES

1. Drill In & Out	2.27
2. Load & Shoot	2.10
3. Smoke Time	0.50
4. Muck Time	1.72
5. Supports (average time/rd.)	0.50
6. Services (average time/rd.)	0.25
Sub Total Hrs. Per Round	7.34
Lost Time @ 10 %	.73
Total Hours Per Round/Cycle	8.07
Crew Hours Worked Per Day	20.
Rounds Per Day	2.48
Peak L. F. Per Day	24.8

PRODUCTION	L. F.	L. F. /Day	W/Days
LOWER INVERT			3.0
	52	24.8	2.0
Total Work Days			5.0
Total L. F.			52
Ave. L. F. Per Day			10.4

120 - 6

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location . KIATANA
Description 22'X22' BUS TUNNEL

Date .....
Dr .....Ch .....
Ref .....

Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
36.67	SHIFTERS	1	1		2	73.34
35.56	DRILLERS	3	3		6	213.36
34.84	TENDERS	3	3		6	209.04
35.95	POWDERMAN	1	1		2	71.90
31.28	TOPMAN	1	1		2	62.56
31.28	DUMPMAN	1	1		2	62.56
41.58	ELECTRICIAN	1	1		2	83.16
38.80	MUCKER OPERATOR	2	2		4	155.20
35.97	DOZER OPERATOR	1	1		2	71.94
	Total	14	14		28	1003.06

Cost Per/Day	10030.06
Cost Per M/Hr. Average	35.82
Cost Per M/Day Average	358.24
Total L. F. Or Cu. Yds.	156
Production	10.4
Total Days Required	15
Total Cost - No. Days X Cost/Day	150450.90
Cost Per/L. F.	964.43
Cost Per/Cu. Yd.	
Total Man Days	420
Total Man Hours	4200

OPERATION ITEM NO. SHEET 7 OF PAGE 121

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	QUANTITY	UNIT	TOTAL
SUPPLIES			
DRILL STEEL	18079 LF	0.20	3616
EXPLOSIVES 2692 @ 4.5#	12114 LB.	1.50	18171
DETONATORS 1507 (1.05 LOSS)	1582 EA.	1.00	1582
AIR & WATER LINES	156 L.F.	12.00	1872
VENT LINE	156 L.F.	30.00	4680
LIGHTS & ELECTRIC LINES	156 L.F.	5.00	780
FOUL WEATHER GEAR	4200 M.H	2.50	10500
			41201
SUPPORTS			
ALLOW #24.23 PER CU. YD. OF ROCK EXCAVATION. 2692 C.Y.			65227

8.5

OPERATION EQUIPMENT SUMMARY ITEM NO. 331-151 SHEET 2 OF 2 PAGE 122

EXCAVATION HORIZONTAL 22'x22' JOB VIATANA

BID QUANTITY 156 UNIT C.F. TAKE OFF QUANTITY _____ EST. BY _____ DATE _____

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
1- 3 DRILL JUMBO	300	HRS			50.88 / 15264	48 - / 14400	42.02 / 12606			140.90 / 42270
1- FAN	300	"			3.89 / 1167	2.35 / 705	2.35 / 705			8.59 / 2577
1- 300 KW GENERATOR	300	"			17.63 / 5289	2.78 / 834	27.11 / 8133			47.52 / 14256
2- PUMPS	600	"			2.40 / 1440	0.27 / 162	1.83 / 1098			4.50 / 2700
2- ST 13 SCOOP TRAMS	600	"			30.05 / 18030	38 - / 22800	38.93 / 23358			106.98 / 64188
1- PICKUP	300	"			2.40 / 720	0.97 / 291	5.71 / 1713			9.08 / 2724
1- FLATBED	300	"			4.01 / 1203	4.17 / 1251	11.04 / 3312			19.22 / 5766
1- D7 DOZER	300	"			24.04 / 7212	17.23 / 5169	22.57 / 6771			63.84 / 19157
	156	L.F.			322.10 / 50325	292.38 / 45612	369.85 / 57696			984.33 / 153633

FOLD LENGTH
12
11
8.5
8
AUTO
MANUAL
FEED

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Excavation Inclined 16' x 16' ITEM NO. 331.152 SHEET ___ OF ___ PAGE 123

JOB Watana Dam

BID QUANTITY 202 UNIT L.F. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS		SUB-CONTRACTS	TOTAL DIRECT COST	
EXCAVATION	202	LF	347.58	70210									347.58	70210
SUPPLIES	202	LF			155.87	31485							155.87	31485
SUPPORTS	202	LF								211.23	42669		211.23	42669
EQUIPMENT	202	LF					118.96	240.29	107.-	216.15	134.92	272.53	360.88	728.97
	202	LF	347.58	70210	155.87	31485	118.96	240.29	107.-	216.15	134.92	272.53	1075.56	217261

FOLD LENGTH
12
11
8.5
8

AUTO

MANUAL

FEED

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION EXCAVATION - INCLINED 331- ITEM NO. 152 SHEET 1 OF PAGE 124

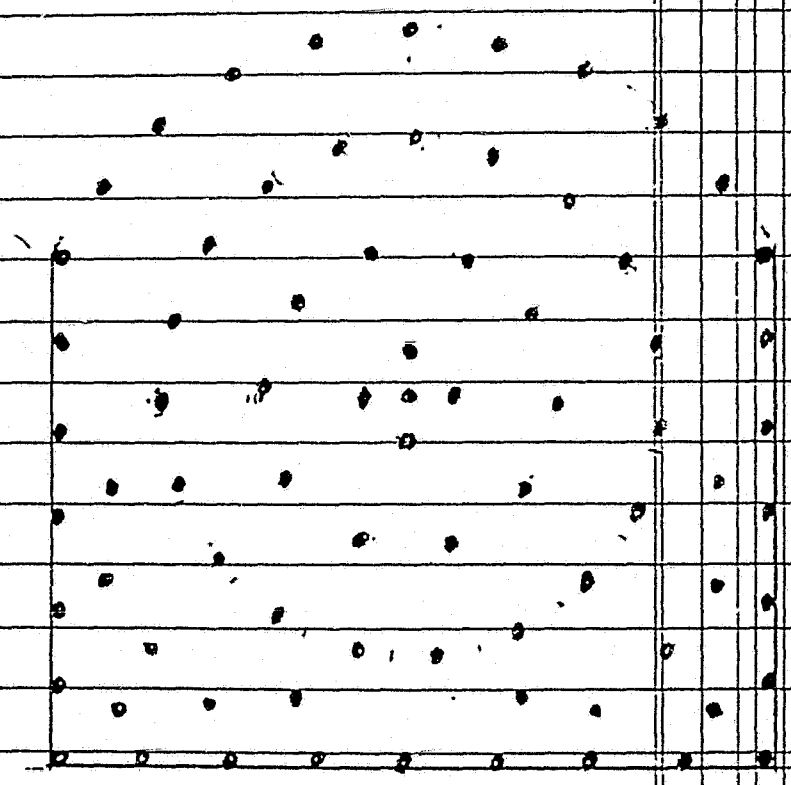
16'x16' JOB

QUANTITY 202 UNIT C.F. EST. BY CK'D. BY DATE

FORM 2

TAKE OFF QUANTITY = 240 C.F.

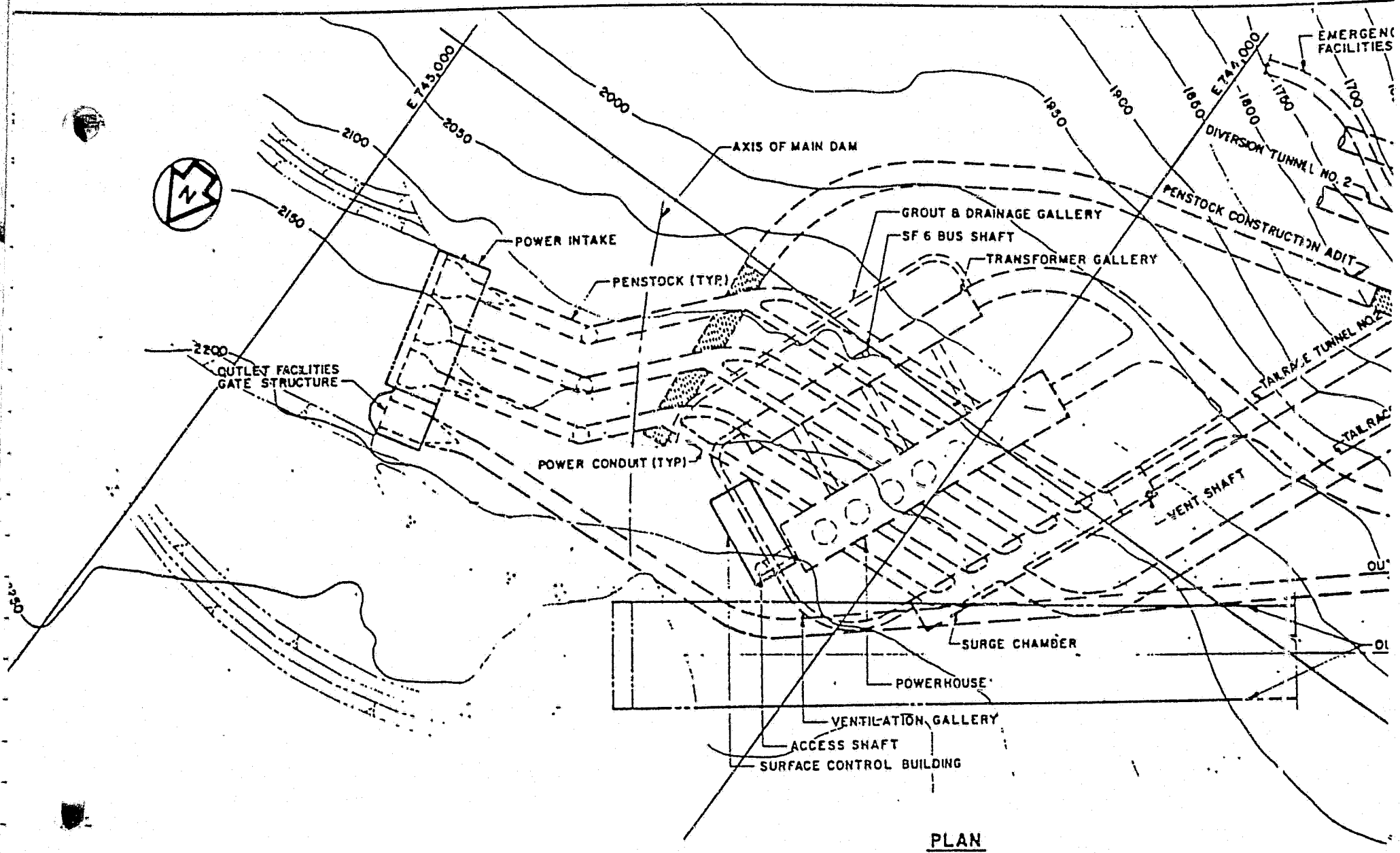
SECTION THAT FLARES FROM 16'x16' INTO TRANSFORMER GALLERY, TO BE INCLUDED IN TRANSFORMER GALLERY EXCAVATION.



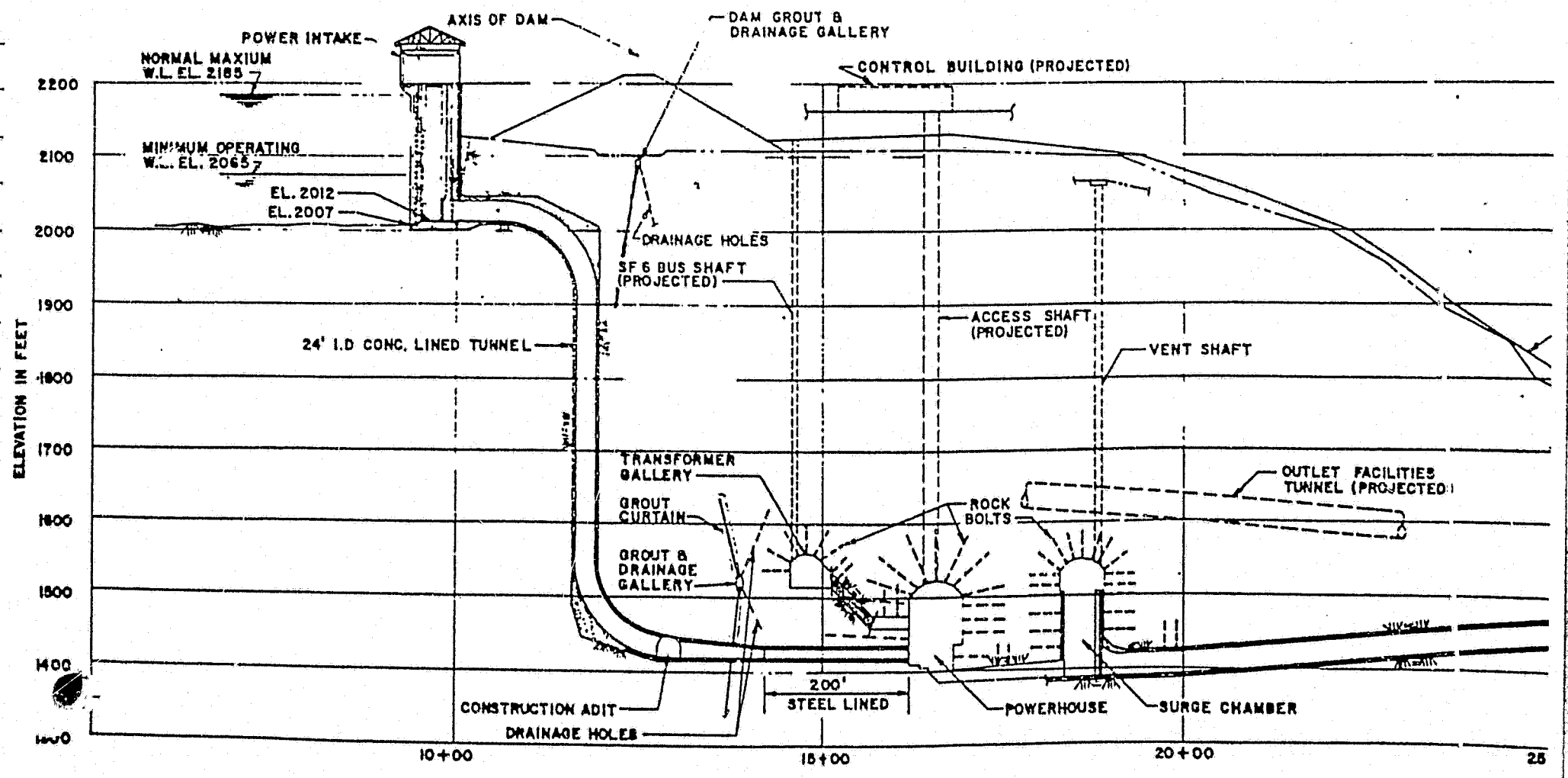
236 S.F. = 8.72 CU. YDS / C.F.

30 PERIMETER HOLES
44 AREA HOLES

8.5



PLAN



PROFILE

0 0 2 4 9 3

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 5 OF PAGE 12b

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

METHOD

DRIVE FULL FACE, USING A JOY 8 DRILL HYDRAULIC JUMBO - DRILL PRODUCTION SAME AS IN DIVERSION TUNNEL.

DRILLING

DRILL 12 FEET & PULL 10 FEET

RETRACT & SET-UP	0.80	MINUTES
DRILL	2.20	"
	3.00	MINUTES / HOLE

74 HOLES / 3 DRILLS = 25 (3) 7.5 MINUTES

CHANGE BITS EVERY 5 HOLES

74 / 3 = 25 (.25) 6 "

81 MINUTES

81 MINUTES / 50 MIN. HOUR = 1.62 HOURS

DRILL CYCLE TIME

MOVE UP & HOOK UP JUMBO	15.0	MINUTES
SCALE	10.0	"
DRILL OUT	97.0	"
UNHOOK	5.0	"
	127	

127 / 60 = 2.12 HOURS

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 4 OF PAGE 127

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

LOAD & SHOOT

BRING UP EXPLOSIVES = 5.0 MINUTES

LOAD HOLES

74 @ 8/M.H. (5 MEN)

60 MINUTE HOUR = 92.0 "

MOVE OUT = 5.0 "

102.0

60 = 1.70 HOURS

NUCKING

USE ST 13 SCOOP TRAMS

HAUL AT 5 MPH HAUL DISTANCE - 180 OCF.

RETURN AT 10 MPH.

FIGURE 11 CU. YDS. BUCK PER CYCLE

8.72 (10) (1.45) = 126.44

11 = 18 CYCLES

CYCLE TIME

LOAD	0.50	MINUTES
HAUL	4.30	"
DUMP & TURN	1.00	"
RETURN	2.15	"
	7.95 (12)	
50 MIN. HOUR	= 1.91	

2 UNITS = 0.96 HOURS.

128

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC. 9 No. Royal Avenue Eagle Point, Oregon	ENGINEERING COMPUTATIONS
Company ALASKA POWER AUTHORITY. Location . KIATAHA Description. 16'X16' BUS TUNNEL	Date..... Dr.....Ch..... Ref.....

CYCLES

1. Drill In & Out	2.12
2. Load & Shoot	1.70
3. Smoke Time	0.50
4. Muck Time	0.96
5. Supports (average time/rd.)	0.50
6. Services (average time/rd.)	0.25
Sub Total Hrs. Per Round	6.03
Lost Time @ 10 %	.60
Total Hours Per Round/Cycle	6.63
Crew Hours Worked Per Day	20
Rounds Per Day	3.02
Peak L. F. Per Day	30.20

PRODUCTION	L. F.	L. F. /Day	W/Days
	202	30.2	6.69
Total Work Days			7.0
Total L. F.			202
Ave. L. F. Per Day			28.86

129 6

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location WATANA
Description 16'X16' BUS TUNNEL

Date .....
Dr ..... Ch .....
Ref .....

Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
36.67	SHIFTERS	1	1		2	73.34
35.56	DRILLERS	3	3		6	213.36
34.84	TENDERS	3	3		6	209.04
35.95	POWDERMAN	1	1		2	71.90
31.28	TOPMAN	1	1		2	62.56
31.28	DUMPMAN	1	1		2	62.56
41.58	ELECTRICIAN	1	1		2	83.16
38.80	MUCKER OPERATOR	2	2		4	155.20
35.97	DOZER OPERATOR	1	1		2	71.94
	Total	14	14		28	1003.06

Cost Per/Day	10030.06
Cost Per M/Hr. Average	35.82
Cost Per M/Day Average	358.24
Total L. F. Or Cu. Yds.	202
Production	28.86
Total Days Required	7
Total Cost - No. Days X Cost/Day	70210.42
Cost Per/L.F.	347.58
Cost Per/Cu. Yd.	
Total Man Days	196
Total Man Hours	1960

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 7 OF - PAGE 130

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	QUANTITY	UNIT	TOTAL
SUPPLIES			
DRILL STEEL	17849 LF.	0.20	3570
EXPLOSIVES 1761 CY.@ 4.5#	7926 LB.	1.50	11889
DETONATORS 1554 (1.05 LOSS)	1632 EA.	1.00	1632
AIR & WATER LINES	202 LF.	12.00	2424
VENT LINE	202 LF.	30.00	6060
LIGHTS & ELECTRIC LINES	202 LF.	5.00	1010
FOUL WEATHER GEAR	1960 MH.	2.50	4900
			31485
SUPPORTS			
ALLOW #2423 PER CU. YD. OF EXCAVATION			
1761 CU. YDS.			42669

8.5

0024993

OPERATION EQUIPMENT SUMMA

EXCAVATION INCLINE 16'

BID QUANTITY 202 UNIT LF TAKE OF

		PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
1-3 DRILL JUMBO	83		140 90	19726
2- FANS	58		8 59	2405
1-300KW GENERATOR	45		47 52	6652
2- PUMPS	17		4 50	1260
2-ST 13 SCOOP TRAM	20		106 98	29954
1- PICKUP	99		9 08	12771
1- FLATBED	46		19 22	2691
1- D7 DOZER	20		43 84	8938
	53		340 88	72897

OPERATION EQUIPMENT SUMMARY ITEM NO. 331-152 SHEET 8 OF 8 PAGE 121

EXCAVATION INCLINE 16'x16' JOB

BID QUANTITY 202 UNIT LF TAKE OFF QUANTITY EST. BY DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
1-3 DRILL JUMBO	140	HRS			50 88 7123	48- 6720	42 02 5883			140 90 19726
2-FANS	280	"			3 89 1089	2 35 658	2 35 658			8 59 2405
1-300KW GENERATOR	140	"			17 63 2408	2 78 389	27 11 3795			47 52 6652
2-PUMPS	280	"			2 40 672	0 27 76	1 83 512			4 50 1260
2-ST 13 SCOOP TRAMS	280	"			30 05 8414	38- 10640	38 93 10900			106 98 29954
1-PICKUP	140	"			2 40 336	0 97 136	5 71 799			9 08 1271
1-FLATBED	140	"			4 01 561	4 17 584	11 04 1546			19 22 2691
1-D7 DOZER	140	"			24 04 3366	17 23 2412	22 59 3160			63 84 8938
	202	LF			118 96 24029	107- 21615	134 92 27253			360 88 72897

FOLD LENGTH
12
11
8.5
8

AUTO

MANUAL

FEED

OPERATION Bus Tunnel Slab Concrete ITEM NO. 331.154 SHEET OF PAGE 132

JOB Watana Dam

BID QUANTITY 350 UNIT C.Y. TAKE OFF QUANTITY LCE EST. BY A. Lee DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
FURNISH CONCRETE	889	CY.	17.71 15744	0.38 338	9.25 8223	8.44 7503	10.24 9103	25.00 31115		81.02 72026
PLACE CONCRETE	871	CY.	7.71 6715	0.42 366	0.60 523	0.53 462	1.33 1158			10.59 9224
WASTE CONCRETE	18	CY.								
OVERBREAK CONCRETE	268	CY.								
FABRICATE FORMS	1252	SF.	4.47 5596	3.00 3756	0.07 88	0.23 288	0.14 175			7.91 9903
ERECT FORMS	3792	SF.	7.34 27833	0.21 796	0.34 1289	0.46 1744	0.44 1665			8.79 33330
STRIP & CLEAN FORMS	3792	SF.	3.23 12248	0.10 379	0.17 645	0.23 872	0.22 834			3.95 14978
FORM HARDWARE	3792	SF.		0.75 2844						0.75 2844
CONCRETE FINISH	3312	SF	0.98 3246	0.08 265	0.06 199	0.08 265	0.09 298			1.29 4273
POINT & PATCH	3792	SF	0.78 2958	0.06 228	0.05 190	0.06 228	0.07 265			1.02 3869
CONSTRUCTION JOINT PREPARATION	234	SF.	1.08 253	0.07 16	0.10 23	0.08 19	0.17 40			1.50 351
FOUNDATION CLEANUP	4824	SF	2.15 10372	0.13 627	0.20 965	0.16 772	0.34 1640			2.98 14376
CONCRETE CURE	871	CY.	5.34 4651	0.83 723	0.20 174	0.08 70	0.47 409			6.92 6027
REINFORCING STEEL	60300	CB.						0.25 15075	0.15 9045	0.40 24120
	603	CY.	148.62 89616	17.14 10338	20.43 12319	20.27 12223	2.585 1559	76.60 46190	15.00 9045	323.91 195321
	350	CY.	148.62 52017	17.14 5999	20.43 7151	20.27 7094	2.585 904	76.60 26810	15.00 5250	323.91 113369

FOLD LENGTH
12 IN
11 IN
8.5 IN
8 IN
AUTO
MANUAL
FEED

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Excavation ITEM NO. 331.161 SHEET OF PAGE

JOB Watana Dam

BID QUANTITY 26,200 UNIT C.Y. TAKE OFF QUANTITY EST. BY A. Lee DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS	TOTAL DIRECT COST	
EXCAVATION	23176	CY.	26 40	611867												26 40	611867
SUPPLIES	23176	CY.			11 62	269204										11 62	269204
SUPPORTS	23176	CY.											28 31	656051		28 31	656051
EQUIPMENT	23176	CY.					9 24	214147	8 25	191223	10 37	240363				27 86	645733
TBM	414	LF.	281 74	116640	70 09	29017	60 68	25122	247 36	100337	103 94	43031				758 81	314147
	27076	CY.	26 91	728507	11 01	298221	8 84	239269	10 77	291560	10 47	283394	24 23	656051		92 23	2497002
	26200	CY	26 91	705042	11 01	288462	8 84	231608	10 77	282174	10 47	274314	24 23	634826		92 23	2416426

FOLD LENGTH
12
11
8.5
8
AUTO
MANUAL
FEED

OPERATION TRANSFORMER GALLERY EXCAVATION ITEM NO. 331-161 SHEET 1 OF PAGE 137

JOB

QUANTITY 26,200 UNIT C.Y. EST. BY CK'D. BY DATE

FORM 2

TAKE OFF QUANTITY

1- MAIN SECTION

2- BUS INCLINE TUNNELS

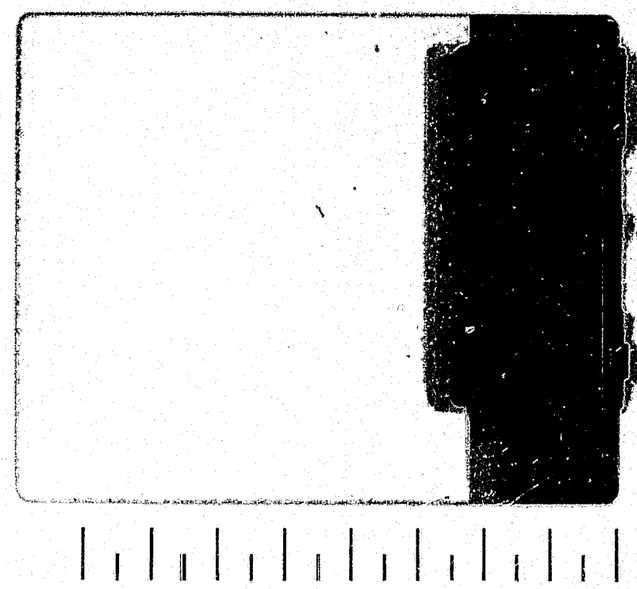
MISC. SUMPS, ETC.

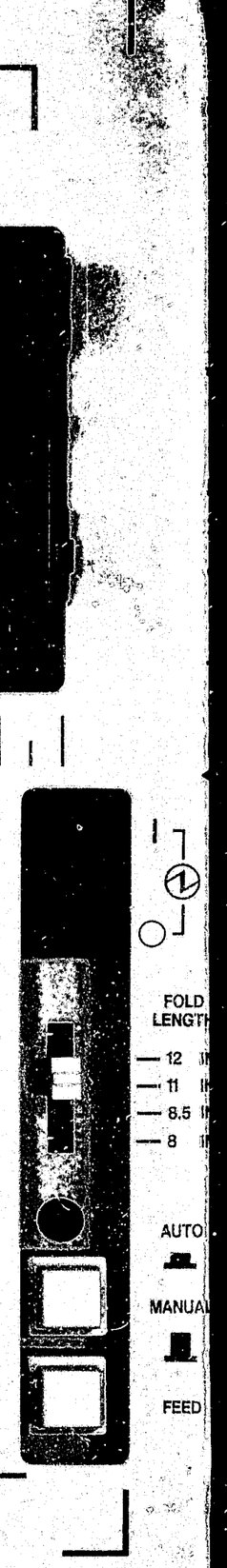
26372 CU.YDS
504 " "
26876 CU.YDS
200 " "
27076

(10) 82 S.F. 1257 C.Y.	(8) 122 S.F. 1871 C.Y.	(7) 122 S.F. 1871 C.Y.	(9) 82 S.F. 1257 C.Y.
		1579 C.Y.	1273 C.Y.
(6) 96 S.F. 1472 C.Y.	18'ϕ T.B.M. 3900 C.Y. 254 S.F.	(2) 103 S.F.	(4) 83 S.F.
		1579 C.Y.	1273 C.Y.
(5) 96 S.F. 1472 C.Y		(1) 103 S.F	(3) 83 S.F.
(11) 247.5 S.F. 3795 C.Y.		(12) 247.5 S.F 3795 C.Y.	

1720 S.F. = 63.7 CU. YDS / L.F.

414 L.F.





OPERATION ITEM NO. SHEET 3 OF PAGE 136

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

BLOCK 1

103

27 = 3.81 C.Y. / L.F. (9 ROUNDS)

FIGURE 46 L.F. LONG x 9 L.F. HIGH = SHOTS = 1115.26 C.Y.

FIGURE 1 DRILL HOLE PER 3 1/2 S.F. OF FACE

46 (9)

3.5 = 118 HOLES - AVERAGE DEPTH = 12.42 L.F.
OVER DRILL 1 L.F.

BLOCK 2

SAME AS ABOVE

BLOCK 3

83

27 = 3.07 C.Y. / L.F. (9 ROUNDS)

FIGURE 46 L.F. LONG x 9 L.F. HIGH - SHOTS = 141.22 C.Y.

FIGURE 1 DRILL HOLE PER 3 1/2 S.F. OF FACE

46 (9)

3.5 = 118 HOLES - AVERAGE DEPTH = 9.5 L.F.
OVER DRILL 1 L.F.

BLOCK 4

SAME AS ABOVE

BLOCK 5

96

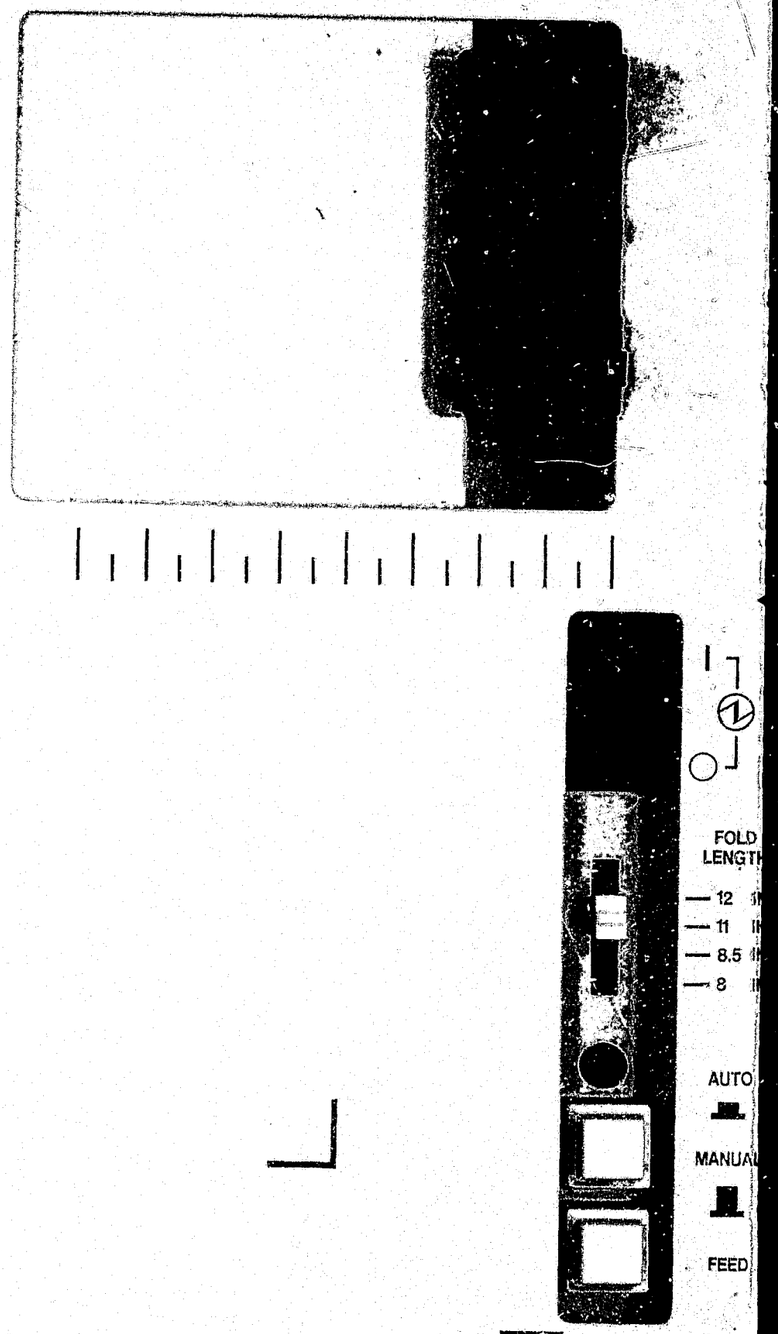
27 = 3.56 C.Y. / L.F. (9 ROUNDS)

FIGURE 46 L.F. LONG x 9 L.F. HIGH SHOTS = 163.96 C.Y.

FIGURE 1 DRILL HOLE PER 3 1/2 S.F. FACE

46 (9)

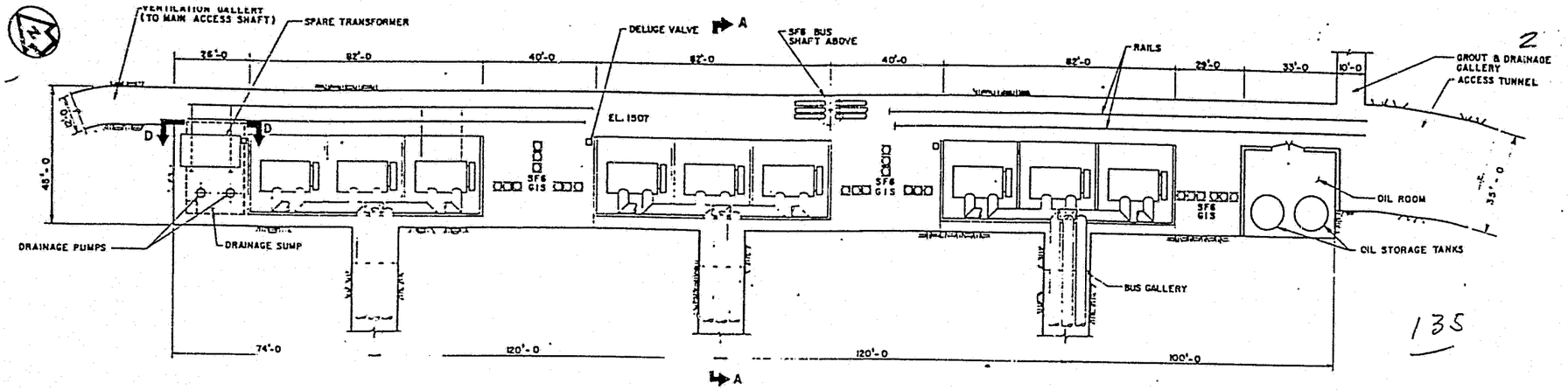
3.5 = 118 HOLES - AVERAGE DEPTH = 12 L.F.
OVER DRILL 1 L.F.



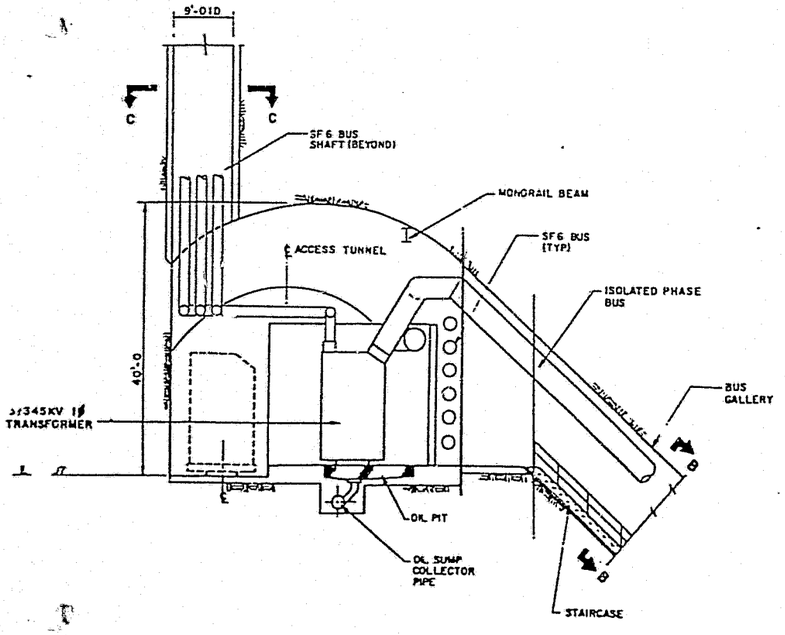
0 0 2 4 9 3

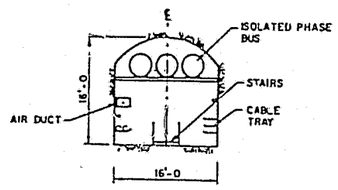
12

11

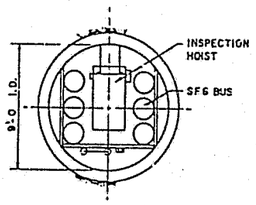


PLAN
SCALE A

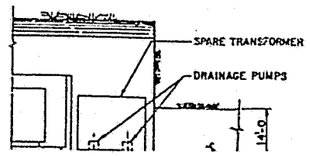




SECTION B-B
THROUGH BUS GALLERY
SCALE B



SECTION C-C
THROUGH BUS SHAFT
SCALE C



SCALE C 0 4 8 FEET (1/4 INCH = 1 FOOT)
SCALE B 0 8 16 FEET (1/8 INCH = 1 FOOT)
SCALE A 0 16 32 FEET (1/16 INCH = 1 FOOT)

HARZA-EBASCO	ALASKA POWER AUTHORITY
	SUSITNA HYDROELECTRIC PROJECT
	WATANA

135

OPERATION ITEM NO. SHEET 4 OF PAGE 127

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

BLOCK 6

SAME AS BLOCK 5

BLOCK 7

122

27 = 4.52 C.Y./L.F.

(12 ROUNDS)

FIGURE 34.5 L.F. LONG x 11.25 L.F. WIDE - SHOTS = 155.94 C.Y.

FIGURE 1 DRILL HOLE PER 3½ S.F. FACE

34.5 (11.25)

3.5 = 111 HOLES - AVERAGE DEPTH = 11.17 L.F.

OVERDRILL 1 L.F.

BLOCK 8

SAME AS ABOVE

BLOCK 9

82

27 = 3.04 C.Y./L.F.

(9 ROUNDS)

FIGURE 46 L.F. LONG x 11.25 L.F. WIDE - SHOTS = 139.84 C.Y.

FIGURE 1 DRILL HOLE PER 3½ S.F. FACE

46 (11.25)

3.5 = 148 HOLES - AVERAGE DEPTH = 7 L.F.

OVERDRILL 1 L.F.

BLOCK 10

SAME AS ABOVE

0024933

OPERATION ITEM NO. SHEET 15 OF PAGE 135

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

BLOCK 11

247.5
27 = 9.17 CU. YDS. / L.F. (21 ROUNDS)

FIGURE 20 L.F. LONG X 22.5 L.F. WIDE - SHOTS = 183.33 C.Y.

FIGURE 1 DRILL HOLE PER 12 S.F. OF BENCH

22.5 (20)
12 = 38 HOLES - DEPTH OF 11 L.F.
OVERDRILL 1 L.F.

BLOCK 12

SAME AS ABOVE

OPERATION ITEM NO. SHEET 6 OF PAGE 139

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	PER ROUND	ROUNDS	LENGTH
HOLES PER ROUND			
BLOCKS 1 & 2	118	18	14
BLOCKS 3 & 4	118	18	11
BLOCKS 5 & 6	118	18	13
BLOCKS 7 & 8	111	24	12
BLOCKS 9 & 10	148	18	8
BLOCKS 11 & 12	38	42	12

DRILLING

1- FOR ALL BLOCKS USE 1 - 3 DRILL JOY HYDRAULIC JUMBO.

2- WEIGHTED AVERAGE HOLE DEPTH = 11.45 L.F.

RETRACT & SET-UP 0.80 MINUTES

DRILL 2.20 "

3.0 MINUTES / HOLE

1- 118 HOLES

3 DRILLS = 39.33 (3)

CHANGE BITS EVERY 3 HOLES

118 / 3 = 39.33 (0.25)

118 MINUTES

10 "

128 MINUTES

128 MINUTES

50 MIN. HOUR

2.56 HOURS.

0 0 2 4 9 3

OPERATION ITEM NO. SHEET 7 OF PAGE 1/2

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

2- 111 HOLES
3 DRILLS = 37 (3) :
CHANGE BITS EVERY 3 HOLES
111
3 = 37 (0,25) =

120 MINUTES
50 MIN. HOUR

3- 148 HOLES
3 DRILLS : 49.33 (3) =
CHANGE BITS EVERY 3 HOLES
148
3 = 49 (0.25)

160 MINUTES
50 MIN. HOUR.

4- 38 HOLES
3 DRILLS : 12.67 (3) :
CHANGE BITS EVERY 3 HOLES
38
3 = 12.67 (0.25) =

41 MINUTES
50 MINUTE HOUR

111 MINUTES

9 "

120 MINUTES

2.40 HOURS

148 MINUTES

12 "

160 MINUTES

3.20 HOURS.

38 MINUTES

3 "

41 MINUTES

0.82 HOURS

OPERATION ITEM NO. SHEET 8 OF PAGE 141

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

DRILLING AVERAGE

2.56 (18) = 46.08

2.40 (24) = 57.60

3.20 (18) = 57.60

0.82 (42) = 34.44

195.72

138 = 1.42 HOURS

DRILL CYCLE TIME

MOVE UP & HOOK UP JUMBO	5.0 MINUTES
SCALE	5.0 "
DRILL OUT	85.0 "
UNHOOK	5.0 "
	100.0
	60 = 1.67 HOURS

LOAD & SHOOT

118 @ 8/M.H. (5 MEN)

60 MINUTE HOUR = 148 MINUTES

111 @ 8/M.H. (5 MEN)

60 MINUTE HOUR = 139 "

148 @ 8/M.H. (5 MEN)

60 MINUTE HOUR = 185 "

38 @ 8/M.H. (5 MEN)

60 MINUTE HOUR = 47 "

OPERATION ITEM NO. SHEET 9 OF PAGE 142

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

LOAD & SHOOT AVERAGE

148 (18) = 2664

139 (24) = 3336

185 (18) = 3330

47 (42) = 1974

11304

138 = 81.91 MINUTES.

LOAD & SHOOT

BRING UP EXPLOSIVES 5.0 MINUTES

LOAD HOLES 81.91 "

MOVE OUT 5.0 "

91.91 MINUTES

CO = 1.53 HOURS.

MUCKING

USE ST 13 SCOOP TRAMS

HAUL AT 5 MPH HAUL DISTANCE = 1910 LF.

RETURN AT 10 MPH.

FIGURE 11 CU. YDS. BULK PER CYCLE.

CYCLE TIME

LOAD	0.50 MINUTES
HAUL	4.34 "
DUMP & TURN	1.00 "
RETURN	2.17 "
	8.01 MINUTES PER CYCLE

50 MINUTE HOUR

8.01 MIN./CYCLE = 6.24 (11) = 68.64 CU. YDS BULK PER HOUR

0024933

OPERATION ITEM NO. SHEET 10 OF PAGE 143

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	C.Y./ROUND	ROUNDS	C.Y.
BLOCKS 1 & 2	175.26	18	3155
BLOCKS 3 & 4	141.22	18	2542
BLOCKS 5 & 6	163.76	18	2948
BLOCKS 7 & 8	155.94	24	3743
BLOCKS 9 & 10	139.84	18	2517
BLOCKS 11 & 12	183.33	42	7700
		138	22605

22605
138 = 163.80 (1.45) = 237.51 CU. YDS. BOLK-AVERAGE

68.46 (2 UNITS) = 137.28 CU. YDS. / HOUR

237.51
137.28 = 1.73 HOURS.

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location WATANA
Description TRANSFORMER GALLERY

Date
Dr. Ch.
Ref.

CYCLES

1. Drill In & Out	1.67
2. Load & Shoot	1.53
3. Smoke Time	0.50
4. Muck Time	1.73
5. Supports (average time/rd.)	0.50
6. Services (average time/rd.)	0.25
Sub Total Hrs. Per Round	6.18
Lost Time @ 10 %	.62
Total Hours Per Round/Cycle	6.80
Crew Hours Worked Per Day	20
Rounds Per Day	2.94
Peak L. F. Per Day	-0-

PRODUCTION	L. F.	L. F. /Day	W/Days
ROUNDS	138	2.94	47
TIGHTS		ALLOW	5
BUS INCLINE TUNNELS	3	1	3
SUMPS, ETC.		ALLOW	6
Total Work Days			61
Total L. F.			-0-
Ave. L. F. Per Day			-0-

145

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC. 9 No. Royal Avenue Eagle Point, Oregon	ENGINEERING COMPUTATIONS
Company ..... Location ..... Description	Date ..... Dr .....Ch ..... Ref .....

Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.

OPERATION ITEM NO. SHEET 13 OF PAGE 141

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	QUANTITY	UNIT	TOTAL
SUPPLIES			
DRILL STEEL	153144 LF.	0.20	30629
EXPLOSIVES 27076 C.Y. @ 4#	108304 LB.	1.50	162456
DETONATORS 13296 EA. (1.05 LOSS)	13961 EA.	1.00	13961
AIR & WATER LINES	414 LF.	12.00	4968
VENT LINE	414 LF.	30.00	12420
LIGHTS & ELECTRIC LINES	414 LF.	5.00	2070
FOUL WEATHER GEAR	17080 M.H.	2.50	42700
			269204
SUPPORTS			
ALLOW #24.23 PER CU. YD. OF ROCK EXCAVATION			
27076 CU. YDS.,			656051

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION EQUIPMENT SUMMARY ITEM NO. 331-161 SHEET 14 OF PAGE

TRENCHFORMED GALLERY EXCAVATION JOB VIATANA

BID QUANTITY 26200 UNIT CY TAKE OFF QUANTITY 27076 EST. BY DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
1-3 DRILL JUMBO	1220	HRS			50.88 / 62074	48.- / 58560	42.02 / 51264			140.90 / 171898
3-FANS	3660	"			3.89 / 14237	2.35 / 8601	2.25 / 8601			8.59 / 31439
1-300 KW GENERATOR	1220	"			17.63 / 21509	2.78 / 3392	27.11 / 33074			47.52 / 57975
2-PUMPS	2440	"			2.40 / 5856	0.27 / 659	1.83 / 4465			4.50 / 10980
2-ST 13 SCOOP TRAMS	2440	"			30.05 / 73322	38.- / 92720	38.93 / 94989			106.98 / 261031
1-PICKUP	1220	"			2.40 / 2928	0.97 / 1183	5.71 / 6966			9.08 / 11077
1-FLATBED	1220	"			4.01 / 4892	4.17 / 5087	11.04 / 13469			19.22 / 23448
1-D7 DOZER	1220	"			24.04 / 29329	17.23 / 21021	22.57 / 27535			63.84 / 77885
	27076	CY.			7.91 / 214147	7.06 / 191223	8.88 / 240363			23.85 / 645733
	26200	CY.			7.91 / 207242	7.06 / 184972	8.88 / 232656			23.85 / 624870

FOLD LENGTH
12
11
8.5
8
AUTO
MANUAL
FEED

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Concrete Slab ITEM NO. 331.164 SHEET ___ OF ___ PAGE 148

JOB Watana Dam

BID QUANTITY 2,100 UNIT C.Y. TAKE OFF QUANTITY 2092 EST. BY A. Lee DATE ___

2C PODS	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS		TOTAL DIRECT COST	
FURNISH CONCRETE	7852	CY.	17 21	50509	0 38	10834	9 25	26381	8 44	24071	10 24	29204	35 00	99820			81 02	231069
PLACE CONCRETE	2800	CY.	7 71	21588	0 42	1176	0 49	1680	0 53	1484	1 33	3724					10 59	29652
CONCRETE WASTE	52	CY.																
CONCRETE OVERBREAK	706	CY.																
FABRICATE FORMS	4790	SF.	4 47	21411	3 00	14370	0 07	335	0 23	1107	0 14	671					7 91	37889
ERECT FORMS	28742	SF	7 34	210946	0 21	6036	0 34	9772	0 46	13221	0 44	12646					8 79	252641
STRIP & CLEAN FORMS	28742	SF.	3 23	92837	0 10	2874	0 17	4886	0 23	6611	0 22	6323					3 95	113531
FORM HARDWARE	28742	SF.			0 75	21557											0 75	21557
CONCRETE FINISH	19753	SF.	0 98	19358	0 08	1580	0 06	1185	0 08	1580	0 09	1778					1 29	25481
POINT & PATCH	28742	SF	0 78	22419	0 06	1725	0 05	1437	0 06	1725	0 07	2012					1 02	29318
CONSTRUCTION JOINT CLEANUP	643	SF.	1 06	694	0 07	45	0 10	64	0 08	51	0 17	109					1 50	963
FOUNDATION PREPARATION	19110	SF.	2 15	41087	0 13	2484	0 20	3822	0 16	3058	0 24	4497					2 98	56948
CONCRETE CURE	2800	CY.	5 34	14952	0 83	2324	0 20	560	0 08	224	0 47	1316					6 92	19376
REINFORCING STEEL	209200	LB											0 25	52300	0 15	31380	0 40	83680
	2092	CY.	237 01	495821	26 41	55255	23 96	50122	25 40	53127	30 73	64280	72 72	152120	15 00	31380	431 23	902105
	2100	CY.	237 01	497721	26 41	55461	23 96	50316	25 40	53340	30 73	64533	72 72	152712	15 00	31500	431 23	905583

FOLD LENGTH
12 IN
11 IN
8.5 IN
8 IN
AUTO
MANUAL
FEED

0 0 2 4 9 3

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Drain Holes ITEM NO. 331.167 SHEET ___ OF ___ PAGE 149

JOB Watana Dam

BID QUANTITY 8,300 UNIT L.F. TAKE OFF QUANTITY — EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SAME AS ITEM 331.117	8300	LF	2 26 / 73074	0 21 / 1743	1 13 / 9379	0 43 / 3569	0 86 / 7138			5 41 / 44903

FOLD LENGTH
12 IN
11 IN
8.5 IN
8 IN
AUTO
MANUAL
FEED

0 0 2 4 9 3

OPERATION Excavation 10.5' Diameter ITEM NO. 331.171 SHEET ___ OF ___ PAGE 10

JOB

BID QUANTITY 560 UNIT L.F. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE

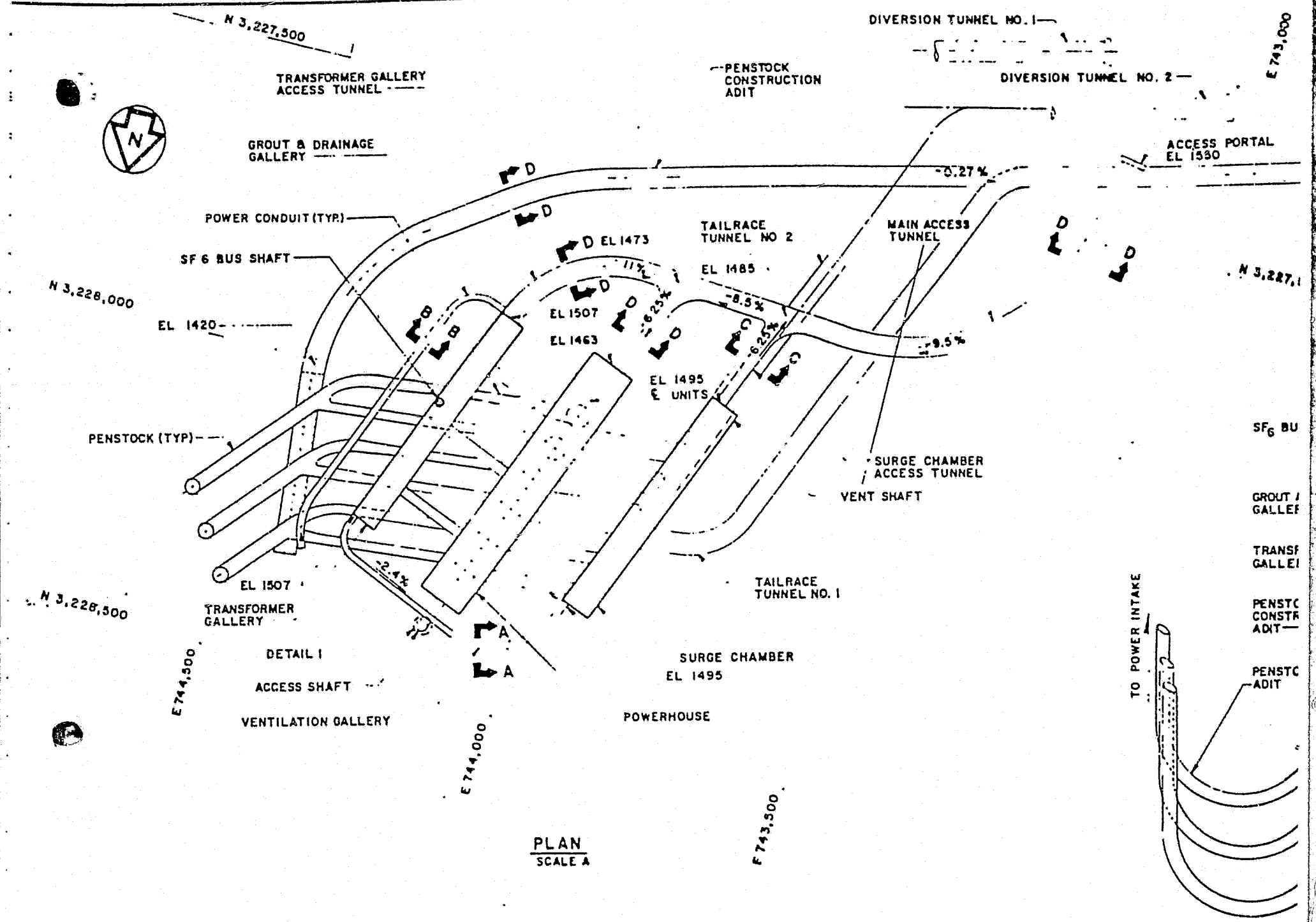
	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
EXCAVATION	560	LF	298.32 1670.59							298.32 1670.59
SUPPLIES	560	LF		88.01 492.85						88.01 492.85
SUPPORTS	560	LF						77.80 435.66		77.80 435.66
EQUIPMENT	560	LF			79.08 442.87	112.87 632.09	107.15 600.04			299.10 1675.00
	560	LF	298.32 1670.59	88.01 492.85	79.08 442.87	112.87 632.09	107.15 600.04	77.80 435.66		763.23 4274.10

FOLD LENGTH
12
11
8.5
8

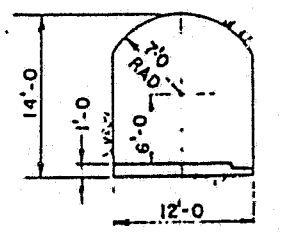
AUTO

MANUAL

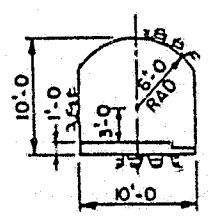
FEED



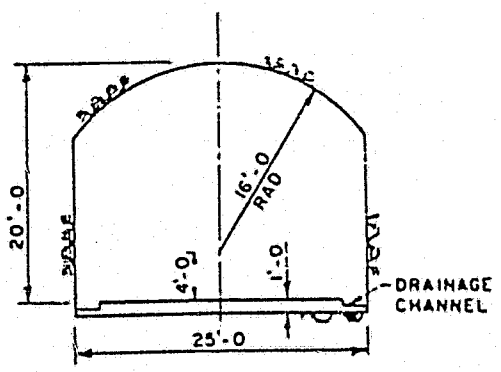
PLAN
SCALE A



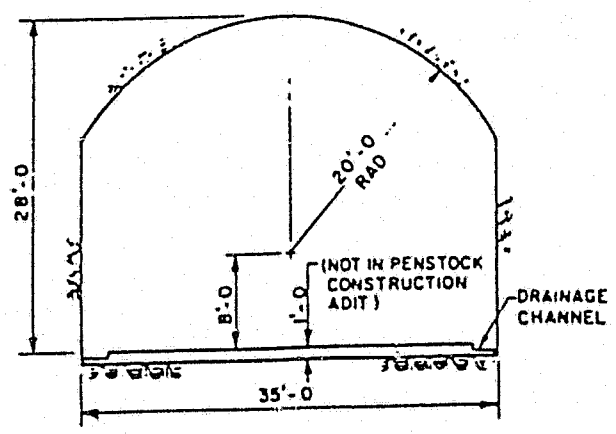
SECTION A-A
SCALE B



SECTION B-B
SCALE B



SECTION C-C
SCALE B



SECTION D-D
SCALE B

COUNT

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION EXCAVATION - 10.5'Φ RAISE SHAFT — ITEM NO. 131-171 SHEET 2 OF — PAGE 152

JOB WATANA

QUANTITY 560 UNIT C.F. EST. BY — CK'D. BY — DATE

ORM 2

ASSUME QUANTITY IS CORRECT.

METHOD

USE ALIMAK RAISE CLIMBER TO DRILL OUT FULL FACE.

BLAST HOLES AT 3 S.F./HOLE PLUS 1 BURN & 3 RELIEF HOLES = 33 HOLES PER ROUND

DRILL 10 C.F. & PULL 8 C.F.

560
8 = 70 ROUNDS.

RAISE CYCLE

LOAD TROLLEY & CLIMBER	10	MINUTES
TRAVEL TO FACE-280 L.F. AVE. @ 40 FPM	7	"
SCALE LOOSE MATERIAL & HOOK-UP	60	"
INSTALL GUIDERAIL & VENT PIPE	60	"
SURVEY-CHECK DIRECTION	10	"
DRILL ROUND-2 DRILLS-33 HOLES-5 MIN./HOLE	83	"
EXPLOSIVES BROUGHT UP BY THIRD MAN	5	"
LOAD HOLES-33 @ 8/MIN.-(3 MEN)	83	"
TRAVEL TO BOTTOM-SAME AS TO FACE	7	"
PARK UNIT & BLAST	15	"
SMOKE	30	"
	370	MINUTES

60 = 6.17 HOURS.

MUCKING

10.5 Φ (8)

27 = 26 (1.45 SWELL) = 37 CU. YDS. BULK

USE ST 13 @ 11 CU. YDS. = 4 CYCLES

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION _____ ITEM NO. _____ SHEET 3 OF _____ PAGE 153

JOB _____

QUANTITY _____ UNIT _____ EST. BY _____ CK'D. BY _____ DATE _____

FORM 2

HAUL SPEED 5 MPH
RETURN SPEED 10 MPH

HAUL DISTANCE = 1910 CF

CYCLE TIME

LOAD	0.50 MINUTES
HAUL	4.34 "
DUMP & TURN	1.00
RETURN	2.17
	8.01 MINUTES / CYCLE

8.01 (4) = 32.04 MINUTES
50 MIN. HOUR = 0.64 HOURS.

SUPPLIES	QUANTITY	UNIT	TOTAL
DRILL STEEL	23100 LF.	0.20	4620
EXPLOSIVES 1798 CY. @ 4.5#	8089 LB.	1.50	12134
DETONATORS 2310 + 5% LOSS	2426 EA.	1.00	2426
AIR & WATER LINE	560 LF.	8.00	4480
FAN LINE	560 LF.	20.00	11200
LIGHTS & ELECTRIC LINE	560 LF.	5.00	2800
FOUL WEATHER GEAR	4650 MH.	2.50	11625
			49285

SUPPORTS
ALLOW $2.23 PER CU. YD. OF EXCAVATION - 1798 C.Y. 43566

154

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC. 9 No. Royal Avenue Eagle Point, Oregon	ENGINEERING COMPUTATIONS
Company ALASKA POWER AUTHORITY. Location KATANA Description BUS SHAFT	Date Dr. Ch. Ref.

CYCLES

1. Drill In & Out	3.04
2. Load & Shoot	1.63
3. Smoke Time	0.50
4. Muck Time	0.64
5. Supports (average time/rd.)	1.00
6. Services (average time/rd.)	1.00
Sub Total Hrs. Per Round	7.81
Lost Time @ 10 %	78
Total Hours Per Round/Cycle	8.59
Crew Hours Worked Per Day	20
Rounds Per Day	2.33
Peak L. F. Per Day	18.64

PRODUCTION	L. F.	L. F. /Day	W/Days
TURN UNDER			1.0
	560	18.64	30.0

Total Work Days 31.0
Total L. F. 560
Ave. L. F. Per Day 18.06

00249 93

155 5

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location WATANA
Description BUS SHAFT

Date .....
Dr .....Ch .....
Ref .....

Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
	SAME AS POWERHOUSE ACCESS SHAFT					
	Total	8	7		15	538.90

Cost Per/Day	5389.00
Cost Per M/Hr. Average	35.93
Cost Per M/Day Average	359.27
Total L. F. Or Cu. Yds.	5LOCF
Production	18.06
Total Days Required	31
Total Cost - No. Days X Cost/Day	167059.00
Cost Per/L. F.	298.32
Cost Per/Cu. Yd.	
Total Man Days	465
Total Man Hours	4650

OPERATION EQUIPMENT SUMMA

BIDS SHEET

BID QUANTITY 560 UNIT L.F. TAKE O

		PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST	
1-ALLIGAK GROUNDHOG	48			69 77	4325B
1-FAN	57			8 59	5326
1-ST13	37			106 98	66328
1-300KW GENERATOR	08			47 52	29463
1-FLATBED	45			19 22	11916
1-PICKUP	40			9 08	5629
2-PUMPS	69			4 50	5580
	04			299 10	167500

12

11

OPERATION EQUIPMENT SUMMARY ITEM NO. 331-171 SHEET 6 OF ___ PAGE [illegible]

BUS SHAFT JOB VIATANA

BID QUANTITY 560 UNIT LF. TAKE OFF QUANTITY 560 EST. BY ___ DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST	
1-ALLMAK GROUNDHOG	620	HRS			8.65	5363	53.14	32947	7.98	4948			69.77	43258
1-FAN	620	"			3.89	2412	2.35	1457	2.35	1457			8.59	5326
1-ST13	620	"			30.05	18631	38	23560	38.93	24137			106.98	66328
1-300KW GENERATOR	620	"			17.63	10931	2.78	1724	27.11	16808			47.52	29463
1-FLATBED	620	"			4.01	2486	4.17	2585	11.04	6845			19.22	11916
1-PICKUP	620	"			2.40	1488	0.97	601	5.71	3540			9.08	5629
2-PUMPS	1240	"			2.40	2976	0.27	335	1.83	2269			4.50	5580
	560	LF			79.08	44287	112.87	63209	107.15	60004			299.10	167500

FOLD LENGTH

12

11

8.5

8

AUTO

MANUAL

FEED

OPERATION Concrete Lining 9.0' Diameter ITEM NO. 331.174 SHEET ___ OF ___ PAGE 157

JOB Watana Dam

BID QUANTITY 560 UNIT L.F. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS		TOTAL DIRECT COST	
FURNISH CONCRETE	1197	CY.	17.71	21199	0.38	455	9.25	11072	8.44	10103	10.24	12257	35.03	41895			81.02	96981
PLACE CONCRETE	1141	CY.	11.89	13566	0.50	571	1.92	2191	2.66	3035	2.43	2773					19.40	22136
CONCRETE WASTE	56	CY.																
CONCRETE OVERBREAK	489	CY.																
FABRICATE FORMS	565	SF.	11.93	6769	2.42	1932	0.19	107	0.62	350	0.37	209					16.53	9367
ERECT FORMS	15831	SF.	7.34	116200	0.21	3325	0.34	5383	0.46	7282	0.44	6966					8.79	139156
STRIP & CLEAN FORMS	15831	SF.	3.23	51134	0.10	1583	0.17	2691	0.23	3641	0.22	3483					3.95	62532
FORM HARDWARE	15831	SF.			0.75	11873											0.75	11873
POINT & PATCH	15831	SF.	0.78	12348	0.06	950	0.05	792	0.06	950	0.07	1108					1.02	16148
CONSTRUCTION JOINT CLEANUP	280	SF.	1.08	950	0.07	62	0.10	88	0.08	70	0.17	150					1.50	1320
CONCRETE CURE	1141	CY.	5.34	6093	0.83	947	0.20	228	0.08	91	0.47	536					6.92	7895
ROCK CLEANUP	19254	SF.	2.15	41611	0.13	2516	0.20	3871	0.16	3097	0.34	6580					2.98	57675
REINFORCING STEEL	65200	LB.											0.25	16300	0.15	9780	0.40	26080
	560	CF.	481.91	269870	43.24	24214	47.18	26423	51.11	28619	60.83	34062	103.92	58195	17.46	9780	805.65	451163

12
11
FOLD LENGTH
12
11
8,5
8
AUTO
MANUAL
FEED

OPERATION Miscellaneous Metalwork ITEM NO. 331.178 SHEET ___ OF ___ PAGE 1/2

JOB Watana Dam

BID QUANTITY 9 UNIT Tns. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SUB-CONTRACT	9	Tns.							$5000 45000	$5000 45000

12

11

FOLD LENGTH
12
11
8.5
8

AUTO

MANUAL

FEED

OPERATION Enclousures (Architectural) ITEM NO. 331.179 SHEET OF PAGE 1.19

JOB Watana Dam

BID QUANTITY 1 UNIT L.S. TAKE OFF QUANTITY EST. BY A. Lee DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SUB-CONTRACT	1	LS.							LS. 58000	LS. 58000

OPERATION Manhoist ITEM NO. 331.170 SHEET ___ OF ___ PAGE 12

JOB Watana Dam

BID QUANTITY 1 UNIT Ea. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SUB-CONTRACT	1	LS.							LS. 154000	LS. 154000

FOLD
LENGTH
12
11
8.5
8
AUTO
MANUAL
FEED

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION CARE OF WATER ITEM NO. 331.18 SHEET ___ OF ___ PAGE ___

JOB Watana Dam

BID QUANTITY 1 UNIT L.S. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
2631 UNDERGROUND DAYS	52620	HRS			4.41 232054	0.50 26310	3.85 202587			8.76 460951

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION INSTRUMENTATION ITEM NO. 331.19 SHEET ___ OF ___ PAGE 122

JOB Watana Dam

BID QUANTITY 1 UNIT L.S. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SUBCONTRACT	1	LS.							LS. 140000	LS. 140000

FOLD LENGTH
12
11
8.5
8

AUTO

MANUAL

FEED

OPERATION MISCELLANEOUS BUILDINGS & STRUCTURES ITEM NO. 331.20 SHEET ___ OF ___ PAGE 155

JOB Watana Dam

BID QUANTITY 1 UNIT L.S. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SUBCONTRACT	1	LS.							LS. 1215000	LS. 1215000

FOLD LENGTH
12
11
8,5
8

AUTO

MANUAL

FEED

OPERATION Reservoir Clearing ITEM NO. 332.10 SHEET ___ OF ___ PAGE ___

JOB Watana Dam

BID QUANTITY 37,500 UNIT Ac. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
PER DETAIL	11636	AC	1131.85 13170207	25.00 290900	149.70 1741909	103.50 1204926	166.40 1936230			1576.45 18343572
PER DETAIL	25864	AC	452.74 11709667	10.00 258640	59.88 1548736	41.40 1070770	66.56 1721508			130.58 16309321
	37500	AC	663.46 24879874	14.65 549540	87.75 3290645	60.67 2275096	97.54 3657738			924.07 34652893

OPERATION FOREST CLEARING ITEM NO. 2 SHEET 1 OF 1 PAGE 165

JOB VILLAGE C.P.

QUANTITY 37,500 UNIT ACRES EST. BY CK'D. BY DATE

FORM 2

EXCEPT FOR AREA ALONG RIVER BANKS, THIS IS A VERY UNIFORM OPERATION

RIVER BANKS

96 BANK MILES SAY 1000 FEET WIDE = 11636 ACRES

FIGURE 2 ACRES PER SHIFT WITH THE FOLLOWING SPREAD.

SPREAD	LABOR	EQUIPMENT	SUPPLIES
1-D7 DOZER	24.04	17.23	22.57
1-PICKUP	2.40	0.97	5.71
1-MISC.	3.50	2.50	5.00
1-DOZER OPERATOR	35.97		
5-LABORERS	156.40		5.00
1-FOREMAN	34.00		
COST PER HOUR	256.31	20.70	38.28
COST PER SHIFT	2563	207	383
	3153		5 ACRE

SUMMARY	UNIT PRICE	TOTAL	UNIT PRICE
DIRECT LABOR	1131.85	13170397	4.5274
SUPPLIES	25.00	290900	10.00
REPAIR LABOR	149.70	1741909	59.88
EQUIPMENT	103.50	1204326	41.40
EQUIP. SUPPLIES	146.40	1936230	66.56
	1576.45	18343572	630.58

FIGURE BALANCE OF CLEARING WITH SAME SPREAD AT 5 ACRES/SHIFT.

OPERATION Access Tunnel to Gate Cham

15' x 20'

BID QUANTITY 2,100 UNIT L.F. TAKE OFI

	PERMANENT MATERIALS		SUB-CONTRACTS		TOTAL DIRECT COST	
EXCAVATION					351 96	749023
SUPPLIES					171 30	359740
SUPPORTS	243 51	511374			243 51	511374
EQUIPMENT 18					319 16	670227
	18 243 51	511374			1090 93	2290964

OPERATION Access Tunnel to Gate Chamber ITEM NO. 332.210 SHEET ___ OF ___ PAGE ___

15' x 20' JOB Watana Dam

BID QUANTITY 2,100 UNIT L.F. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
EXCAVATION	2100	LF.	356.96 7 49 623							356.96 7 49 623
SUPPLIES	2100	LF.		171.30 359 740						171.30 359 740
SUPPORTS	2100	LF.						243.51 511 374		243.51 511 374
EQUIPMENT	2100	LF.			109.23 229 377	89.79 188 552	120.14 252 298			319.16 670 229
	2100	CF.	356.96 7 49 623	171.30 359 740	109.23 229 377	89.79 188 552	120.14 252 298	243.51 511 374		1090.93 2 290 964

DIVERSIFIED CONSTRUCTORS, INC.

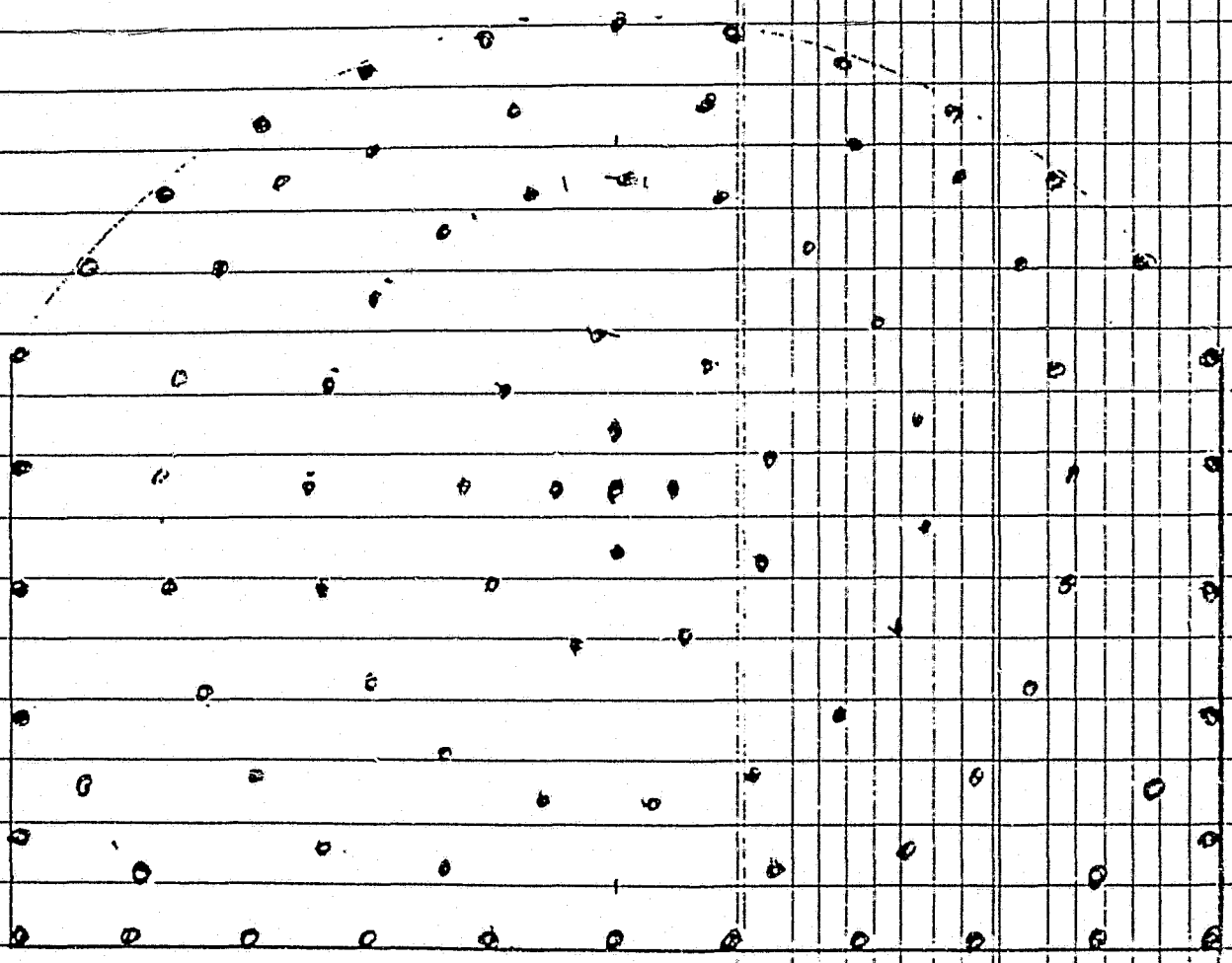
OPERATION ACCESS TUNNEL TO GATE CHAMBER 15'x20' ITEM NO. 332-210 SHEET 1 OF PAGE 167

JOB

QUANTITY 2100 UNIT C.F. EST. BY CK'D. BY DATE

FORM 2

TAKEOFF LENGTH = 2100 L.F.



AREA = 271.36 S.F.

VOLUME = 10.05 C.Y./L.F.

91 HOLES

0024933

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 2 OF PAGE 168

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

METHOD

DRIVE FULL FACE, USING A JOY-3 DRILL HYDRAULIC JUMBO - DRILL PRODUCTION SAME AS IN DIVERSION TUNNEL.

DRILL 12 FT & PULL 10 FT.

RETRACT & SETUP	0.80 MINUTES	
DRILL	2.20 "	
	3.0 MINUTES / HOLE	

91 HOLES

3 DRILLS = 30.33 (3) 91 MINUTES

CHANGE BITS EVERY 2 HOLES

91

3 = 30.33 (0.25) 8 "

99 MINUTES

99 MINUTES

50 MIN. HOUR = 1.98 HOURS

LOAD & SHOOT

BRING UP EXPLOSIVES	5.0 MINUTES	
91 HOLES @ 8/H.H. (5 MEN)	1140 "	
MOVE OUT	50 "	
	1240 MINUTES	
	60 = 2.0 HRS.	

MUCKING

USE ST 13 SCOOP TRAMS

HAUL DISTANCE - 1300 CF

HAUL AT 5 MPH 2.95

RETURN AT 10 MPH 1.48

CYCLE TIME

LOAD	0.50	MINUTES
HAUL	2.95	"
DUMP & TURN	1.00	"
RETURN	1.48	"
	5.93	MIN. / CYCLE

0 0 2 4 9 3

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 3 OF ____ PAGE 119

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

ORM 2

10.05 (10)(1.45) = 145.73 CU. YDS.

50 MINUTE HOUR
5.93 MIN./CYCLE = 8.43 (11) = 92.73 CU. YDS / HOUR

145.73
92.73 = 1.57 HOURS

170

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC. 9 No. Royal Avenue Eagle Point, Oregon	ENGINEERING COMPUTATIONS
Company ALASKA POWER AUTHORITY Location KATANA Description GATE CHAMBER ACCESS TUNNEL	Date Dr. Ch. Ref.

CYCLES

1. Drill In & Out	1.98
2. Load & Shoot	2.07
3. Smoke Time	0.50
4. Muck Time	1.57
5. Supports (average time/rd.)	0.50
6. Services (average time/rd.)	0.25
Sub Total Hrs. Per Round	6.87
Lost Time @ 10 %	0.69
Total Hours Per Round/Cycle	7.56
Crew Hours Worked Per Day	20.0
Rounds Per Day	2.65
Peak L. F. Per Day	26.50

PRODUCTION	L. F.	L. F. /Day	W/Days
TURN UNDER			2.0
	2100	26.50	79.0
Total Work Days			81.0
Total L. F.			2100.
Ave. L. F. Per Day			25.93

171 5

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC. 9 No. Royal Avenue Eagle Point, Oregon	ENGINEERING COMPUTATIONS
Company ALASKA POWER AUTHORITY Location . KIATANA Description GATE CHAMBER ACCESS TUNNEL	Date ..... Dr .....Ch ..... Ref .....

Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
36.67	SHIFTER	1	1		2	73.34
35.56	DRILLER	3	3		6	213.36
34.84	TENDER	3	3		6	209.04
35.95	POWDERMAN	1	1		2	71.90
31.28	TOPMAN	1	1		2	62.56
31.28	DUMPMAN	1	1		2	62.56
41.58	ELECTRICIAN	1	1		2	83.16
38.80	MUCKER OPERATOR	1	1		2	77.60
35.97	DOZER OPERATOR	1	1		2	71.94
	Total	13	13		26	925.46

Cost Per/Day	9254.60
Cost Per M/Hr. Average	35.60
Cost Per M/Day, Average	355.95
Total L. F. Or Cu. Yds.	2100 C.F.
Production	25.93
Total Days Required	81
Total Cost - No. Days X Cost/Day	749622.60
Cost Per/L. F.	356.96
Cost Per/Cu. Yd.	
Total Man Days	2106.
Total Man Hours	21060

0024933

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 6 OF PAGE 172

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	QUANTITY	UNIT	TOTAL
SUPPLIES			
DRILL STEEL	229320 L.F.	0.20	45864
EXPLOSIVES 21105 CY. @ 4.5#	94973 LB.	1.50	142460
DETONATORS 19110 (1.05 LOSS)	20066 EA.	1.00	20066
AIR & WATER LINES	2100 L.F.	12.00	25200
VENT LINE	2100 L.F.	30.00	63000
LIGHTS & ELECTRIC LINE	2100 L.F.	5.00	10500
FOUL WEATHER GEAR	21060 M.H.	2.50	52650
			359740
SUPPORTS			
ALLOW 24.23 PER CU. YD. OF EXCAVATION 21105 CU. YDS.			511374

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION EQUIPMENT SUMMARY ITEM NO 232-210 SHEET 7 OF ___ PAGE 12

ACCESS TUNNEL TO GATE CHAMBER JOB ___

BID QUANTITY 2100 UNIT LF. TAKE OFF QUANTITY ___ EST. BY ___ DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
1-3 DRILL JUMBO	1620	Hrs			50.88 82426.	46.- 74760.	42.02 68072.			140.90 228258.
2-FANS	3240	"			3.89 12604	2.35 7614	2.35 7614			8.59 27832.
1-300 KW GENERATOR	1620	"			17.63 28561	2.78 4504	27.11 43918			47.52 76983
2-PUMPS	3240	"			2.40 7776.	0.27 875	1.83 5937			4.50 14588
1-ST 13 SCOOP TRAM	1620	"			30.05 48681	38.- 61560	38.93 63067			106.98 173308
1-PICKUP	1620	"			2.40 3888	0.97 1571	5.71 9250			9.08 14709
1-FLATBED	1620	"			4.01 6496	4.17 6755	11.04 17885			19.22 31136
1-D7 DOZER	1620	"			24.04 38945	17.23 27913	22.59 36563			63.84 103421
	2100	LF.			109.23 229377	89.79 188557	120.14 252298			319.14 670227

FOLD
LENGTH
12
11
8.5
8
AUTO
MANUAL
FEED

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Diversion Tunnel, Excavation 39' Dia. ITEM NO. 332.211 SHEET ___ OF ___ PAGE 177

JOB Watana Dam

BID QUANTITY 7,220 UNIT L.F. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
PILOT BORE	100	LF.	17070	4464						21534
ERECT & DISMANTLE TBM	2	EA.	542046							542046
TBM - 18'Φ	7120	LF.	1398883							1398883
HEADING	7220	LF.	3099455							3099455
BENCH	7220	LF.	2387283							2387283
SUPPLIES HEADING & BENCH	7220	LF.		1908497						1908497
REMOVE TRACKAGE	7720	LF.	76188							76188
RAILROAD SUPPLIES	7220	LF.		359641						359641
INCIDENTAL SUPPLIES	1	LS.		524850						524850
EQUIPMENT	ALL				2358387	3464602	2905861			8728850
PERMANENT MATERIAL	7720	LF.						142.90 1103188		1103188
	7720	LF.	1041.68 7520925	387.46 2797452	326.65 2358387	479.86 3464602	402.47 2905861	142.90 1103188		2781.02 20150415

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION LOWER CLEAR TUNNEL — ITEM NO. 211 SHEET 1 OF ____ PAGE 175

39'ϕ — JOB WAIANUE LOT

QUANTITY | UNIT | EST. BY | CK'D. BY | DATE

FORM 2

METHOD:

THIS TUNNEL WILL BE DRIVEN WITH HEADING & BENCH OR-TBM WITH A COMPATABLE BORE (SAY 18'ϕ BORE), THIS WAY WE WOULD UTILIZE A TBM TO OPEN UP TUNNELS AND OTHER UNDERGROUND OPENING AND FOLLOW UP WITH SLASHING OR WHATEVER TO DESIRED BORE OR CONFIGURATION. DRIVE THROUGH 48'ϕ SECTION ALSO.

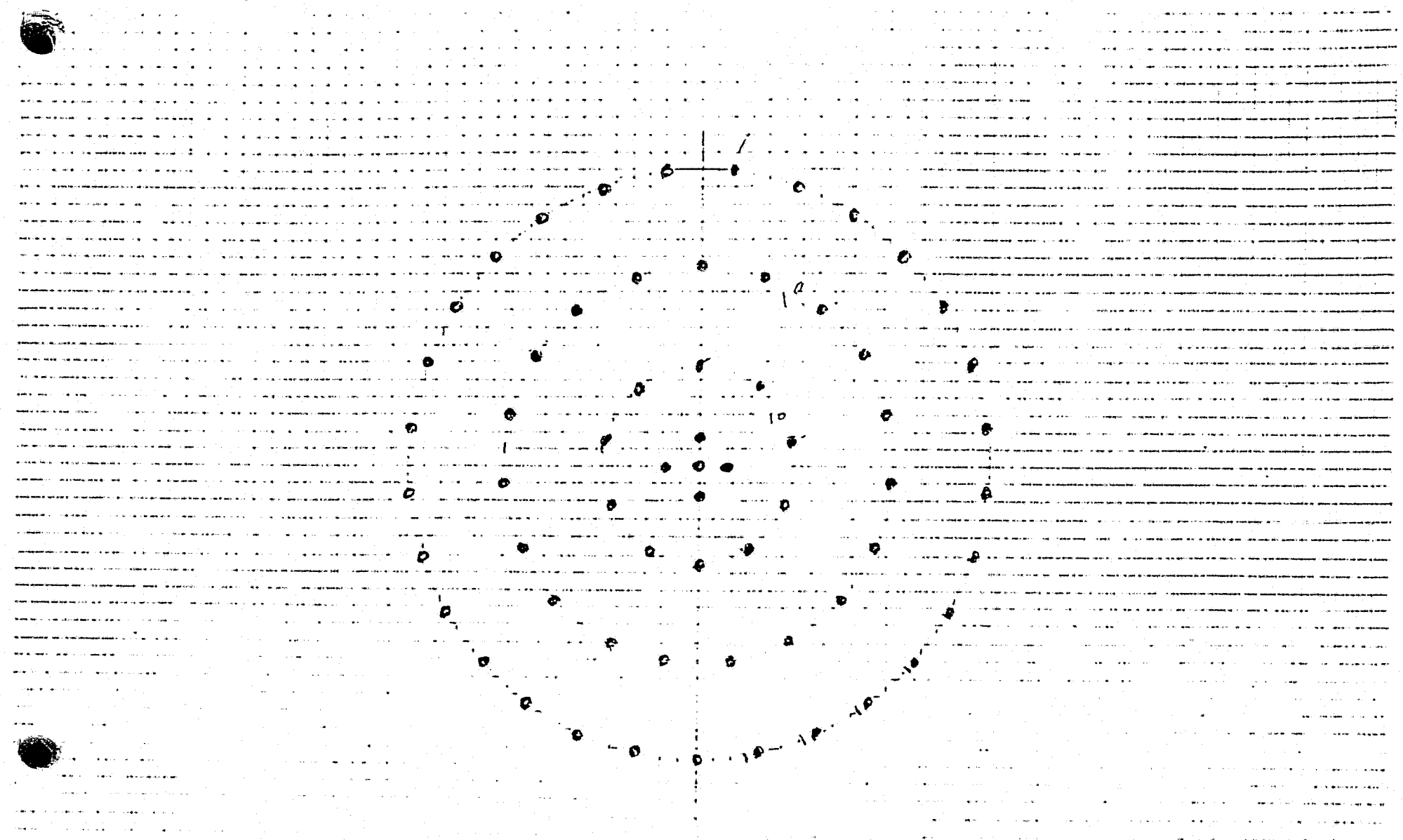
FIGURE ※ 3,500,000.00 FOR TBM 1500 H.P 1125KW GENERATION.

DRIVE A DRIFT 50 L.F. FOR EACH SET-UP.

.121-21'H x 25'W. SURGE CHAMBER ACCESS	180
.211-39'ϕ DIVERSION TUNNEL	7220
.21A-48'ϕ " "	760
.512-31'ϕ OUTLET TUNNEL	2050
.81A-27'ϕ PENSTOCK	1245
.817-21'ϕ "	190
.818-18'ϕ "	1200
.911-37'ϕ TAILRACE	2050
-TRANSFORMER GALLERY	445
-POWERHOUSE	475
-SURGE CHAMBER	415
	16730

3,500,000 / 16730 = ※ 209.21 L.F. W.O.

0 0 2 4 9 3



DRILL PATTERN FOR 18' Φ DRIFT
DRILL 12' & PULL 10'
63 HOLES

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 2 OF PAGE 177

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

DRIVE 2-50' DRIFTS
NO TURN UNDER TIME IS NEEDED
SINCE BOTH INTAKE & OUTLET
ARE EXCAVATED INTO SOLID
ROCK. DRILL 12 FEET & PULL 10 FEET
USE A JOY 3-DRILL JUMBO.
HYDRAULIC DRILLS.
80KW POWER PER DRILL
10 GAL WATER/MIN. PER DRILL
AT 90-100 PSI.
DRILL RATE BASED ON RATED
AVERAGE AT HELMS PROJECT
FOR 15-12 FOOT HOLES =
2.20 MINUTES = 0.18 MINUTES
PER L.F.

RETRACT & SETUP DRILL — 0.80 MINUTES
2.20 "
3.00 MINUTES/HOLE

DRILLING
63 HOLES
3 DRILLS = 21 (3 MINUTES) — 63 MINUTES
CHANGE BITS EVERY 3 HOLES
63 HOLES
3 HOLES = 21 CHANGES (0.25) — 5 "
68 MINUTES
50 MIN. HOUR = — 1.36 HOURS

DRILL CYCLE TIME
MOVE UP & HOOK UP JUMBO — 5.0 MINUTES
SCALE — 5.0 "
DRILL OUT — 82.0 "
UNHOOK — 5.0 "
90.0
CO = 1.42 HOURS

OPERATION ITEM NO. SHEET 4 OF PAGE 178

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

LOAD & SHOOT

BRING UP EXPLOSIVES .50 MINUTES

LOAD HOLES

120 @ 8/MIN. (CHEN)

60 MIN. HOUR = 790 "

50 "

880

60 = 1.47 HOURS.

SERVICES

AIR, WATER & POWER

ALLOW 15 MIN./ROUND

60 MIN. HOUR = 0.25 HOUR

HAULING

USE ST13 SCOOP TRAM

HAUL AT 5 M.P.H. HAUL DISTANCE 750 L.F.

RETURN AT 10 M.P.H.

FIGURE 11 CU. YDS. BULK PER CYCLE

18' Ø (10') = 94 CU. YDS.

BULK AT 1.45 = 136 CU. YDS.

136

11 = 12 CYCLES

CYCLE TIME

LOAD	0.50 MINUTES
HAUL	1.70 "
DUMP & TURN	1.00 "
RETURN	0.85 "
	4.05 (12)
	50 MIN. HOUR = 0.97 HOURS.

179

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location WATANA
Description DIVERSION TUNNEL

Date 7-17-84
Dr AOL Ch.
Ref.

CYCLES

1. Drill In & Out	1.36
2. Load & Shoot	1.47
3. Smoke Time	0.50
4. Muck Time	0.97
5. Supports (average time/rd.)	—
6. Services (average time/rd.)	0.25
Sub Total Hrs. Per Round	4.55
Lost Time @ 10 %	.46
Total Hours Per Round/Cycle	5.01
Crew Hours Worked Per Day	20.0
Rounds Per Day	5.01
Peak L. F. Per Day	39.9

PRODUCTION	L. F.	L. F. /Day	W/Days
	50	39.9	1.25
TURN UNDER			0.75
Total Work Days			2.0
Total L. F.			50.0
Ave. L. F. Per Day			25.0

180

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC. 9 No. Royal Avenue Eagle Point, Oregon	ENGINEERING COMPUTATIONS
Company ALASKA POWER AUTHORITY Location .WATANA Description .DIVERSION TUNNEL	Date 7-17-84 Dr A.O.G. Ch Ref

Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
36.67	SHIFTER	1	1		2	73.34
35.56	DRILLERS	3	3		6	213.36
34.84	TENDERS	3	3		6	209.04
35.95	POWDERMAN	1	1		2	71.90
31.28	TOPMAN	1	1		2	62.56
31.28	DUMPMAN	1	1		2	62.56
41.58	ELECTRICIAN	1	1		2	83.16
38.80	MUCKER OPER	1	1		2	77.60
	Total	12	12		24	853.52

Cost Per/Day	8535.20
Cost Per M/Hr. Average	35.56
Cost Per M/Day Average	355.60
Total L. F. Or Cu. Yds.	50
Production	25
Total Days Required	2
Total Cost - No. Days X Cost/Day	17070.40
Cost Per/L.F.	341.41
Cost Per/Cu. Yd.	36.24
Total Man Days	24
Total Man Hours	480

0 0 2 4 9 3

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 7 OF PAGE 1 F 1

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	QUANTITY	UNIT	TOTAL
SUPPLIES			
DRILL STEEL	1512 LF.	0.20	302
EXPLOSIVES 4.5#/C.Y. (471 C.Y.)	2120 LB.	1.50	3180
DETONATORS 126 +5%	132 EA.	1.00	132
AIR & WATER LINES	50 LF	12.00	600
LIGHTS & ELECTRIC LINES	50 LF	5.00	250
			4464

EQUIPMENT	LABOR	EQUIPMENT	SUPPLIES
1-3 DRILL JUMBO	50.88	48.00	42.02
1-FAN	3.89	2.35	2.35
1-300 KW GENERATOR	17.13	2.78	27.11
1-PUMP	2.40	0.27	1.83
1-ST 8 SCOOPTRAM	30.05	28.00	35.93
1-PICKUP	2.40	0.97	5.71
COST PER HOUR	107.25	92.37	117.95
COST 40 HOURS.	4290	3695	4718

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OPERATION

ITEM NO. SHEET 8 OF PAGE 12

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

TUNNEL BORING - 18' Ø.

7200 L.F.

(120')

7130 L.F.

ITEMS OF WORK

1- MOVE IN & SET UP TBM	2 OPERATIONS
2- KNOCK DOWN TBM	2 "
3- TUNNELING	7120 L.F.
4- LOCKING - 2X RING	4000 L.F.

SET-UP & DISMANTLE TBM

ALLOW 10 DAYS TO ERECT AND 5 DAYS TO KNOCK DOWN.

0 0 2 4 9 3

163

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location . WATANA
Description SET UP & KNOCK DOWN TRIM.

Date 7-18-84
Dr AOC Ch
Ref

Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
39.59	OPERATOR 4 MAN	1	1		2	79.18
36.42	MECHANIC/WELDERS	5	5		10	364.20
38.80	OPERATOR	2	2		4	155.20
35.09	OILER	1	1		2	70.18
31.69	LABORERS	5	5		10	316.90
33.99	TEAMSTER	2	2		4	135.96
43.07	ELECTRICIAN	3	3		6	258.42
35.69	LOCO - OPERATOR	1	1		2	71.38
35.09	BRAKEMAN	1	1		2	70.18
34.84	MINERS	2	2		4	139.36
37.84	OPERATOR - CRANE	1	1		2	75.68
35.09	OILER - "	1	1		2	70.18
	Total	25	25		50	1806.82

Cost Per/Day	18068.20
Cost Per M/Hr. Average	36.14
Cost Per M/Day Average	361.36
Total L. F. Or Cu. Yds.	
Production	
Total Days Required	30
Total Cost - No. Days X Cost/Day	542,046.00
Cost Per/L. F.	
Cost Per/Cu. Yd.	
Total Man Days	1500.
Total Man Hours	15000

0024693

OPERATION ITEM NO. SHEET 10 OF PAGE 164

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

TBM OPERATION

FROM RECORDS ON PREVIOUS TUNNELING AND WEIGHING THE AVERAGES, FIGURE PRODUCTION AT 62 L.F. PER DAY.

7120

62 = 115 DAYS

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY....
Location . WATANA.....
Description . TBM OPERATION.....

Date 7-18-'84.....
Dr A.O.C....Ch .....
Ref .....

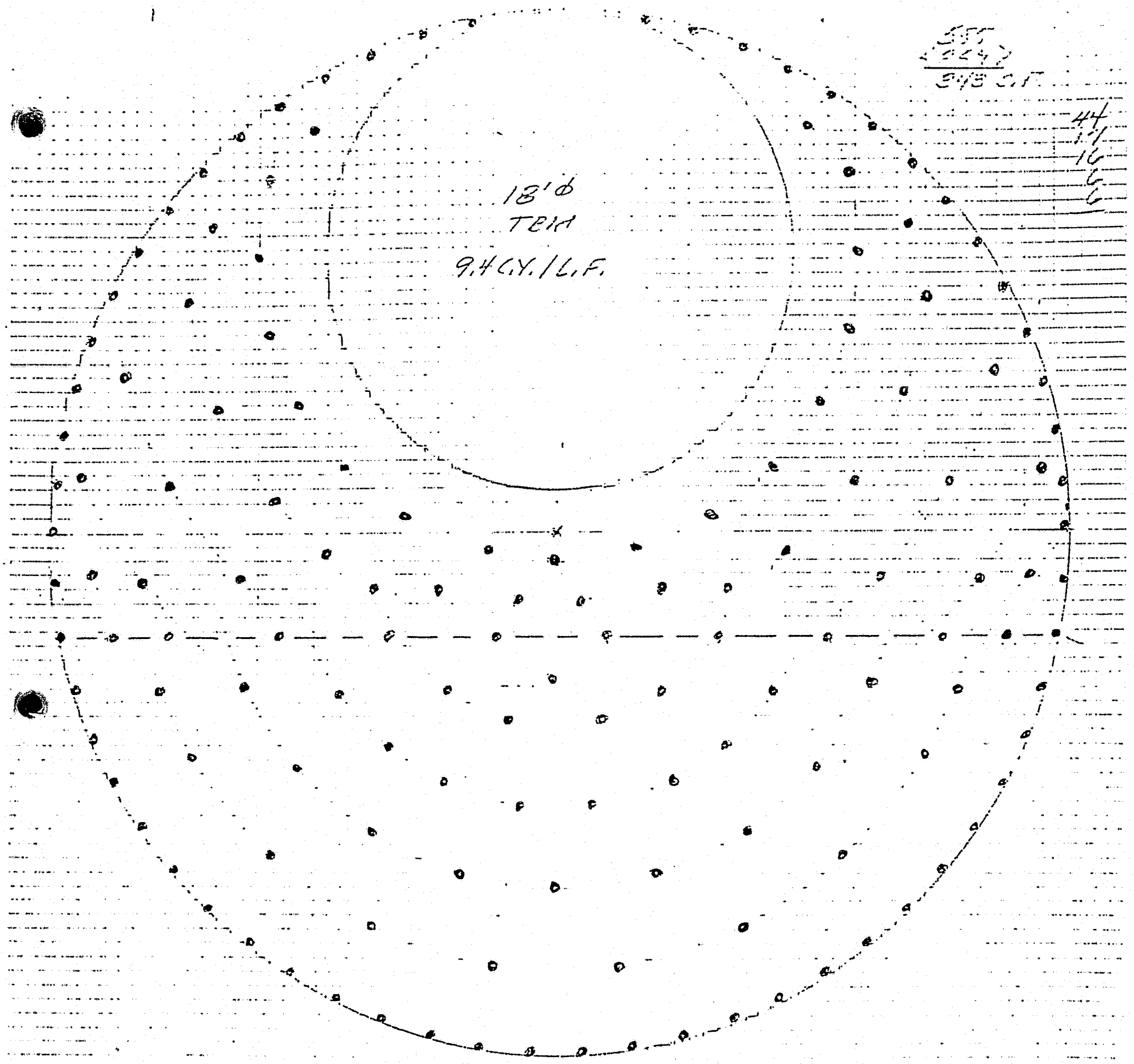
Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
37.67	WALKER	1	1		2	75.34
36.67	SHIFTER	1	1		2	73.34
38.80	OPERATOR	1	1		2	77.60
36.09	OILER	1	1		2	72.18
42.70	ELECTRICIAN	1	1		2	85.40
36.42	MECHANIC	1	1		2	72.84
34.84	MINER	2	2		4	139.36
35.69	SHUTTLE CAR OPER.	1	1		2	71.38
35.69	LOCO. OPERATOR	2	2		4	142.76
35.09	BRAKEMEN	2	2		4	140.36
31.28	DUMPMEN	1	1		2	62.56
32.84	TRACKMEN	2	2		4	131.36
35.97	DOZER OPERATOR	1	1		2	71.94
	Total	17	17		34	1216.42

Cost Per/Day..... 12164.20
Cost Per M/Hr. Average 35.78
Cost Per M/Day Average 357.77

Total L. F. Or Cu. Yds. ..... 7120 CF.
Production ..... 62 CF
Total Days Required 115

Total Cost - No. Days X Cost/Day 1,398,683.00
Cost Per/L. F..... 196.47
Cost Per/Cu. Yd. .....

Total Man Days..... 3910
Total Man Hours 39100


18'Ø
TBM
9.4 C.Y./L.F.
39'Ø DIVERSION
TUNNEL

OPERATION ITEM NO. SHEET 13 OF PAGE 187

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

DRILL OUT UPPER HEADING

USE 3 DRILL JOY JUMBO HYDRAULIC DRILLS

80 KW POWER PER DRILL

10 GAL. WATER/MIN. PER DRILL AT 90-100 P.S.I.

DRILL 12 FEET & PULL 10 FEET

DRILL RATE BASED ON RATED AVERAGE AT HELMS PROJECT FOR 15-12 FOOT HOLES. = 2.20 MINUTES = 0.16 MINUTES PER L.F.

RETRACT & SETUP	0.80	MINUTES
DRILL	2.20	"
	3.00	MINUTES/HOLE

DRILLING

89 HOLES

3 DRILLS = 29.67 (3 MINUTES) 89 MINUTES

CHANGE BITS EVERY 3 HOLES

89 HOLES

3 HOLES = 30 CHANGES (0.25) 8 "

97 MINUTES.

60 MIN. HOUR. = 1.94 HOURS.

DRILL CYCLE TIME

MOVE UP & HOOK UP JUMBO	5.0	MINUTES
SCALE	5.0	"
DRILL OUT	116.0	"
UNHOOK	5.0	"
	131.0	

60 = 2.18 HOURS.

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OPERATION ITEM NO. SHEET 14 OF PAGE 165

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

LOAD & SHOOT

BRING UP EXPLOSIVES = 50 MINUTES

LOAD HOLES.

89 @ 8/M.H. (SIMEN)

60 MIN. HOUR = 120 "

MOVE OUT = 50 "

102

60 = 2.03 HOURS

SERVICES

AIR, WATER & POWER

ALLOW 15 MIN./ROUND

60 MIN. HOUR 0.25 HOUR

MUCKING

USE ST 13 SCOOP TRAMS

HAUL AT 5 M.P.H. HAUL DISTANCE = 2695 L.F.

RETURN AT 10 M.P.H.

FIGURE 11 CU. YDS. BULK PER CYCLE. 751.73 #

< 254.47 #/ 1E' ϕ

497.26 #

27 = 18.42 (10) (1.45) = 267 CU. YDS

267

11 = 24 CYCLES

CYCLE TIME

LOAD	0.50 MINUTES
HAUL	6.13 "
DUMP & TURN	1.00
RETURN	3.06 "
	10.69 (24)
	50 MIN. HOUR = 5.13
	2 UNITS = 2.57 HOURS

0024933

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC. 9 No. Royal Avenue Eagle Point, Oregon	ENGINEERING COMPUTATIONS
Company ALASKA POWER AUTHORITY Location KATANA Description DIVERSION - UPPER HEADING	Date 7-18-84 Dr A.O.G. Ch. Ref.

CYCLES

1. Drill In & Out	2.18
2. Load & Shoot	2.03
3. Smoke Time	0.25
4. Muck Time	2.57
5. Supports (average time/rd.)	0.50
6. Services (average time/rd.)	0.25
Sub Total Hrs. Per Round	7.78
Lost Time @ 10 %	.78
Total Hours Per Round/Cycle	8.56
Crew Hours Worked Per Day	20.0
Rounds Per Day	2.34
Peak L. F. Per Day	23.40

PRODUCTION	L. F.	L. F. /Day	W/Days
	7220	23.40	309

Total Work Days 309
Total L. F. 7220
Ave. L. F. Per Day 23.40

190 16

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location WATANA
Description DIVERSION TUNNEL - UPPER HEADING

Date 7-18-84
Dr AAG Ch
Ref

Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
36.67	SHIFTER	1	1		2	73.34
35.56	DRILLERS	3	3		6	213.36
34.84	TENDERS	3	3		6	209.04
35.95	POWDERMAN	1	1		2	71.90
31.28	TOPMAN	1	1		2	62.56
31.28	DUMPMAN	1	1		2	62.56
41.58	ELECTRICIAN	1	1		2	83.16
38.80	MUCKER OPERATOR	2	2		4	155.20
35.97	DOZER OPERATOR	1	1		2	71.94
	Total	14	14		28	1003.06

Cost Per/Day	10,030.60
Cost Per M/Hr. Average	35.82
Cost Per M/Day Average	358.24
Total L. F. Or Cu. Yds.	7220 L.F.
Production	
Total Days Required	309
Total Cost - No. Days X Cost/Day	3,099,465.40
Cost Per/L.F.	429.29
Cost Per/Cu. Yd.	
Total Man Days	8652
Total Man Hours	86520

OPERATION ITEM NO. SHEET 17 OF PAGE 991

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

DRILL OUT BENCH.
SAME DISCRIPTIVE INFORMATION
AS HEADING

DRILLING
58 HOLES
2 DRILLS = 19 (3 MINUTES) 57 MINUTES
CHANGE BITS EVERY 3 HOLES
58 HOLES
3 HOLES = 19 CHANGES (0.25) 5 "
62 MINUTES

62 MINUTES
60 MIN. HOUR = 1.24 HOURS

DRILL CYCLE TIME
MOVE UP & HOOK UP TUNED 5.0 MINUTES
SCALE 5.0 "
DRILL OUT 7.0 "
UNHOOK 3.0 "
75.0
60 1.25 HOURS

LOAD & SHOOT
BRING UP EXPLOSIVES = 5.0 MINUTES
LOAD HOLES
58 @ 2/M.H. (5 MEN)
60 MIN. HOUR = 73.0 "
MOVE OUT = 5.0 "
83
60 = 1.38 HOURS

SERVICES
AIR, WATER & POWER
ALLOW 15 MIN./ROUND
60 MIN HOUR 0.25 HOUR

PATTERSON-FLED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 18 OF PAGE 197

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

MUCKING

1194.59 S.F. = 39' Ø

(751.73) S.F. HEADING ± 18' Ø BORE

442.86 S.F. BENCH

442.86

27 = 16.4 (10) (1.45) = 238 CU. YDS. / ROUND

238

11 = 22 CYCLES

SAME CYCLE TIME AS HEADING

10.69 (22)

50 MIN. HOUR = 4.70 HOURS

2 UNITS = 2.35 HOURS

19

193

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location WATANA
Description DIVERSION - BENCH

Date 7-18-84
Dr AOC Ch.
Ref.

CYCLES

1. Drill In & Out	1.25
2. Load & Shoot	1.38
3. Smoke Time	0.25
4. Muck Time	2.35
5. Supports (average time/rd.)	0.50
6. Services (average time/rd.)	0.25
Sub Total Hrs. Per Round	5.98
Lost Time @ 10 %	.60
Total Hours Per Round/Cycle	6.58
Crew Hours Worked Per Day	20.0
Rounds Per Day	3.04
Peak L.F. Per Day	30.40

PRODUCTION	L. F.	L. F. /Day	W/Days
	7220	30.40	238

Total Work Days 238
Total L. F. 7220
Ave. L. F. Per Day 30.34

00249 93

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC. 9 No. Royal Avenue Eagle Point, Oregon	ENGINEERING COMPUTATIONS
Company ..... Location ..... Description	Date ..... Dr .....Ch ..... Ref .....

Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
	SAME AS HEADING					
	Total	14	14		28	1003.06

Cost Per/Day.....	10,030.60
Cost Per M/Hr. Average	35.82
Cost Per M/Day Average	358.24
Total L. F. Or Cu. Yds.	7220 LF
Production	
Total Days Required	238
Total Cost - No. Days X Cost/Day	2,387,282.80
Cost Per/L. F.....	330.65
Cost Per/Cu. Yd.	
Total Man Days.....	6664
Total Man Hours	66640

0 0 2 4 9 3

OPERATION ITEM NO. SHEET 21 OF PAGE 195

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	QUANTITY	UNIT	TOTAL
SUPPLIES			
DRILL STEEL	1273608 LB	0.20	254722
EXPLOSIVES			
HEAVING = 132,992 CY. @ 4#	531968 LB	1.50	797952
BENCH = 118,408 CY. @ 3.5#	414428 LB	1.50	621642
DETONATORS 106,134 + 5% LOSS	111441 EA.	1.00	111441
AIR & WATER LINES	7220 LF	12.00	86640
LIGHTS & ELECTRIC LINES	7220 LF	5.00	36100
			1908497

OPERATION ITEM NO. SHEET 22 OF PAGE 196

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

REMOVE TRACKAGE

ALLOW 10 DAYS OR 772 LF

PER DAY.

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location . WATANA
Description . REMOVE TRACKAGE

Date 7-19-82
Dr A.O.L. Ch
Ref

Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
36.67	SHIFTER	1	1		2	73.34
34.84	MINERS	4	4		8	278.72
33.72	TEAMSTER	1	1		2	67.44
37.84	OPERATOR	1	1		2	75.68
31.28	TOPMAN	2	2		4	125.12
35.67	LOCOMOTIVE OPERATR	1	1		2	71.34
35.09	BRAKEMAN	1	1		2	70.18
	Total	11	11		22	761.82

Cost Per/Day	7618.82
Cost Per M/Hr. Average	34.63
Cost Per M/Day Average	346.31
Total L. F. Or Cu. Yds.	7720 L.F.
Production	772 LF
Total Days Required	10
Total Cost - No. Days X Cost/Day	76188.20
Cost Per/L.F.	9.87
Cost Per/Cu. Yd.	
Total Man Days	220
Total Man Hours	2200

	QUANTITY	UNIT	TOTAL
RAILROAD - SUPPLIES 7220 LF.			
OUTSIDE TRACK & TRESTLE		"ALLOW"	100000
TRACK 7220 LF ÷ 3 (45) ÷ 2000	78	350.00	27300
ANGLEBAR 92 # / TRACK FOOT	33212	0.25	8303
SPIKES	4200	2.35	2170
NUT LOCKS	1256	0.45	565
BRIDLES	226	9.50	2147
TURNOUTS & SWITCHES	"ALLOW"		25000
TIES 5"x7"x4' @ 28" C-C	1550	7.50	11625
CALIFORNIA SWITCH	1 - "ALLOW"		45000
SLIDING FLOOR	1 - "ALLOW"		135000
TRACK BOLTS	1875	1.35	2531
			359471
INCIDENTAL SUPPLIES			
FOUL WEATHER GEAR			
209940 M.H. @ 2.50/M.H.			524850

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION [illegible] ITEM NO. 220.41 SHEET 25 OF ____ PAGE 139

DIVERSION TUNNEL JOB CATALINA

BID QUANTITY 7220 UNIT L.F. TAKE OFF QUANTITY ____ EST. BY G. LEE DATE ____

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
2- 50 FOOT INLETS 18'ϕ										
1-3 DRILL JOY JUMBO	40	HR.			50.88 9035	48.- 1920	42.02 1681			140.90 5636
1- FAN	40	"			3.89 156	2.35 94	2.35 94			8.59 344
1- 300 KW GENERATOR	40	"			17.63 705	2.78 111	27.11 1084			47.52 1900
1- PUMP	40	"			2.40 96	0.27 11	1.83 73			4.50 180
1- ST 12 SCOOP TRAM	40	"			30.05 1202	38.- 1520	38.93 1557			106.98 4279
1- PICKUP	40	"			2.40 96	0.97 39	5.71 228			9.08 363
2- 3560'-18'ϕ TUNNELS										
1- TBM 3300 HRS. TIED-IN	-				IN DIRECTS	LF 209.21 1489575	117.26 269498			- 1759273
2- 500 KW GENERATORS	4600	HR.			32.85 151110	12.32 56672	32.14 147844			77.31 355626
1- 300 KW GENERATOR	2300	"			17.63 40549	2.78 6394	27.11 62353			47.52 109296
1- D7 DOZER	2300	"			24.04 55292	17.23 39629	22.57 51911			63.84 146832
1- FLATBED	2300	"			4.01 9223	4.17 9591	11.04 25392			19.22 44206
1- PICKUP	2300	"			2.40 5520	0.97 2231	5.71 13133			9.08 20884
3- FANS	6900	"			3.89 26841	2.35 16215	2.35 16215			8.59 59271
2- LOCOMOTIVES 20T	4600	"			10.81 49726	14.98 68908	14.45 66470			40.24 185104
12- MUCK CARS	27600	"			1.33 36708	0.59 16284	0.67 18492			2.59 71484
2- PUMPS	4100	"			2.40 11040	0.27 1242	1.83 8418			4.50 20700
1- LO BOY	600	"			14.02 8412	11.- 6600	14.51 8442			39.09 23454
1- 10T CRANE	600	"			2.24 1344	25.- 15000	27.46 16476			77.70 46620
1- HYDRA CRANE	600	"			15.62 9372	11.19 6714	15.80 9480			42.61 25566
2- 300 GAL WELDERS	1800	"			2.- 3600	0.81 1458	6.42 11556			9.23 16614
1- FLATBED	600	"			4.01 2406	4.17 2502	11.04 6624			19.22 11532
1- PICKUP	600	"			2.40 1440	0.97 582	5.71 3426			9.08 5448
2- UPPER FRAMING & PENTH (3610' EA)										
1-3 DRILL JOY JUMBO	10940	HR.			10.88 55427	45.- 229120	42.02 459699			110.90 1544444
3- FANS	32820	"			3.89 127670	2.35 77127	2.35 77127			8.59 281924
1- 300 KW GENERATOR	10940	"			17.63 192877	2.78 30413	27.11 296585			47.52 519946
2- PUMPS	21880	"			2.40 52512	0.27 5908	1.83 40040			4.50 98460
2- ST 12 SCOOP TRAMS	21880	"			20.05 438694	38.- 831440	38.93 851788			106.98 2340722
1- PICKUP	10940	"			2.40 26256	0.97 10612	5.71 62467			9.08 99335
1- FLATBED	10940	"			4.01 43849	4.17 45620	11.04 120778			19.22 210267
1- D7 DOZER	10940	"			24.04 262998	17.23 188496	22.57 246916			63.84 698410
2- REMOVE TRACKS (3860 L.F. EA)										
1- LOCOMOTIVE 20T	200	HR.			16.61 2322	14.98 2996	14.45 2890			40.24 8048
4- MATERIAL CARS	800	"			1.06 848	0.39 312	0.52 416			1.97 1576
1- FLATBED	200	"			4.01 802	4.17 834	11.04 2208			19.22 3844
1- PICKUP	200	"			2.40 480	0.97 194	5.71 1142			9.08 1816
1- HYDRACRANE	200	"			15.62 2124	11.19 2238	15.80 3160			42.61 8522
					1526387	3464102	2905361			9728150

FOLD LENGTH
12 IN
11 IN
8.5 IN
8 IN
AUTO
MANUAL
FEED

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Diversion Tunnel, Excavation 48' Dia. ITEM NO. 332.21A SHEET ___ OF ___ PAGE 760

JOB Watana Dam

BID QUANTITY 760 UNIT L.F. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
TO 39' Φ	760	LF.	1041.68 791677	387.46 294470	326.65 248254	479.86 364694	402.47 305877	142.90 108604		2781.02 2113576
SLASH TO 48' Φ	760	LF.	435.54 331010							435.54 331010
SUPPLIES	760	LF.		169117						222.52 169117
SUPPORTS	760	LF.						142.90 108604		142.90 108604
EQUIPMENT	760	LF.			152.43 115850	136.12 103448	171.10 130034			459.65 349332
	760	LF.	1477.22 1122687	609.98 463587	479.08 364104	615.98 468142	573.57 435911	285.80 217208		4041.13 3071639

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION DIVERSION TUNNEL — ITEM NO. 332-21A. SHEET 1 OF ____ PAGE 221

EXCAVATION 48'Φ — JOB KNIK

QUANTITY 760 UNIT L.F. — EST. BY — CK'D. BY — DATE

FORM 2

METHOD

AFTER DRIVING AHEAD WITH 39'Φ EXCAVATION - SLASH TO 48'Φ

USE 3 DRILL JOY JUMBO - SAME DRILL PRODUCTION AS FOR 39'Φ.

RETRACT & SETUP	0.80 MINUTES
DRILL	2.20 "
	3.00 MINUTES/HOLE

DRILLING.

74 HOLES

3 DRILLS = 24.67 (3 MINUTES) = 74 MINUTES

CHANGE BITS EVERY 3 HOLES.

74/3 = 24.67 (0.25) — 6 "

80 MINUTES — 80 MINUTES.

50 MIN. HOUR. = 1.60 HOURS

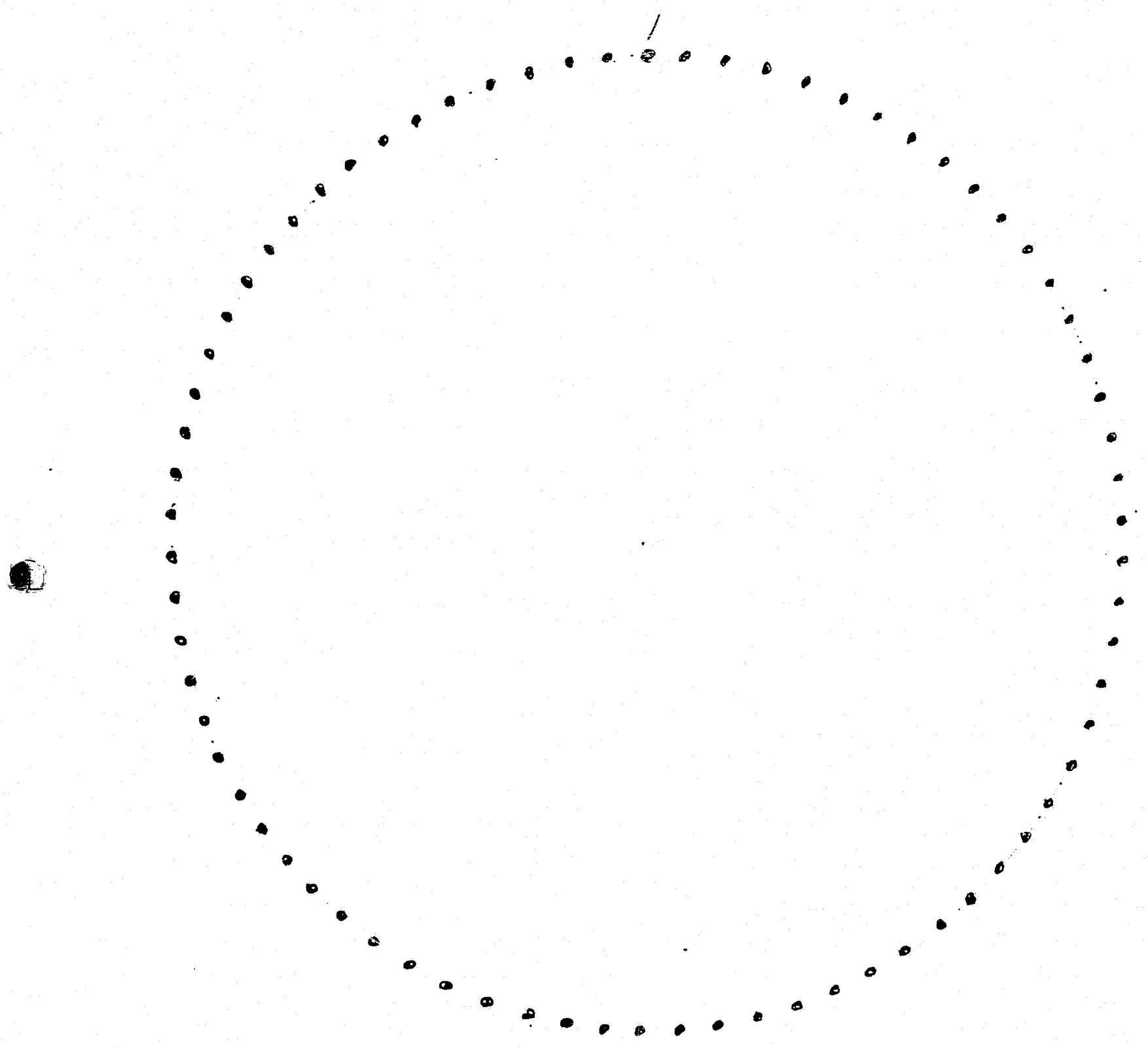
DRILL CYCLE TIME

MOVE UP & HOOK UP JUMBO	5.0 MINUTES
SCALE	5.0 "
DRILL OUT	96.0 "
UNHOOK	5.0 "
	111.0
	60 = 1.85 HOURS.

LOAD & SHOOT

BRING UP EXPLOSIVES =	5.0 MINUTES
LOAD HOLES	
74 @ 8/M.H. (5MEN)	
60 MIN. HOUR =	92.0 "
MOVE OUT =	5.0 "
	102
	60 = 1.70 HOURS.

202



48' Ø

22.78 CU. YDS. / L.F.

74 HOLES.

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 5 OF PAGE 205

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

MOCKING

USE ST 13 SCOOP TRAM HAUL DISTANCE = 2470 LF

HAUL AT 5MPH

RETURN AT 10MPH.

FIGURE 11 CU. YDS. BULK PER CYCLE

22.78 (10) (1.45) = 330 CU. YDS BULK PER ROUND

330 / 11 = 30 CYCLES

CYCLE TIME

LOAD	0.50	MINUTE
HAUL	5.61	"
DUMP & TURN	1.00	"
RETURN	2.81	"
	9.92 (30)	
	60 MIN. HOUR.	= 5.95 / 2 UNITS = 2.98 HOURS

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location . WATANA
Description. 48'ø DIVERSION TUNNEL

Date.....
Dr.....Ch.....
Ref.....

CYCLES

1. Drill In & Out	1.85
2. Load & Shoot	1.70
3. Smoke Time	0.50
4. Muck Time	2.98
5. Supports (average time/rd.)	0.50
6. Services (average time/rd.)	0.25
Sub Total Hrs. Per Round	7.78
Lost Time @ 10 %	0.78
Total Hours Per Round/Cycle	8.56
Crew Hours Worked Per Day	20.0
Rounds Per Day	2.34
Peak L.F. Per Day	23.40

PRODUCTION	L. F.	L.F./Day	W/Days
	760	23.40	32.48
Total Work Days			33.0
Total L. F.			760
Ave. L. F. Per Day			23.03

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location KUTANA
Description 48'ø DIVERSION TUNNEL

Date .....
Dr ..... Ch .....
Ref .....

Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
36.67	SHIFTER	1	1		2	73.34
35.56	DRILLER	3	3		6	213.36
34.84	TENDER	3	3		6	209.04
35.95	POWDERMAN	1	1		2	71.90
31.28	TOPMAN	1	1		2	62.56
31.28	DUMPMAN	1	1		2	62.56
41.58	ELECTRICIAN	1	1		2	83.16
38.80	MUCKER OPERATOR	2	2		4	155.20
35.97	DOZER OPERATOR	1	1		2	71.94
	Total	14	14		28	1003.06

Cost Per/Day 10030.60
Cost Per M/Hr. Average 35.82
Cost Per M/Day Average 358.24

Total L. F. Or Cu. Yds. 760
Production 23.03
Total Days Required 33

Total Cost - No. Days X Cost/Day 331009.80
Cost Per/L. F. 435.54
Cost Per/Cu. Yd. .....

Total Man Days 924
Total Man Hours 9240

0024933

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 6 OF PAGE 206

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	QUANTITY	TOTAL	UNIT PRICE
SUPPLIES			
DRILL STEEL	67480 LF.	0.20	13496
EXPLOSIVES 17313 @ 3.5#	60596 LB.	1.50	90894
DETONATORS 5624 (1.05 LOSS) =	5905 EA.	1.00	5905
AIR & WATER LINES	760 LF.	12.00	9120
VENT LINE	760 LF.	30.00	22800
LIGHTS & ELECTRIC LINES	760 LF.	5.00	3800
FOUL WEATHER GEAR	9340 MH.	2.50	23100
			169117
SUPPORTS @ $142.90/LF.			108604

OPERATION EQUIPMENT SUMMARY ITEM NO. 338-21A SHEET ___ OF ___ PAGE ___

48" Ø TUNNEL JOB ___

BID QUANTITY 760 UNIT LF. TAKE OFF QUANTITY ___ EST. BY ___ DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
1-3 DRILL JUMBO	660	HRS			50.88 33581	48.00 31680	42.02 27733			140.90 92994
3-FANS	1980	"			3.89 7707	2.35 4653	2.35 4653			8.59 17008
1-300 KW GENERATOR	660	"			17.63 11636	2.78 1835	27.11 17893			47.52 31364
2-PUMPS	1320	"			2.40 3168	0.27 356	1.83 2416			4.50 5940
2-ST 13 SCOOP TRAMS	1320	"			30.05 39666	38.00 50160	38.93 51388			106.98 141214
1-PICKUP	660	"			2.40 1584	0.97 640	5.71 3769			9.08 5993
1-FLATBED	660	"			4.01 2647	4.17 2752	11.04 7286			19.22 12685
1-D7 DOZER	660	"			24.04 15860	17.23 11372	22.57 14896			63.84 42128
	760	LF			152.43 115850	136.12 103448	171.10 130034			459.65 349332

FOLD LENGTH
12
11
8,5
8
AUTO
MANUAL
FEED

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Portals, Common Excavation ITEM NO. 332.21B SHEET ___ OF ___ PAGE 78

JOB Watana Dam

BID QUANTITY 67,100 UNIT C.Y. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
UNIT COST SAME AS P.H. ACCESS TUNNEL	67100	CY	1.12 / 75152	0.02 / 1342	0.64 / 42944	0.71 / 47641	0.83 / 55693			3.32 / 222772

FOLD LENGTH
12
11
8.5
8

AUTO

MANUAL

FEED

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Portals, Rock Excavation ITEM NO. 332.21C SHEET OF PAGE

JOB Watana Dam

BID QUANTITY 85,550 UNIT C.Y. TAKE OFF QUANTITY EST. BY A. Lee DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
UNIT COST SAME AS P.H. ACCESS TUNNEL	85550	CY.	5.80 / 496,190	2.30 / 196,765	2.60 / 222,430	1.57 / 134,314	2.34 / 200,187			14.61 / 1,249,886

FOLD LENGTH
12
11
8.5
8

AUTO

MANUAL

FEED

OPERATION Emergency Release Chambers, Rock Exc. ITEM NO. 332.21D SHEET ___ OF ___ PAGE ___

JOB Watana Dam

BID QUANTITY 4,700 UNIT C.Y. TAKE OFF QUANTITY 4042 EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
EXCAVATION	4042	CY	34.74 140428							34.74 140428
SUPPLIES	4042	CY		11.88 48013						11.88 48013
SUPPORTS	4042	CY						24.23 97938		24.23 97938
EQUIPMENT	4042	CY			12.16 49148	10.81 43887	13.45 55167			36.42 148202
	4042	CY	34.74 140428	11.88 48013	12.16 49148	10.81 43887	13.45 55167	24.23 97938		107.52 434581
	4700	CY	34.74 163278	11.88 55836	12.16 57152	10.81 51042	13.45 64155	24.23 113881		107.52 505344

FOLD LENGTH
12
11
8.5
8

AUTO

MANUAL

FEED

332-

OPERATION EMERGENCY RELEASE ITEM NO. 210 SHEET 1 OF ____ PAGE 7.11

CHAMBERS JOB WATANA

QUANTITY 4,700 UNIT C.Y. EST. BY CK'D. BY DATE

FORM 2

TAKE OFF QUANTITY = 4042 C.Y.

METHOD

DRIVE ENERGENCY RELIEF ACCESS TUNNEL THROUGH TO BACK OF CHAMBER & SLASH OUT CHAMBER ROOF = 108 L.F.

UPSTREAM

$\frac{1-54\ (26.67H)(22'W)}{27}$ = 1892 CU. YDS.

$\frac{2-44\ (26.0H)(8.75W)}{27}$ = 742 " "

2634 CU. YDS.

DOWNSTREAM

$\frac{1-54\ (23.33H)(22'W)}{27}$ = 108300 YDS.

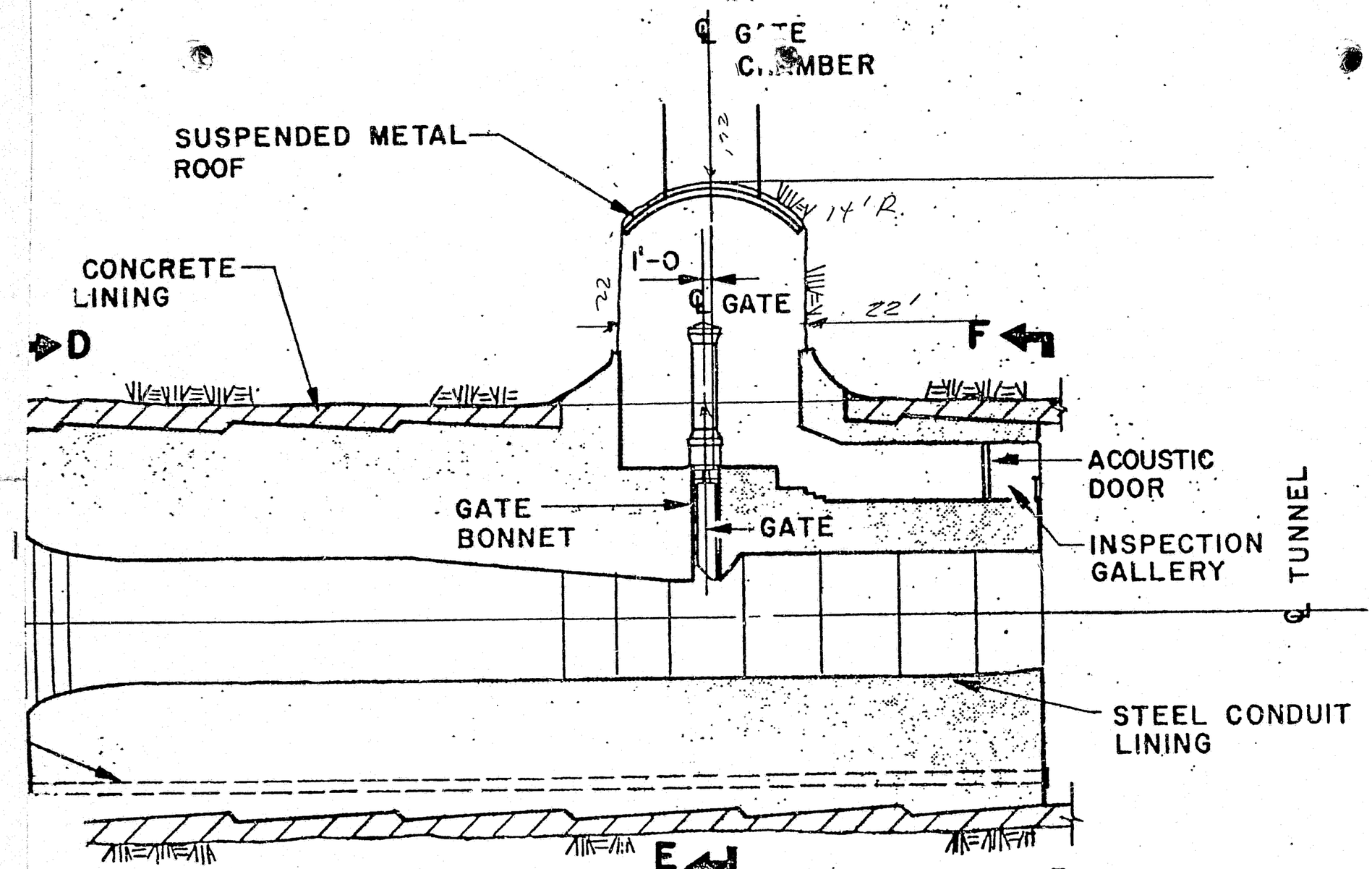
$\frac{2-28\ (17.0H)\ (3.10W)}{27}$ = 109 " " 1192

3826 CU. YDS.

MISC. UPSTREAM

$\frac{1-54\ (12)\ (9)}{27}$ = 216 "

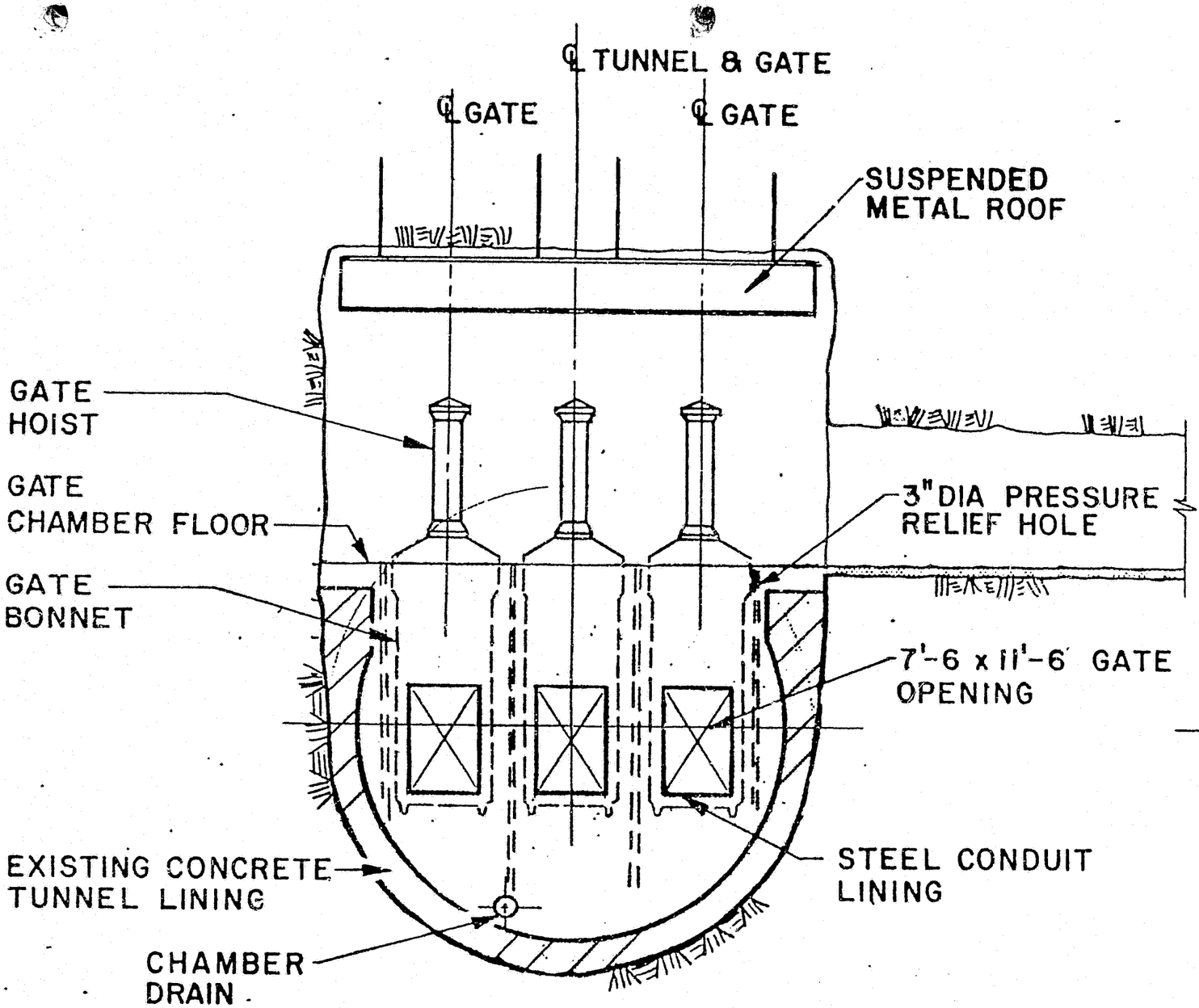
4042 CU. YDS.



LOW LEVEL OUTLET
DOWNSTREAM PLUG

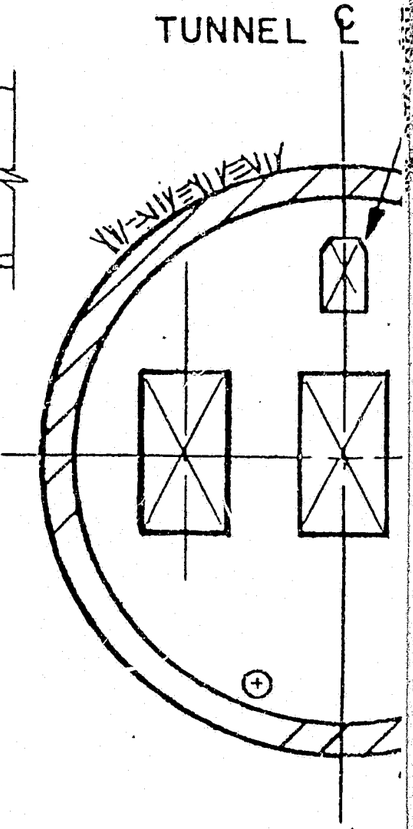
SCALE B

002493



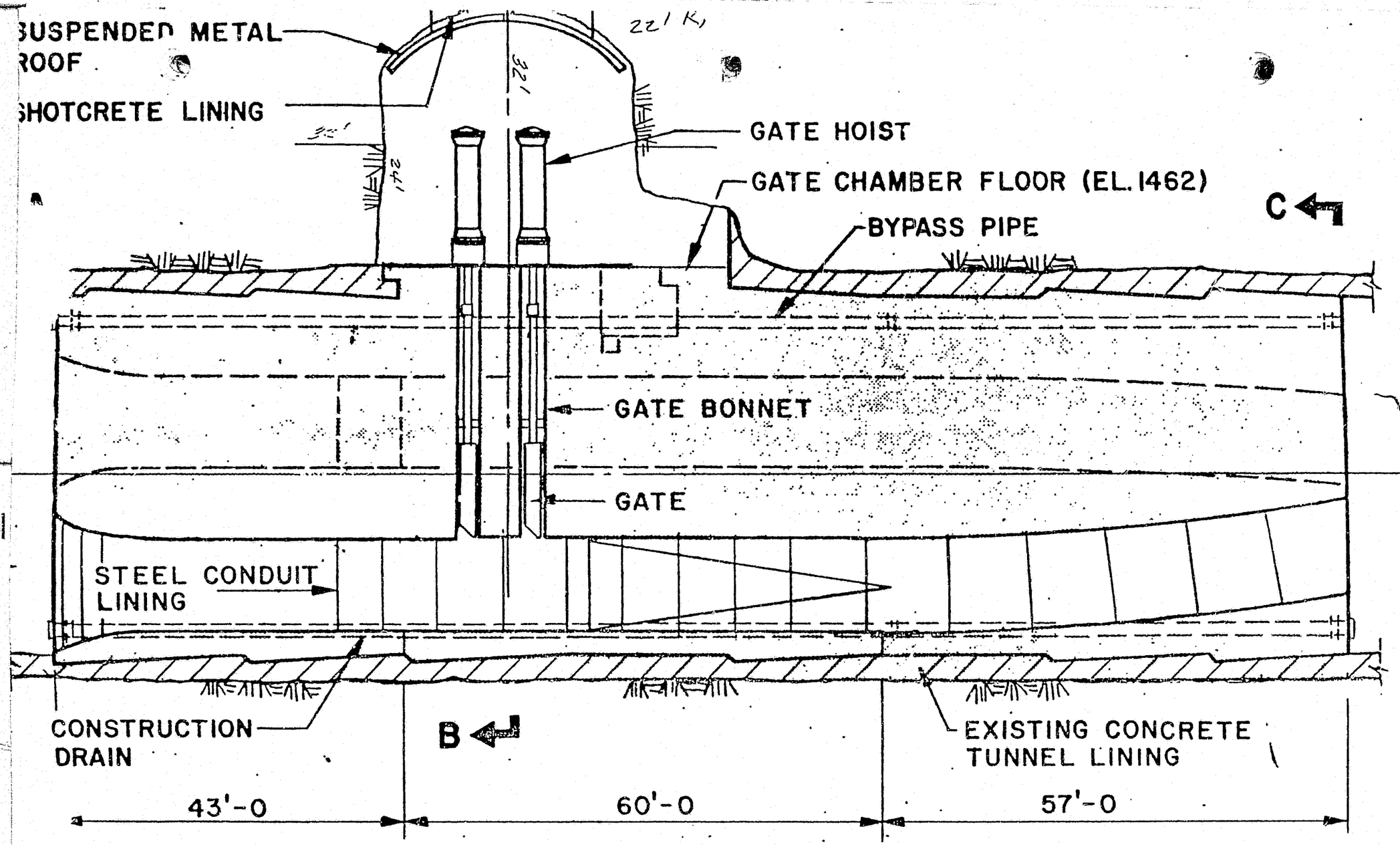
SECTION E-E

SCALE B



SECTION

SCALE B

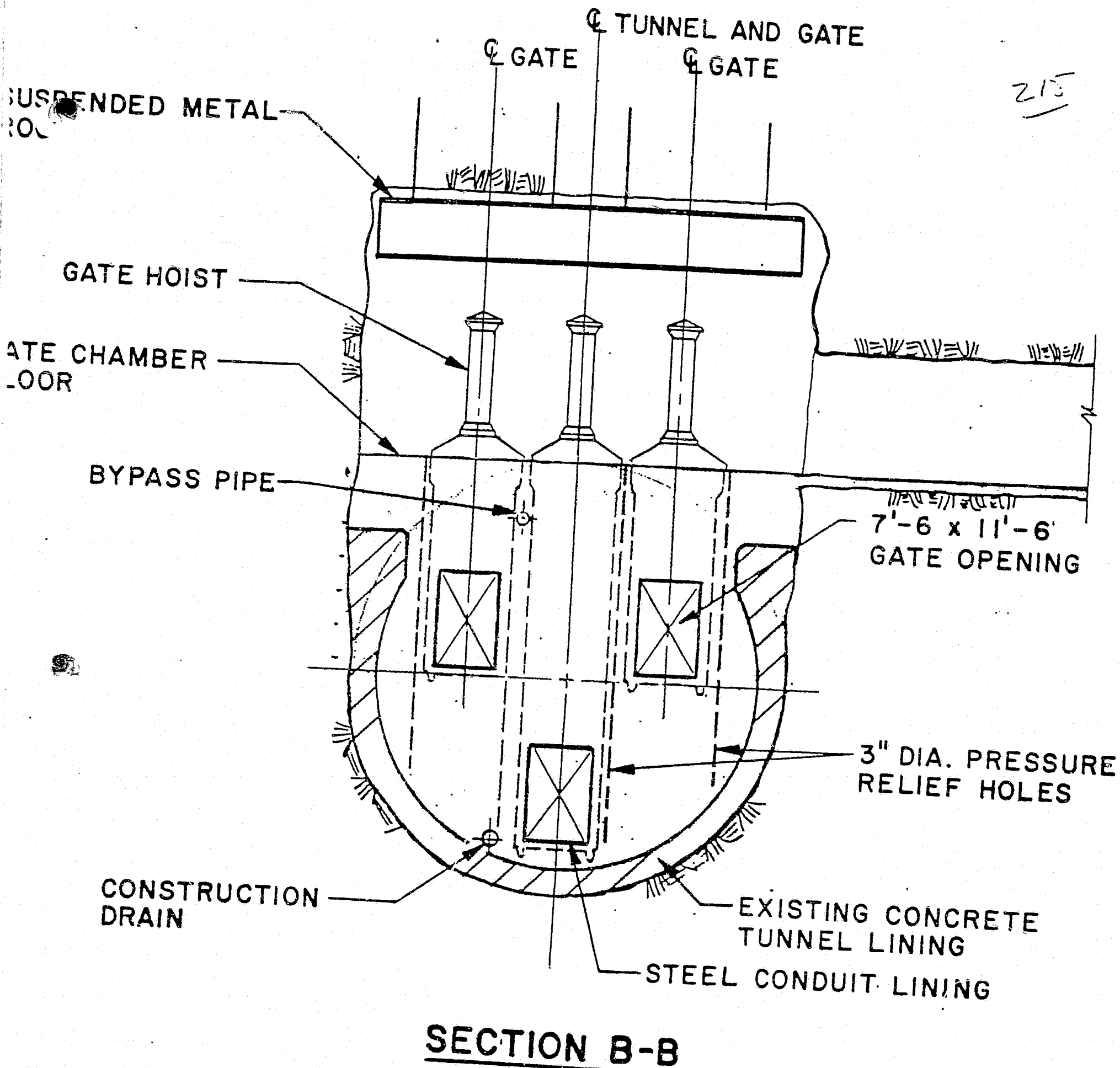


LOW LEVEL OUTLET
UPSTREAM PLUG

SCALE B

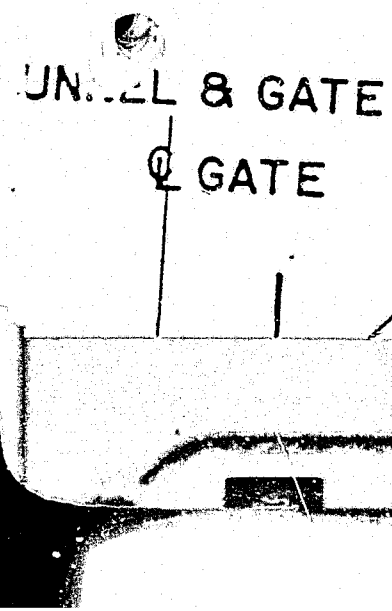
0 0 2 4 3 3

215

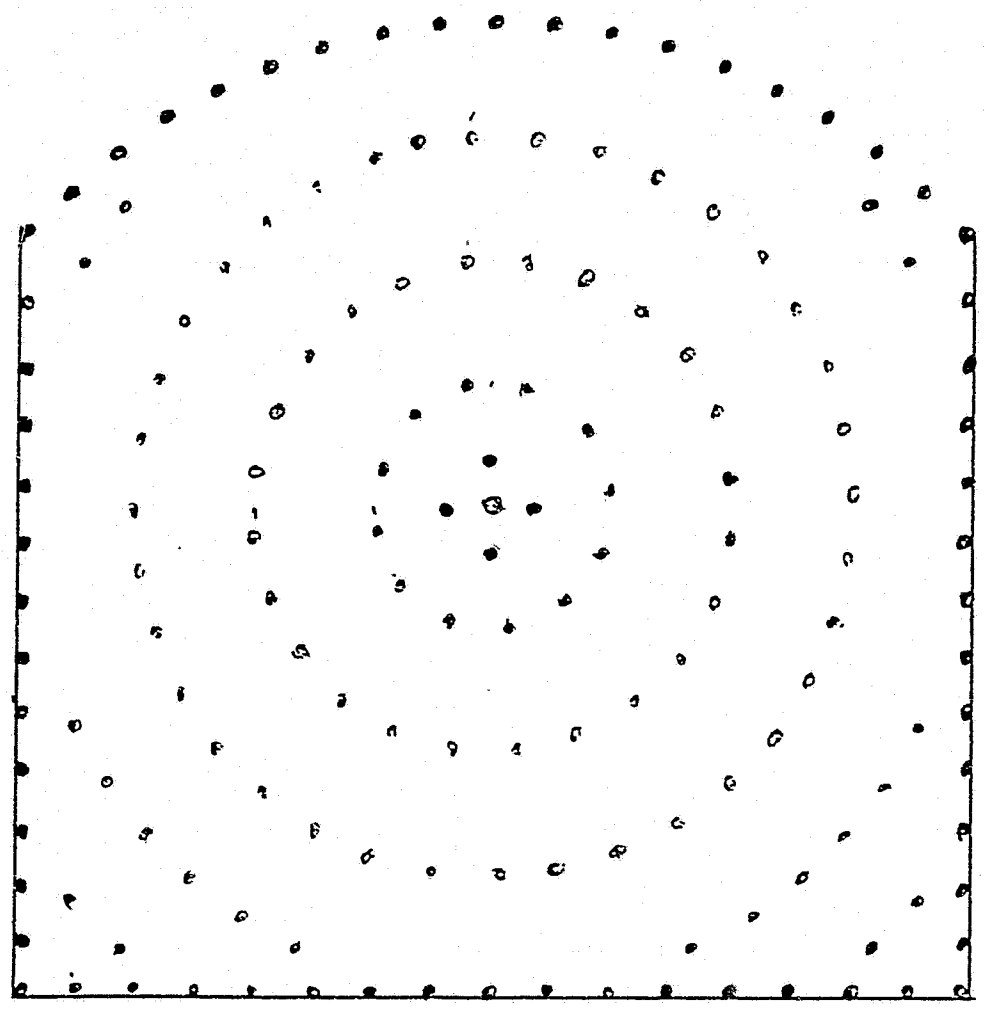


SECTION B-B

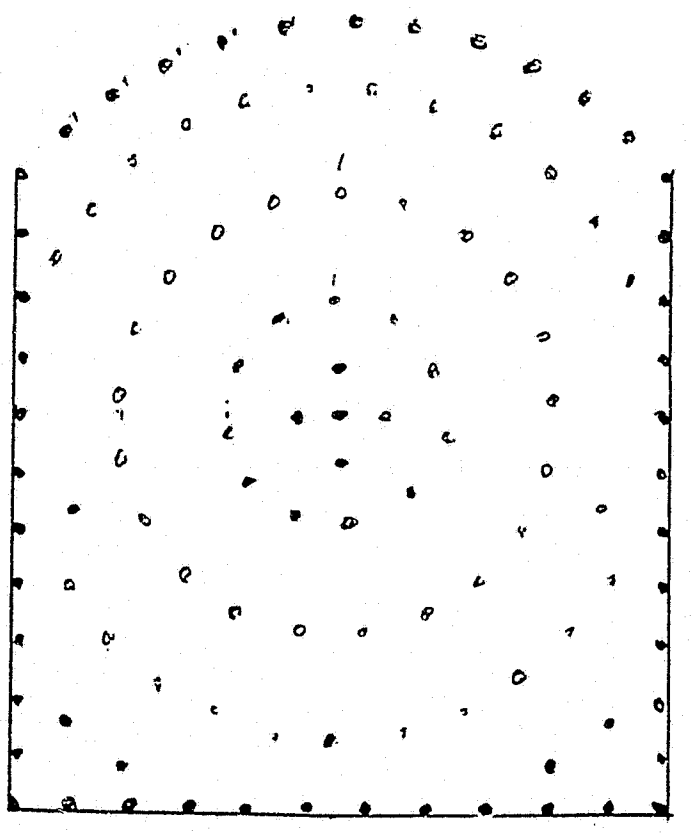
SCALE B



214



UPSTREAM PLUG.
157 HOLES 36.08 C.Y. / L.F.



DOWNSTREAM PLUG
111 HOLES
20.05 C.Y. / L.F.

OPERATION

ITEM NO. SHEET 7 OF ____ PAGE 217

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

UPSTREAM PLUG

157 HOLES

DRIVE FULL FACE USING A JOY 3 DRILL JUMBO - DRILL PRODUCTION SAME AS IN DIVERSION TUNNEL.

DRILL 11 FT & PULL 9 FT.

RETRACT & SETUP	0.80 MINUTES
DRILL	2.20 "
	3.00 MINUTES / HOLE

157 HOLES

3 DRILLS = 52.33 (3)

CHANGE BITS EVERY 3 HOLES

157

3 = 52.33 (0.25)

	157 MINUTES
	13 "
	170 MINUTES
	3.14 HOURS.

157

50 =

LOAD & SHOOT

BRING UP EXPLOSIVES

157 HOLES @ 8/M.H. (SIXES)

MOVE OUT

	5.0 MINUTES
	197.0 "
	5.0
	207.0 MINUTES
	LD = 3.45 HOURS.

MUCKING

USE ST 13 SCOOP TRAMS.

HAUL AT 5 MPH HAUL DISTANCE 2670 LF.

RETURN AT 10 MPH

CYCLE TIME

LOAD	0.50 MINUTES
HAUL	6.07 "
DUMP & TURN	1.00 "
RETURN	3.04 "
	10.61 MIN. / CYCLE

OPERATION ITEM NO. SHEET 3 OF ____ PAGE 218

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

35.08 (9)(1.45) = 458 CU. YDS

11 CY./CYCLE = 41.64 (SAY 42 CYCLES)

42 (10.61)

50 MIN. HR. = 8.91

2 UNITS = 4.46 HOURS

DOWNSTREAM PLUG.

111 HOLES

3 DRILLS = 37 (3) = 111 MINUTES

CHANGE BITS EVERY 3 HOLES

111

3 = 37 (0.25) 9

120 MINUTES

120

50 = 2.40 HOURS.

LOAD & SHOOT

BRING UP EXPLOSIVES 5.0 MINUTES

111 HOLES @ 8/MIN. H. (SIMEN) 139.0 "

MOVE OUT 5.0 "

149 MINUTES

60 = 2.48 HOURS.

MUCKING.

USE ST 13 SCOOP TRAMS

HAUL AT 5.0 M.P.H HAUL DISTANCE = 2120 C.F.

RETURN AT 10.0 "

CYCLE TIME

LOAD	0.50	MINUTES
HAUL	4.82	"
DUMP & TURN	1.00	"
RETURN	2.41	"
	8.73	MIN. / CYCLE

20.05 (9)(1.45) = 262 CU. YDS.

11 C.Y. / CYCLE = 24 CYCLES.

24 (8.73)

50 MIN. HOUR = 4.19

2 UNITS = 2.10 HOURS.

219

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location WATANA
Description UPSTREAM RELEASE CHAMBER

Date
Dr. Ch.
Ref.

CYCLES

1. Drill In & Out	3.14
2. Load & Shoot	3.45
3. Smoke Time	0.50
4. Muck Time	4.46
5. Supports (average time/rd.)	0.50
6. Services (average time/rd.)	0.25
Sub Total Hrs. Per Round	12.30
Lost Time @ 10 %	1.23
Total Hours Per Round/Cycle	13.53
Crew Hours Worked Per Day	20.0
Rounds Per Day	1.48
Peak L.F. Per Day	13.32

PRODUCTION	L. F.	L. F. /Day	W/Days
	54	13.32	4
TRIM			4
Total Work Days			8
Total L. F.			54
Ave. L. F. Per Day			6.75

220

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location KIATANA
Description DOWNSTREAM RELEASE CHAMBER

Date
Dr. Ch.
Ref.

CYCLES

1. Drill In & Out	2.40
2. Load & Shoot	2.48
3. Smoke Time	0.50
4. Muck Time	2.10
5. Supports (average time/rd.)	0.50
6. Services (average time/rd.)	0.25
Sub Total Hrs. Per Round	8.23
Lost Time @ 10 %	.82
Total Hours Per Round/Cycle	9.05
Crew Hours Worked Per Day	20.0
Rounds Per Day	2.21
Peak L. F. Per Day	19.89

PRODUCTION	L. F.	L. F. /Day	W/Days
	54	19.89	3.0
TRIM			3.0
Total Work Days			6
Total L. F.			54
Ave. L. F. Per Day			9

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location WATANA
Description U/S & D/S RELEASE CHAMBERS

Date .....
Dr .....Ch .....
Ref .....

Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
36.67	SHIFTER	1	1		2	73.34
35.56	DRILLER	3	3		6	213.36
34.84	TENDER	3	3		6	209.04
35.95	POKIERMAN	1	1		2	71.90
31.28	TOPMAN	1	1		2	62.56
31.28	DUMPMAN	1	1		2	62.56
41.58	ELECTRICIAN	1	1		2	83.16
38.80	MUCKER OPERATOR	2	2		4	155.20
35.97	DOZER OPERATOR	1	1		2	71.94
	Total	14	14		28	1003.06

Cost Per/Day	10030.60
Cost Per M/Hr. Average	35.82
Cost Per M/Day Average	358.24
Total L. F. Or Cu. Yds.	4042. C.Y.
Production	289
Total Days Required	14
Total Cost - No. Days X Cost/Day	140428.40
Cost Per/L. F.	
Cost Per/Cu. Yd.	34.74
Total Man Days	392
Total Man Hours	3920.

OPERATION ITEM NO. SHEET 12 OF PAGE 222

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	QUANTITY	UNIT	TOTAL
SUPPLIES			
DRILL STEEL	19457 LF.	0.20	3891
EXPLOSIVES 4042 (4.5#)	18189 LB.	1.50	27284
DETONATORS 1869 (1.05 LOSS)	1962 EA.	1.00	1962
AIR & WATER LINES	108 LF.	12.00	1296
VENT LINE	108 LF.	30.00	3240
LIGHTS & ELECTRIC LINE	108 LF.	5.00	540
FOUL WEATHER GEAR	3920 MH	2.50	9800
			48013
SUPPORTS			
ALLOW $24.23 PER CU. YD. OF EXCAVATION			
4042 CU. YDS.			97938

12

11

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION EMERGENCY RELEASE ITEM NO. 332-210 SHEET 13 OF ___ PAGE 22

CHAMBERS JOB VIATONA

BID QUANTITY 4700 UNIT CY. TAKE OFF QUANTITY 4042 EST. BY ___ DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST	
1- 3 DRILL JUMBO	280	HRS			50.88	14246	48 -	13440	42.02	11766			140.90	39452
3- FANS	840	"			3.89	3268	2.35	1974	2.35	1974			8.59	7216
1- 300 KW GENERATOR	280	"			17.63	4936	2.78	778	27.11	7591			47.52	13305
2- PUMPS	560	"			2.40	1344	0.27	151	1.83	1025			4.50	2520
2- ST13 SCOOP TRAINS	560	"			30.05	16828	38 -	21280	38.93	21801			106.98	59909
1- PICKUP	280	"			2.40	672	0.97	272	5.71	1599			9.08	2543
1- FLATBED	280	"			4.01	1123	4.17	1168	11.04	3091			19.22	5382
1- D7 DOZER	280	"			24.04	6731	17.23	4824	22.57	6320			63.84	17875
	4042	CY.			12.16	49148	10.86	43887	13.65	55167			36.67	148202

FOLD LENGTH

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8 IN

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MANUAL

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11

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Temporary Cofferdam Fill for U/S Portals ITEM NO. 332.212 SHEET ____ OF ____ PAGE ____

JOB Watana Dam

BID QUANTITY 34,540 UNIT C.Y. TAKE OFF QUANTITY ____ EST. BY A. Lee DATE ____

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
PER DETAIL	34540	CY.	0.27 9200	0.02 675	0.19 6488	0.10 3498	0.13 4570			0.71 24431

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DIVERSIFIED CONSTRUCTORS, INC.

OPERATION TEMPORARY COFFERDAM FILL ITEM NO. 232-212 SHEET ___ OF ___ PAGE [illegible]

FOR U/S PORTALS JOB [illegible]

QUANTITY 34540 UNIT CY EST. BY CK'D. BY DATE

FORM 2

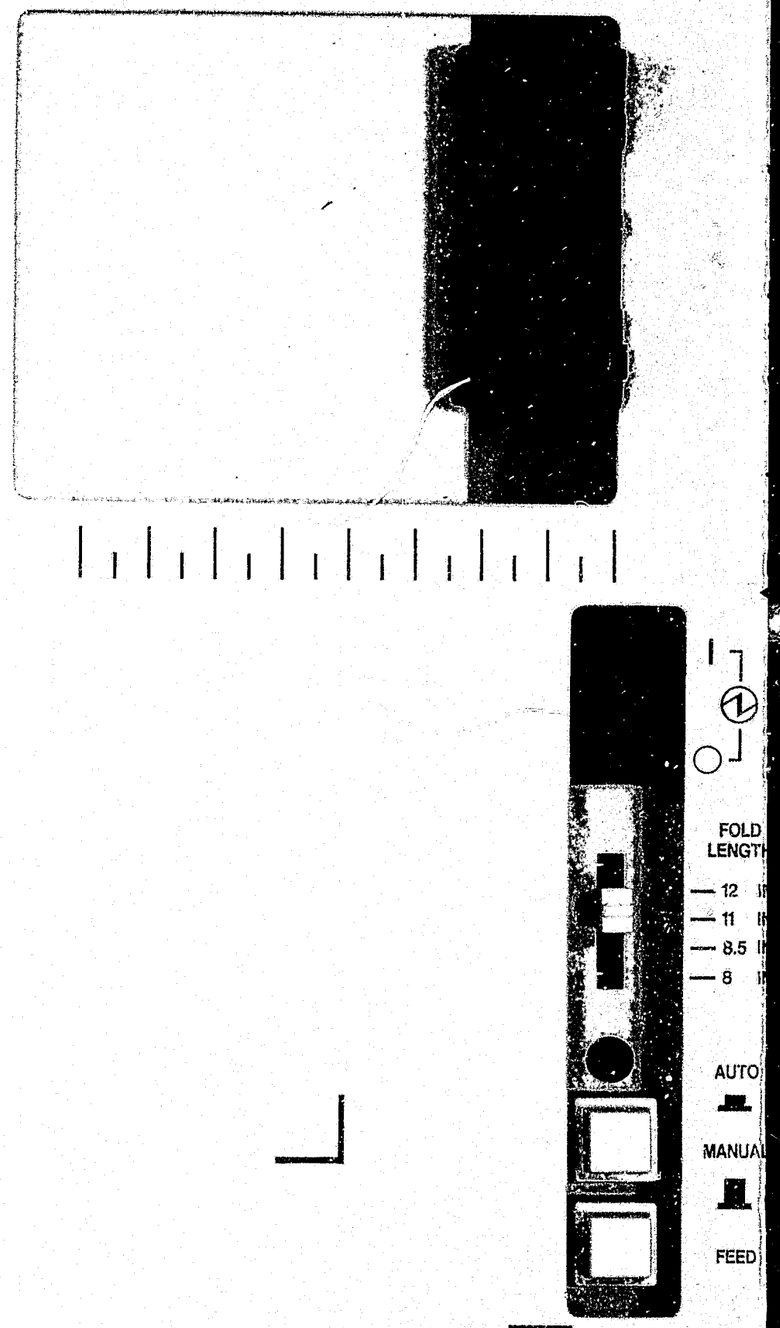
MATERIAL FROM REQUIRED
EXCAVATION. FIGURE A DOZER
FOR SPREADING AND PRODUCTION
BASED ON EXCAVATION PRODUCTION

BANK 94,400 C.Y. @ 288 CU. YDS. HOUR
" 71,790 " @ 213 " " "
166,210 @ 256 CU. YDS. AVERAGE

34540
256 - 135 HOURS

SPREAD	LABOR	EQUIPMENT	SUPPLIES
1-D8 DOZER	48.06	25.91	33.85
1-OPERATOR	35.97		
1-GRADE CHECKER	32.18		5.00
COST PER HOUR	116.21	25.91	38.85
COST 135 HOURS.	15688	3498	5245

SUMMARY	TOTAL	UNIT PRICE
DIRECT LABOR	9200	0.27
SUPPLIES	675	0.02
REPAIR LABOR	6488	0.19
EQUIPMENT	3498	0.10
EQUIP. SUPPLIES	4570	0.13
	24431	0.71



DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Tunnel Concrete Lining - 36' I.D. ITEM NO. 332.214 SHEET ___ OF ___ PAGE 27

JOB Watana Dam

BID QUANTITY 7,220 UNIT L.F. TAKE OFF QUANTITY 4779 CY EST. BY A. Lee DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
FURNISH CONCRETE	72296		17.71 1280362	0.38 27472	9.25 668738	8.44 610178	10.24 740311	35.00 2530360		81.02 5857421
PLACE CONCRETE	71863	CY.	7.71 554064	0.42 30182	0.60 43118	0.53 38087	1.33 95578			10.59 761029
CONCRETE WASTE	433	CY.								
CONCRETE OVERBREAK	24572	CY.								
FABRICATE FORMS	31279	SF.	11.93 373158	3.42 106974	0.19 5943	0.62 19393	0.37 11573			16.53 517041
ERECT FORMS	842206	SF.	7.34 6181792	0.21 176863	0.34 286350	0.46 387415	0.44 370571			8.79 7402991
STRIP & CLEAN FORMS	842206	SF.	3.23 2720325	0.10 84221	0.17 143175	0.23 193707	0.22 185285			3.95 3326713
FORM HARDWARE	842206	SF.		0.75 631655						0.75 631655
CONSTRUCTION JOINT PREPARATION	25625	SF.	1.08 27675	0.07 1794	0.10 2563	0.08 2050	0.17 4356			1.50 38438
CONCRETE CURE	71863	CY.	5.34 383748	0.83 59646	0.20 14373	0.08 5749	0.47 33776			6.92 497292
FOUNDATION "ROCK" CLEANUP	884594	SF.	2.15 1901877	0.13 114997	0.20 176919	0.16 141535	0.34 300762			2.98 2636090
REINFORCING STEEL	100000	LB.						0.25 25000	0.15 15000	0.40 40000
	7220	LF.	1859.14 13423001	170.89 1233804	185.76 1341179	193.66 1398114	241.30 1742212	353.93 2555360	2.08 15000	3006.24 21708670

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DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Tunnel Concrete Lining - 45' I.D. ITEM NO. 332.21E SHEET OF PAGE 27

JOB Watana Dam

BID QUANTITY 760 UNIT L.F. TAKE OFF QUANTITY 2171 CY EST. BY A. Lee DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
FURNISH CONCRETE	9401	CY.	12.71 166 492	0.38 3 572	9.25 86 959	8.44 79 344	10.24 96 266	35.00 329 035		81.02 761 668
PLACE CONCRETE	9355	CY.	7.71 72 127	0.42 3 929	0.60 5 615	0.53 4 958	1.33 12 442			10.59 99 069
CONCRETE WASTE	46	CY.								
CONCRETE OVERBREAK	3184	CY.								
FABRICATE FORMS	10355	SF.	11.93 123 535	3.42 35 414	0.19 1 967	0.62 6 420	0.37 3 831			16.53 171 167
ERECT FORMS	110728	SF.	7.34 812 744	0.21 23 253	0.34 37 648	0.46 50 935	0.44 48 720			8.79 973 300
STRIP & CLEAN FORMS	110728	SF.	3.23 357 651	0.10 11 073	0.17 18 824	0.23 25 467	0.22 24 360			3.95 437 375
FORM HARDWARE	110728	SF.		0.75 83 046						0.75 83 046
CONSTRUCTION JOINT PREPARATION	3287	SF	1.08 3 550	0.07 230	0.10 329	0.08 263	0.17 559			1.50 4931
CONCRETE CURE	9355	CY.	5.34 49 956	0.83 7 765	0.20 1871	0.08 748	0.47 4397			6.92 64737
FOUNDATION "ROCK" CLEANUP	114608	SF.	2.15 246 407	0.13 14 899	0.20 22 922	0.16 18 337	0.34 38 967			2.98 341 532
REINFORCING STEEL	15000	LB.						0.25 3750	0.15 2250	0.40 6000
	760	LF	241.13 183 246	241.03 183 181	231.75 176 133	245.26 186 472	302.03 229 542	437.88 332 785	2.96 2250	887.14 2 947 825

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DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Portal Concrete ITEM NO. 332.215 SHEET ___ OF ___ PAGE [illegible]

JOB Watana Dam

BID QUANTITY 18,525 UNIT C.Y. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
PER DETAIL	18525	CY.	183.14 3485294	30.45 564086	19.08 353457	21.39 396250	23.49 435152	64.38 1192640	15.00 277875	361.93 6704754

FOLD LENGTH

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DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Portal Concrete ITEM NO. 331 SHEET OF PAGE [illegible]

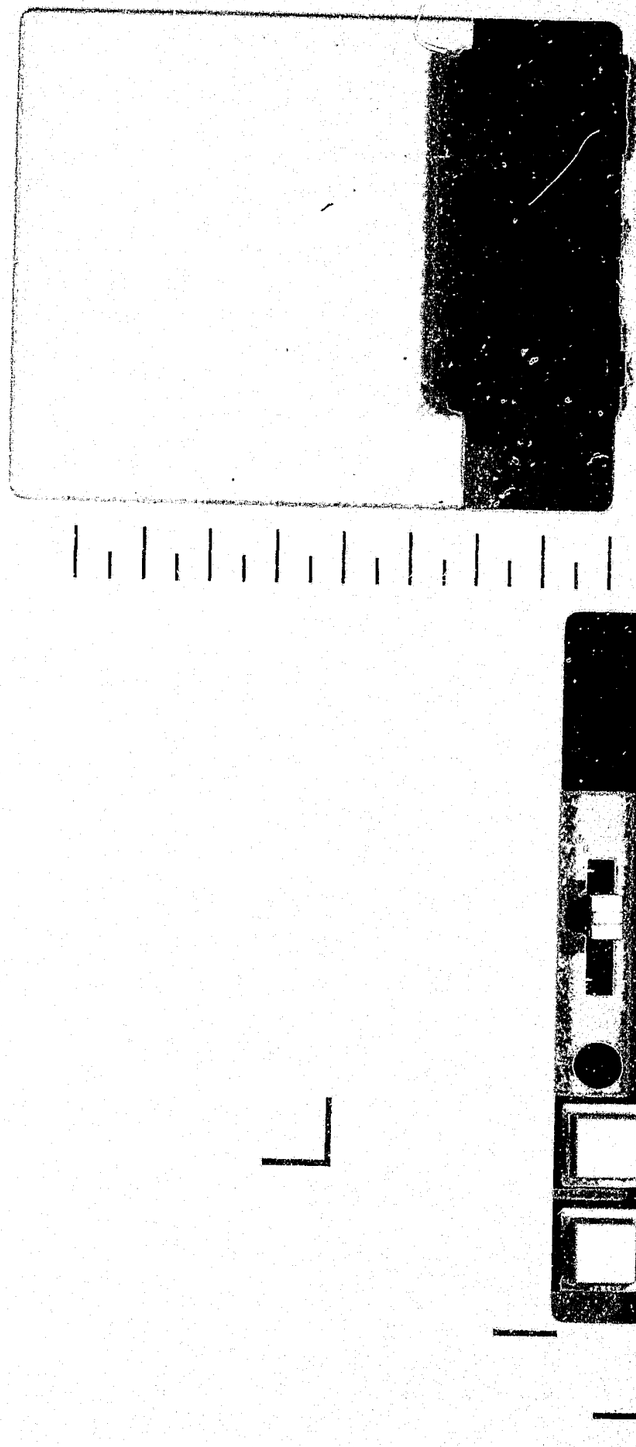
JOB [illegible]

QUANTITY 18525 UNIT [illegible] EST. BY CK'D. BY DATE

FORM 2

SAME UNIT PRICES AS ITEM 331.124

SUMMARY	TOTAL	UNIT PRICE
DIRECT LABOR	3495294	188.14
SUPPLIES	564086	30.45
REPAIR LABOR	353457	19.08
EQUIPMENT	396350	21.39
EQUIP. SUPPLIES	435152	23.49
PERM. MATERIAL	1192640	64.38
SUB-CONTRACT	277875	15.00
	6704754	361.93



DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Mass Concrete ITEM NO. 332.215A SHEET ___ OF ___ PAGE 232

JOB Watana Dam

BID QUANTITY 200 UNIT C.Y. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST	
CONCRETE - FURNISH	304	C.Y.	17.71 5384	0.38 116	9.25 2812	8.44 2566	10.24 3113	35.00 10640		81.02	24631
" - PLACE	304	C.Y.	7.71 2344	0.42 128	0.60 182	0.53 161	1.33 404			10.59	3219
" - WASTE	2	C.Y.									
" - OVERBREAK	104	C.Y.									
FORMS - FABRICATE	336	S.F.	4.47 1502	3.00 1008	0.07 24	0.23 77	0.14 47			7.91	2658
" - ERECT	3588	S.F.	7.34 26336	0.21 753	0.34 1220	0.46 1650	0.44 1579			8.79	31538
" - STRIP - CLEAN	3588	S.F.	3.23 11589	0.10 359	0.17 610	0.23 825	0.22 789			3.95	14172
" - HANDLING	3588	S.F.		0.75 2691						0.75	2691
CONSTRUCTION JOINT PREPARATION	106	S.F.	1.08 114	0.07 7	0.10 11	0.08 8	0.17 18			1.50	158
FOUNDATION PREPARATION	3714	S.F.	2.15 7985	0.13 483	0.20 743	0.16 594	0.34 1263			2.98	11068
CONCRETE CURE	304	S.F.	5.34 1623	0.83 252	0.20 61	0.08 24	0.47 143			6.92	2103
REINFORCING STEEL	486	LB.						0.25 122	0.15 73	0.40	195
	200	C.Y.	28.39 5677	28.99 5797	28.32 5663	28.53 5706	36.78 7356	53.81 10762	0.31 62	73.62	92433

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DIVERSIFIED CONSTRUCTORS, INC.

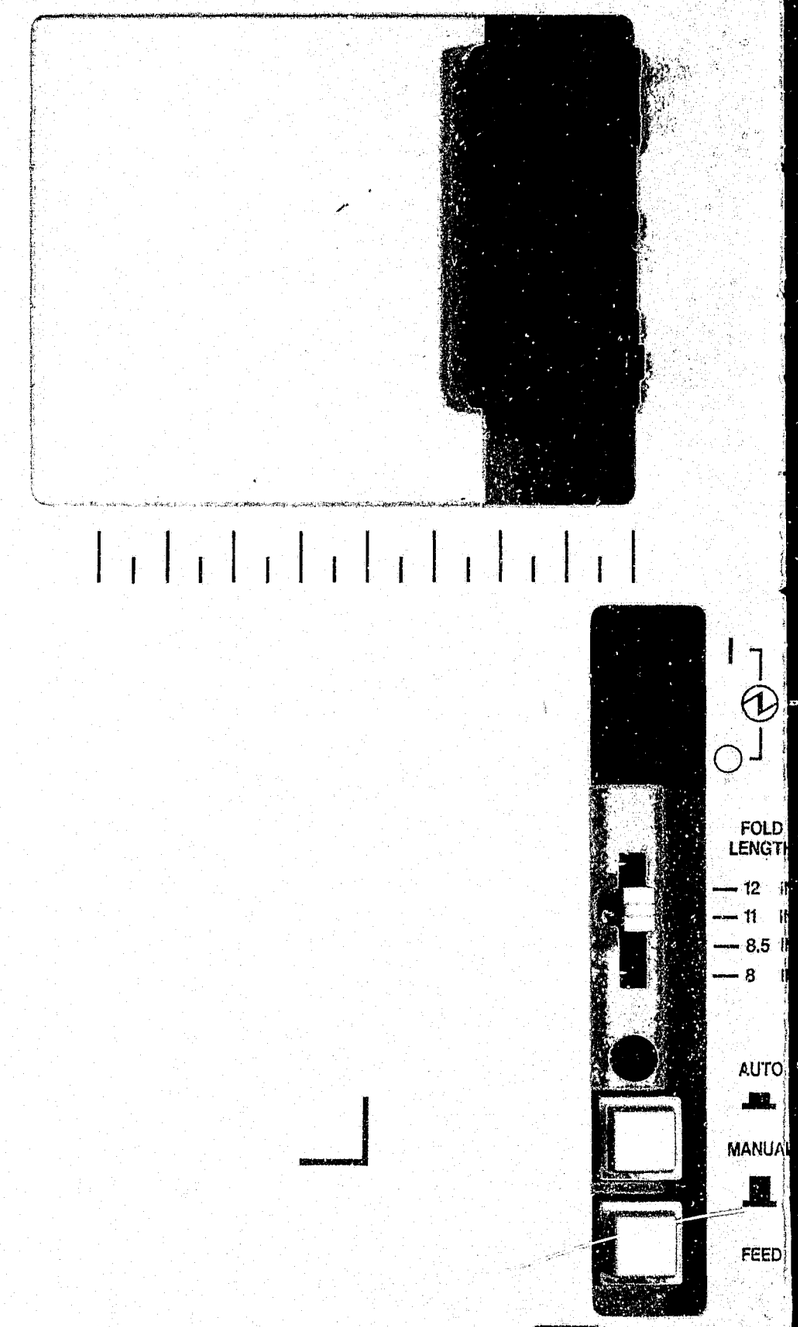
OPERATION MASS CONCRETE ITEM NO 332-215 F SHEET 1 OF ___ PAGE 73

JOB WATANA

QUANTITY 200 UNIT C.Y. EST. BY CK'D. BY DATE

FORM 2

CANNOT IDENTIFY		
FIGURE FOLLOWING RATIOS		
CONCRETE - FURNISH	1.52	304
" - PLACE	1.52	304
" - WASTE	0.01	2
" - OVERBREAK	0.52	104
FORMS - FABRICATE	1.68	336
" - ERECT	17.94	3588
" - STRIP & CLEAN	17.94	3588
" - HARDWARE	17.94	3588
CONCRETE FINISH	-0-	
POINT & PATCH	-0-	
CONSTRUCTION JOINT PREPARATION	0.53	106
FOUNDATION PREPARATION	18.57	3714
CONCRETE CURE	1.52	304
REINFORCING STEEL	2.43	486



DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Flip Bucket Concrete ITEM NO. 332.216 SHEET ___ OF ___ PAGE 77

JOB Watana Dam

BID QUANTITY 2,000 UNIT C.Y. TAKE OFF QUANTITY 2307 EST. BY A. Lee DATE ___

FORM		QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS		TOTAL DIRECT COST	
	FURNISH CONCRETE	2391	CY	17.71	42345	0.38	909	9.25	22117	8.44	20180	10.24	24484	35.00	83685			81.02	193720
	PLACE CONCRETE	2388	CY	7.71	18411	0.42	1003	0.60	1433	0.53	1266	1.33	3176					10.59	25289
	WASTE CONCRETE	3	CY																
	CONCRETE OVERBREAK	86	CY																
	FOUNDATION PREPARATION	4625	SF	2.15	9944	0.13	601	0.20	925	0.16	740	0.34	1573					2.98	13783
	CONCRETE FINISH	4625	SF	0.98	4533	0.08	370	0.06	278	0.08	370	0.09	416					1.29	5967
	CONCRETE CURE	2388	CY	5.24	12517	0.83	1982	0.20	478	0.08	191	0.47	1122					6.82	16525
	FABRICATE FORMS	1680	SF	4.47	7510	3.00	5040	0.07	118	0.23	386	0.14	235					7.91	13289
	ERECT FORMS	3360	SF	7.34	24662	0.21	706	0.34	1142	0.46	1546	0.44	1478					8.79	29534
	STRIP & CLEAN FORMS	3360	SF	3.23	10853	0.10	336	0.17	571	0.23	773	0.22	739					3.95	13272
	FOIL HARDWARE	3360	SF			0.75	2520											0.75	2520
	REINFORCING STEEL	115100	LB											0.25	29775	0.15	17265	0.40	46040
		2307	CY	56.91	131010	5.85	13467	11.76	27062	11.06	25452	14.43	33223	48.85	112460	7.50	17265	156.36	359939
		5000	CY	56.91	113820	5.85	11700	11.76	23520	11.06	22120	14.43	28860	48.85	97700	7.50	15000	156.36	312720

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DIVERSIFIED CONSTRUCTORS, INC.

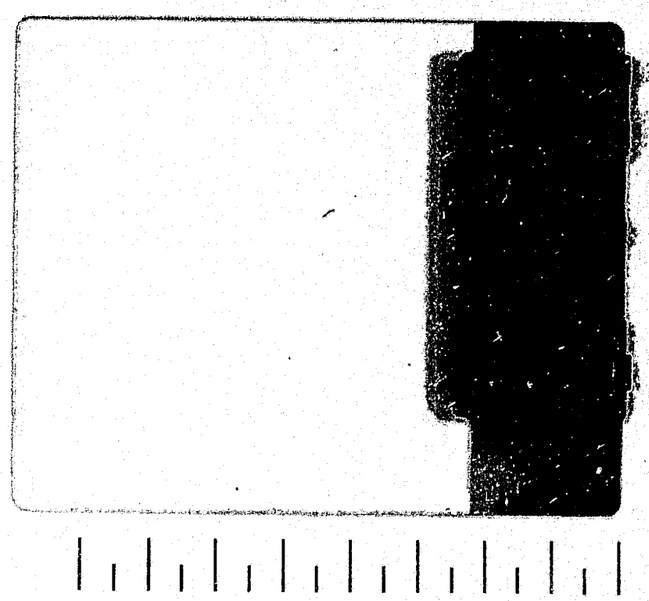
OPERATION FLIP BUCKET CONCRETE ITEM NO. 216 SHEET 1 OF PAGE 335

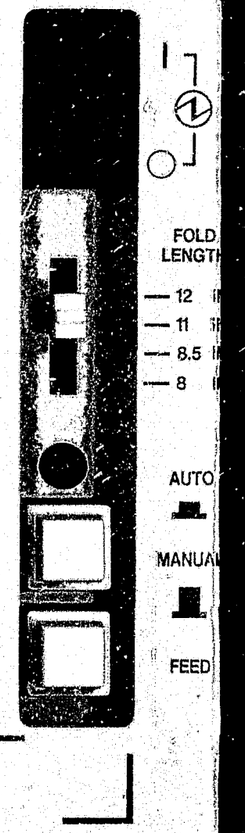
JOB VIETNAM LAM

QUANTITY 2,000 UNIT C.Y. EST. BY CK'D. BY DATE

FORM 2

DOWNSTREAM END OF
DIVERSION TUNNEL No. 1





OPERATION Emergency Release Chamber Concrete ITEM NO. 332.217 SHEET ___ OF ___ PAGE ___

JOB Watana Dam

BID QUANTITY 15,300 UNIT C.Y. TAKE OFF QUANTITY 13450 EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS		TOTAL DIRECT COST	
FURNISH CONCRETE	13468	CY.	17.71	238518	0.38	5118	9.25	124579	8.44	113670	10.24	137912	35.00	471380			81.02	1091177
PLACE CONCRETE	13450	CY.	7.71	103700	0.42	5649	0.60	8070	0.53	7129	1.33	17889					10.59	142437
WASTE CONCRETE	18	CY.																
CONCRETE OVERBREAK	-0-																	
FABRICATE FORMS	5173	SF.	4.47	23123	3.00	15519	0.07	362	0.23	1190	0.14	724					7.91	40918
ERECT FORMS	20693	SF.	7.34	151887	0.21	4346	0.34	7036	0.46	9519	0.44	9105					8.79	181893
STRIP & CLEAN FORMS	20693	SF.	3.23	66835	0.10	2069	0.17	3518	0.23	4759	0.22	4552					3.95	81736
FORM HARDWARE	20693	SF.			0.75	15520											0.75	15520
CONCRETE FINISH	6152	SF.	0.98	6029	0.08	492	0.06	369	0.08	492	0.09	554					1.29	7936
CONSTRUCTION JOINT PREPARATION	39584	SF.	1.08	42751	0.07	2771	0.10	3958	0.08	3167	0.17	6729					1.50	59376
CONCRETE CURE	13450	CY.	5.34	71823	0.83	11164	0.20	2690	0.08	1076	0.47	6322					6.92	93075
REINFORCING STEEL	672500	LB.											0.25	168125	0.15	100875	0.40	269000
	13450	CY.	52.39	704669	4.66	62648	11.20	150582	10.48	141002	13.66	183787	47.55	639505	7.50	100875	147.44	1983068
	15300	CY.	52.39	801567	4.66	71298	11.20	171360	10.48	160344	13.66	208998	47.55	727515	7.50	114750	147.44	2255832

FOLD LENGTH

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AUTO

MANUAL

FEED

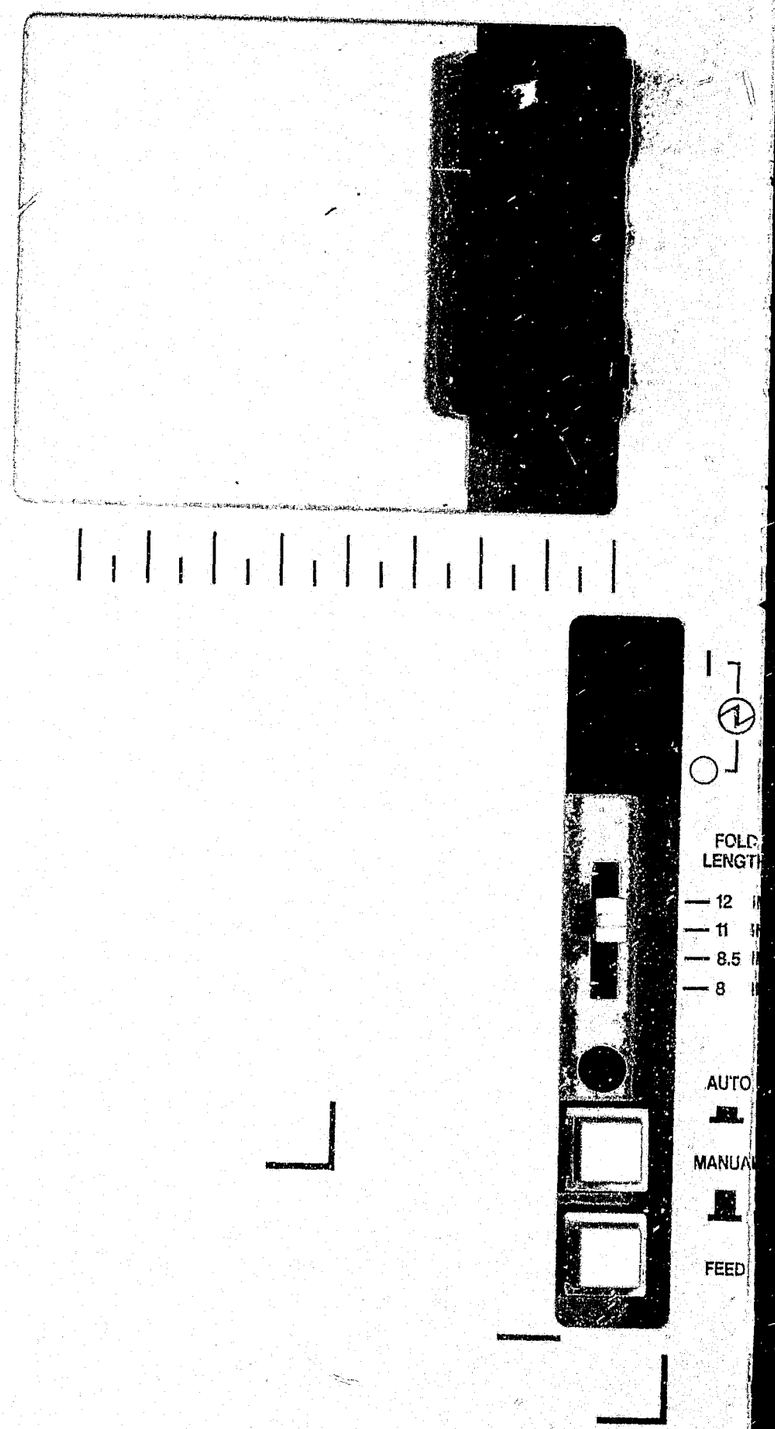
OPERATION EMERGENCY RELEASE ITEM NO. 552 SHEET ___ OF ___ PAGE 235

CHAMBER CONCRETE JOB [illegible]

QUANTITY 15300 UNIT CY. EST. BY CK'D. BY DATE

FORM 2

UPSTREAM PLUG		
1-45'Φ (160)		9424
DEDUCT		
2-7x12x56	FORM	<523>
3-11.5Φ x 104	STEEL	<1200>
DOWNSTREAM PLUG		
1-45'Φ (120)		7069
DEDUCT		
3-7.5x13.2x120	FORM 64'	<1320>
	STEEL 56'	13450 CU YDS



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DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Suspended Metal Roof, Emergency ITEM NO. 332.218 SHEET ___ OF ___ PAGE 77

Release Chamber JOB Watana Dam

BID QUANTITY 2,775 UNIT S.F. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SUB. CONTRACT	2775	SF							28.50 79088	28.50 79088

FOLD LENGTH
12
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AUTO

MANUAL

FEED

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Lower Diversion Tunnel Plug Concrete ITEM NO. 332.219 SHEET ___ OF ___ PAGE 227

JOB Watana Dam

BID QUANTITY 5,570 UNIT C.Y. TAKE OFF QUANTITY 4660 EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS		TOTAL DIRECT COST	
FURNISH CONCRETE	4660	CY	17 71	82529	0 38	1771	9 25	43105	8 44	39330	10 24	47718	35 00	163100			91 02	377563
PLACE CONCRETE	4650	CY	7 71	35852	0 42	1953	0 60	2790	0 53	2465	1 33	6185					10 59	49245
WASTE CONCRETE	10	CY																
CONCRETE OVERBREAK	- 0 -	CY																
FABRICATE FORMS	7804	SF	11 93	93102	3 42	26690	0 19	1483	0 62	4838	0 37	2887					16 53	129000
ERECT FORMS	15608	SF	7 34	114563	0 21	3278	0 34	5307	0 46	7180	0 44	6868					8 79	137196
STRIP & CLEAN FORMS	15608	SF	3 23	50414	0 10	1561	0 17	2653	0 23	3590	0 22	3434					3 95	61652
FORM HARDWARE	15608	SF			0 75	11706											0 75	11706
CONCRETE CURE	4650	CY	5 34	24831	0 83	3860	0 20	930	0 08	372	0 47	2186					6 92	32179
CONSTRUCTION JOINT PREPARATION	13572	SF	1 08	14658	0 07	950	0 10	1357	0 08	1086	0 17	2307					1 50	20358
REINFORCING STEEL	46500	LB											0 25	11625	0 15	6975	0 40	18600
	4650	CY	89 45	415949	11 13	51769	12 39	57625	12 66	58861	15 39	71585	37 58	174725	1 50	6975	180 10	837489
	5570	CY	89 45	498237	11 13	61994	12 39	69012	12 66	70516	15 39	85722	37 58	209321	1 50	8355	180 10	1003157

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FOLD LENGTH
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AUTO
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FEED

DIVERSIFIED CONSTRUCTORS, INC.

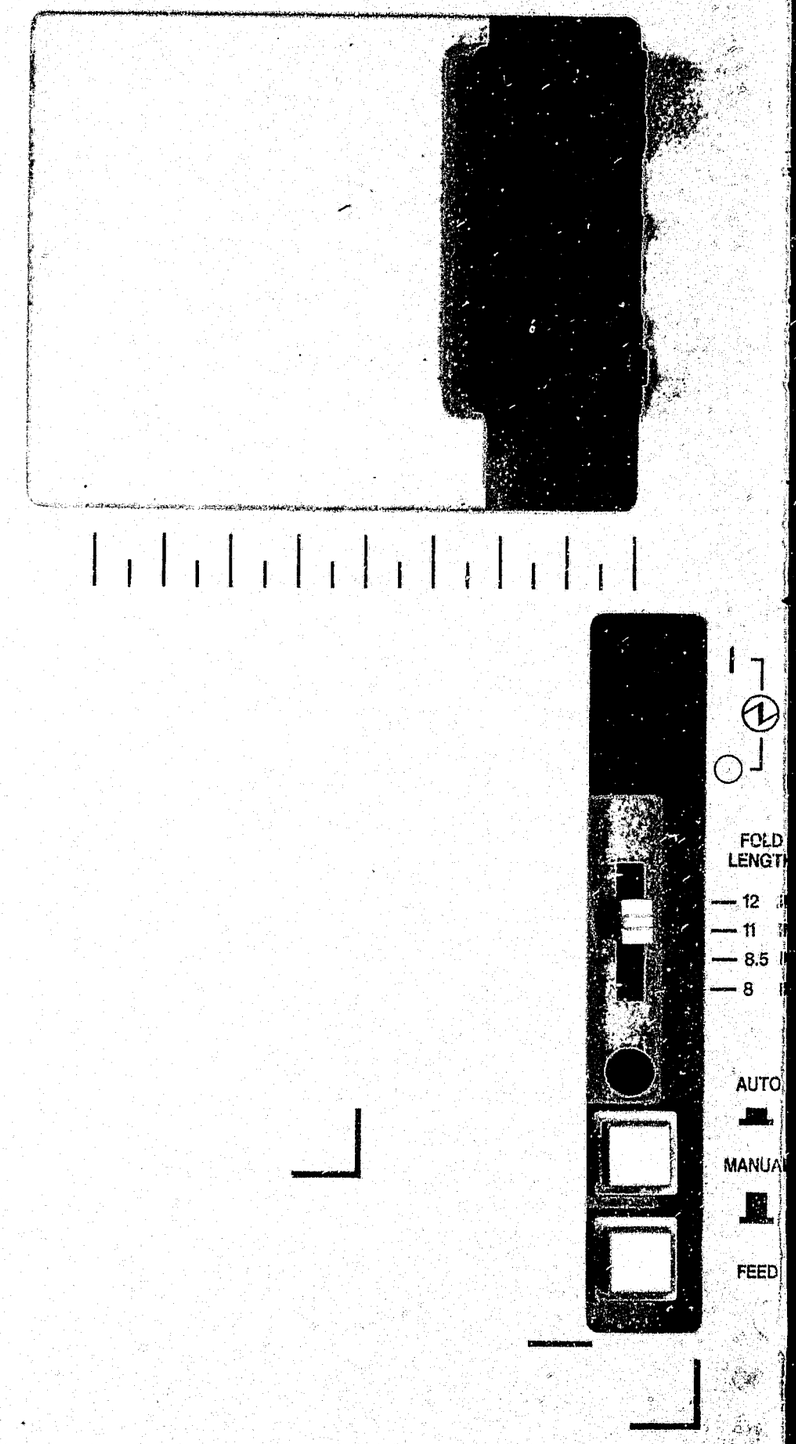
OPERATION LOWER DIVERSION TUNNEL ITEM NO. 319 SHEET 1 OF ___ PAGE 238

PLUG - TUNNEL NO. 2 JOB [illegible]

QUANTITY 5570 UNIT C.Y. EST. BY CK'D. BY DATE

FORM 2

SECTION SHOWS A SERIES OF
TAPERS ALONG TUNNEL WALL
FIGURE ON A FORM OVERLAY
THRU THIS SECTION FOR ROLE.



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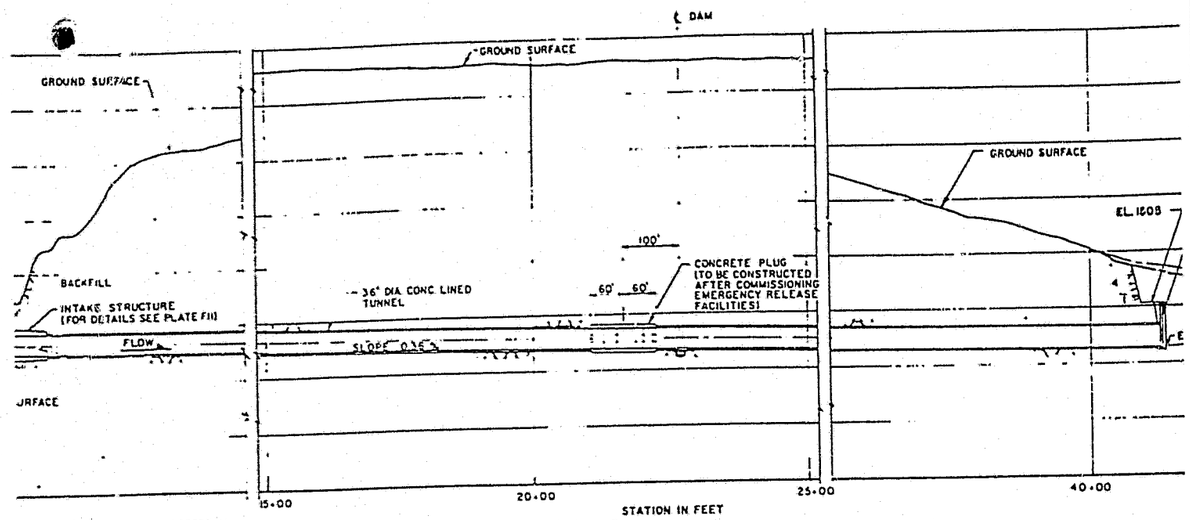
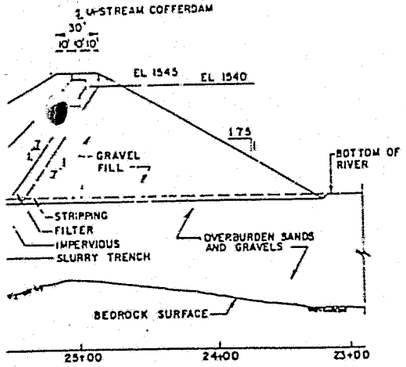
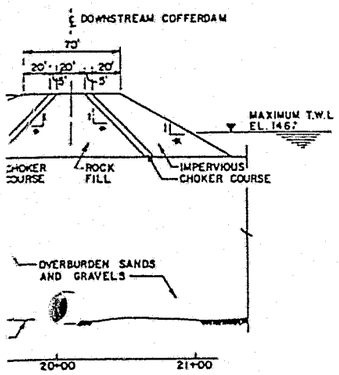


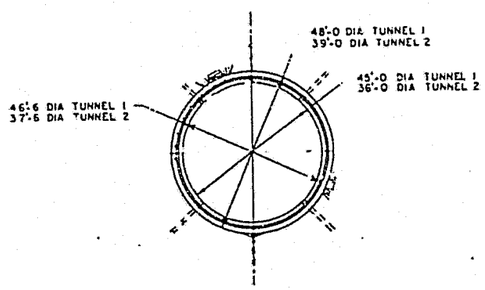
PROFILE - TUNNEL 2
SCALE A



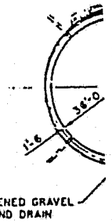
ECTION UPSTREAM COFFERDAM
SCALE B



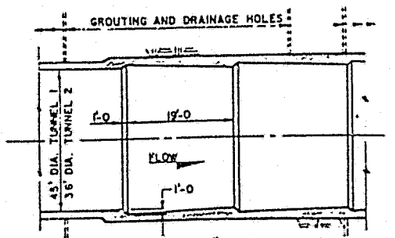
ION DOWNSTREAM COFFERDAM
SCALE B



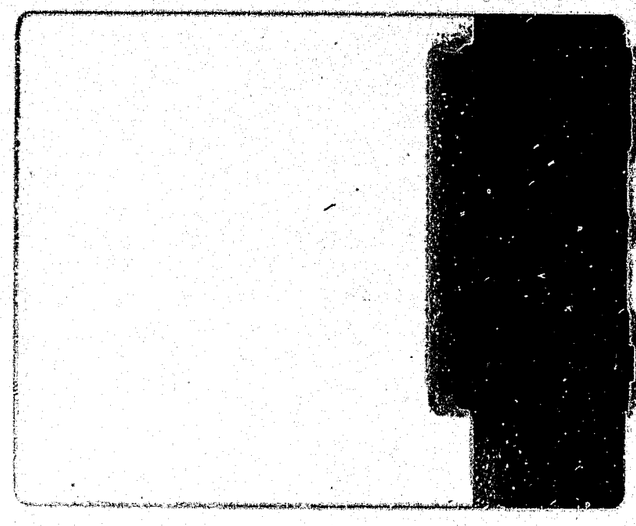
CROSS SECTION AT PLUG (TYPICAL)
N.T.S

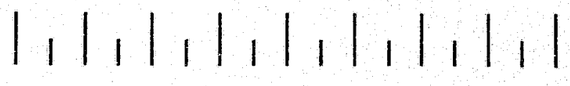


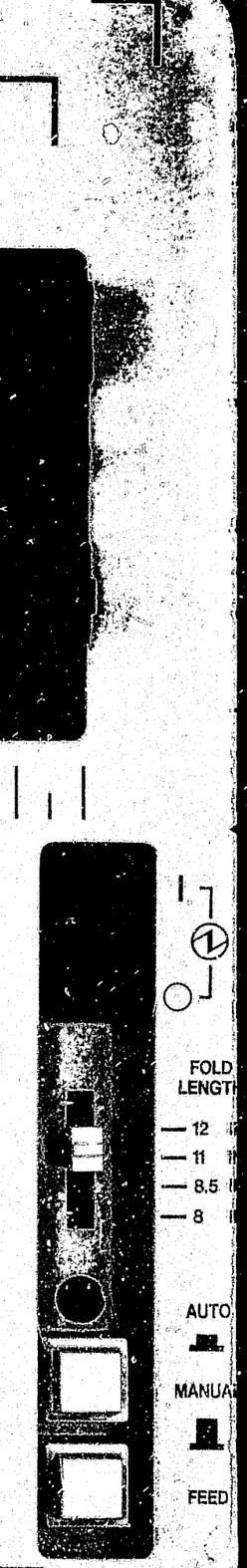
TYPICAL TUN



SECTION ALONG ℄ OF TUNNEL AT PLUG LOCATION
SCALE C







OPERATION Lower Diversion Tunnel Plug at Tailrace Tunnel ITEM NO. 332.21F SHEET ___ OF ___ PAGE ___
JOB Watana Dam
BID QUANTITY 8,500 UNIT C.Y. TAKE OFF QUANTITY 10,218 EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS		TOTAL DIRECT COST	
JUNCTION AT TAILRACE TUNNEL	3488	C.Y.	8.45	29,002	11.13	38821	12.39	43216	12.66	44158	15.39	53680	27.58	131079	1.50	5222	180.10	628188
TAILRACE I & 2 CROSSING PENSTOCK CONSTRUCTION J.C.T.																		
FURNISH CONCRETE	7108	C.Y.	17.71	125883	0.38	2701	9.25	65749	8.44	59992	10.24	72786	35.00	248780			91.02	575891
PLACE CONCRETE	7085	C.Y.	7.71	54648	0.42	2970	0.60	4253	0.53	3757	1.33	9427					10.59	75061
WASTE CONCRETE	20	C.Y.																
CONCRETE OVERPOUR	258	C.Y.																
FABRICATE FORMS	1829	S.F.	11.93	21820	3.42	6255	0.19	348	0.62	1134	0.37	677					16.53	30234
ERECT FORMS	3658	S.F.	7.34	26850	0.21	768	0.34	1244	0.44	1603	0.44	1610					8.79	32155
STRIP & CLEAN FORMS	2658	S.F.	3.23	11815	0.10	366	0.17	622	0.23	841	0.22	805					3.95	14449
FORM HARDWARE	2658	S.F.			0.75	2744											0.75	2744
CONCRETE CURE	7088	C.Y.	5.34	27850	0.83	5883	0.20	1418	0.08	567	0.47	3331					6.92	49049
CONSTRUCTION JOINT PREPARATION	19355	S.F.	1.08	20903	0.07	1355	0.10	1936	0.08	1548	0.17	3290					1.50	29032
REINFORCING STEEL	70550	LBS											0.25	17720	0.15	10632	0.40	28352
	10218	C.Y.	59.87	611771	6.05	61869	11.63	118786	11.13	113680	14.25	145606	38.91	397579	1.55	15864	145.39	1485155
	8500	C.Y.	59.87	508895	6.05	51425	11.63	98855	11.13	94605	14.25	121125	38.91	330735	1.55	13175	145.39	1218815

FOLD LENGTH
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DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Lower Diversion Tunnel No. 2 ITEM NO. 332-21F SHEET ___ OF ___ PAGE 7

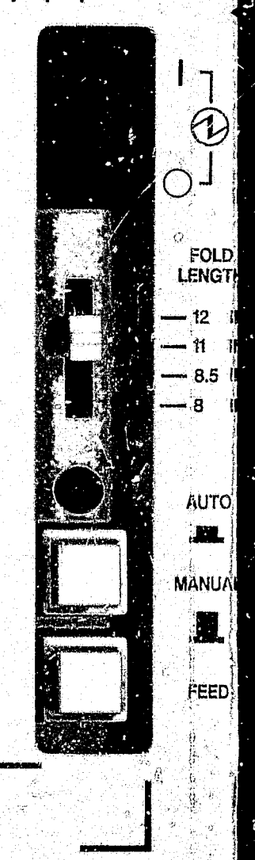
PLUG AT TAILRACE TUNNEL JOB WATANA

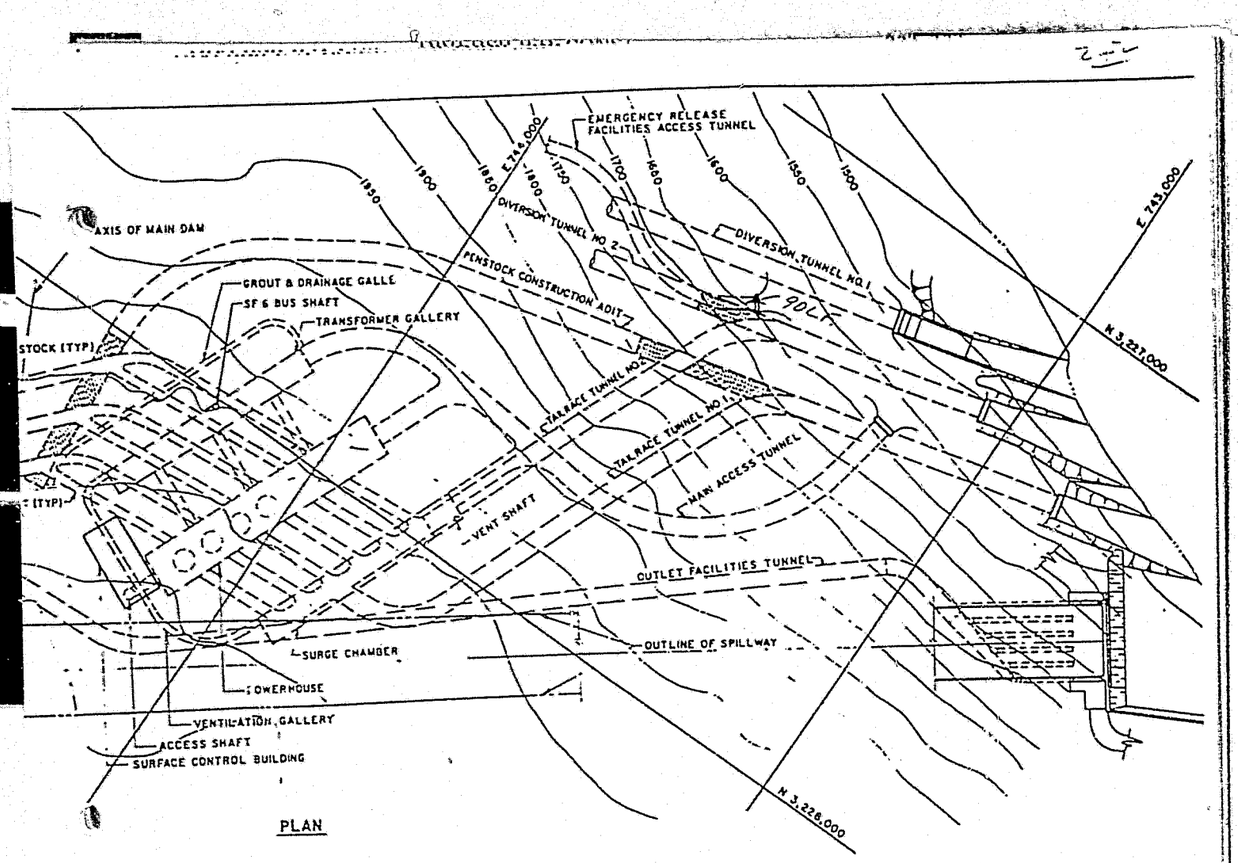
QUANTITY 9,500 UNIT CY. EST. BY CK'D. BY DATE

FORM 2

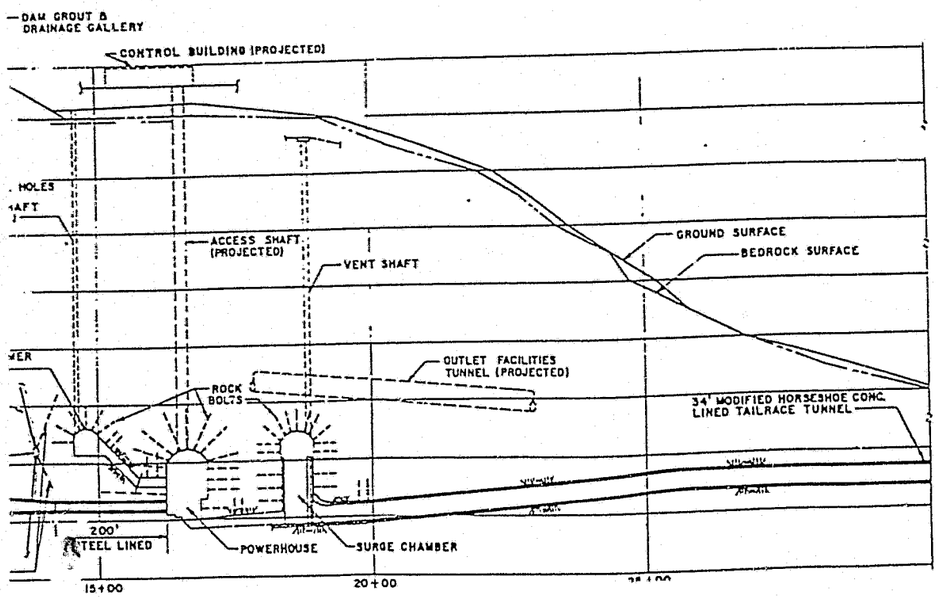
DIVERSION TUNNEL No. 2 WITH JUNCTION
OF TAILRACE TUNNEL
3488 CU. YDS.
TAILRACE : 1 & 2 CROSSING
PENSTOCK CONSTRUCTION ADIT.
245 LF (33.3T) = 8293
LESS TAILRACE (1563)
6730
3488
10218 CU. YDS.

NOTE:
APPEARS TO BE A QUANTITY
MIX BETWEEN THIS ITEM AND
ITEM No. 332-219.
HARZA TOTAL = 14070 CU. YDS.
DESON TOTAL = 14863 CU. YDS.





PLAN



PROFILE

SCALE 0 10

HARZA-EBASCO

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DIVERSIFIED SUBCONTRACTORS, INC.

OPERATION Diversion Tunnel Mechanical ITEM NO. 332.21G SHEET ___ OF ___ PAGE ___

JOB Watana Dam

BID QUANTITY 1 UNIT L.S. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SUB-CONTRACT	1	LS.							LS. 4873960	LS. 4873960

FOLD LENGTH
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MANUAL

FEED

DIVERSIFIED CONSTRUCTORS, INC.

UNIT TAKE-OFF

JOB NAME WATANA DATE SHEET OF

DESCRIPTION	MATERIAL						LABOR		SHIPPING	
	SIZE	QUANTITY	MATERIAL LIST PRICE	MATERIAL SUB TOTAL	DISC.	MATERIAL EXTENSION	LABOR UNIT	TOTAL HOURS	UNIT WT.	TOTAL WT.
Upstream Lower Gates - Gate Equipment		2 ea								
Closure Gates	11.5'x20'		125000-			250000-	80	160		
Gate Guides	420 FT							1260		
Gate Hoist								40		
TOTAL THIS SHEET						250000-		1460		

1 of 1

DIVERSIFIED CONSTRUCTORS, INC.

UNIT TAKE-OFF

JOB NAME WATANA DATE SHEET OF

DESCRIPTION	MATERIAL						LABOR		SHIPPING	
	SIZE	QUANTITY	MATERIAL LIST PRICE	MATERIAL SUB TOTAL	DISC.	MATERIAL EXTENSION	LABOR UNIT	TOTAL HOURS	UNIT WT.	TOTAL WT.
Upstream Upper Gates - Gate Equipment		2 ea								
Closure Gates	45'x20'		12,500.00			25,000.-	80	160		
Side Guides	420 FT						3	1260		
Gate Hoist								40		
TOTAL THIS SHEET						25,000.-		1460		

2 of 3

DIVERSIFIED CONSTRUCTORS, INC.

UNIT TAKE-OFF

JOB NAME WATANA DATE _____ SHEET _____ OF _____

DESCRIPTION	MATERIAL						LABOR		SHIPPING	
	SIZE	QUANTITY	MATERIAL LIST PRICE	MATERIAL SUB TOTAL	DISC.	MATERIAL EXTENSION	LABOR UNIT	TOTAL HOURS	UNIT WT.	TOTAL WT.
Trashracks		1 LS								
Trashracks	45'x20'	24'	55000-			1320000-	80	1920		
Guides		1552 ft	-			38800-	3	4656		
TOTAL THIS SHEET						1358800-		6576		

242

DIVERSIFIED CONSTRUCTORS, INC.

UNIT TAKE-OFF

JOB NAME WATANA DATE SHEET OF

DESCRIPTION	SIZE	QUANTITY	MATERIAL LIST PRICE	MATERIAL SUB TOTAL	DISC.	MATERIAL EXTENSION	LABOR UNIT	LABOR TOTAL HOURS	SHIPPING UNIT WT.	SHIPPING TOTAL WT.
Downstream Lower Outlet - Stoplog Guides		1 LS								
Guides		130FT	25-			3250-	3	390		
TOTAL THIS SHEET						3250=		390		

LR2

DIVERSIFIED CONSTRUCTORS, INC.

UNIT TAKE-OFF

B NAME WATANA DATE SHEET OF

DESCRIPTION	MATERIAL						LABOR		SHIPPING	
	SIZE	QUANTITY	MATERIAL LIST PRICE	MATERIAL SUB TOTAL	DISC.	MATERIAL EXTENSION	LABOR UNIT	TOTAL HOURS	UNIT WT.	TOTAL WT.
Stoplogs - Includes Follower		1 LS								
Stoplogs -		2	40000 -			80000 -	150	300		
FOLLOWERS (INCL ABOVE)										
TOTAL THIS SHEET						80000 -		300		

248

DIVERSIFIED CONSTRUCTORS, INC.

UNIT TAKE-OFF

JOB NAME WATANA DATE SHEET OF

DESCRIPTION	MATERIAL						LABOR		SHIPPING	
	SIZE	QUANTITY	MATERIAL LIST PRICE	MATERIAL SUB TOTAL	DISC.	MATERIAL EXTENSION	LABOR UNIT	TOTAL HOURS	UNIT WT.	TOTAL WT.
Downstream Upper Outlet - Stoplog Guides		1 LS								
Guides		130 FT	10-			1300-	3	390		
TOTAL THIS SHEET						1300-		390		

DIVERSIFIED CONSTRUCTORS, INC.

UNIT TAKE-OFF

JOB NAME WATANA DATE SHEET OF

DESCRIPTION	MATERIAL						LABOR		SHIPPING	
	SIZE	QUANTITY	MATERIAL LIST PRICE	MATERIAL SUB TOTAL	DISC.	MATERIAL EXTENSION	LABOR UNIT	TOTAL HOURS	UNIT WT.	TOTAL WT.
Low Level Release Slide Gates - Includes Steel Liner		9 Ea								
Slide Gates	7'6"x11'6"	9	15000 -			135000 -	40	360		
Gate Bonnets		9	10000 -			90000 -	20	180		
Gate Hoists		9	10000 -			90000 -	20	180		
Steel Liner Upstream Downstream Plug 1100 LBS PER FT @ .75¢ PER LB		840				693000 -	285/LB	3242		
Chamber Drains & By Pass Pipe	18"	500'	3[illegible] -	15000 -			2	1000		
TOTAL THIS SHEET						1008000 -		4962		

250

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Granular Backfill ITEM NO. 332.21H SHEET ___ OF ___ PAGE 2-1

JOB Watana Dam

BID QUANTITY 8,245 UNIT C.Y. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
PROJECT NIGHTLY FROM CONCRETE AGGREGATE PRODUCTION	8245	C.Y.	4.48 36938	0.12 989	1.02 8410	0.83 6844	1.26 10389			7.71 63570

FOLD LENGTH
12
11
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AUTO

MANUAL

FEED

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION [illegible] ITEM NO. [illegible] SHEET 1 OF 1 PAGE 252

JOB [illegible]

QUANTITY 8245 UNIT [illegible] EST. BY CK'D. BY DATE

FORM 2

REJECT MATERIAL FROM
CONCRETE AGGREGATE PRODUCTION.
12000 FT HAUL

UNIT HAUL SPEED = 15 MPH. = 9.09 MINUTES
" RETURN " = 25 MPH. = 5.45 "

USE LEGAL END SPILLS.

CYCLE TIME

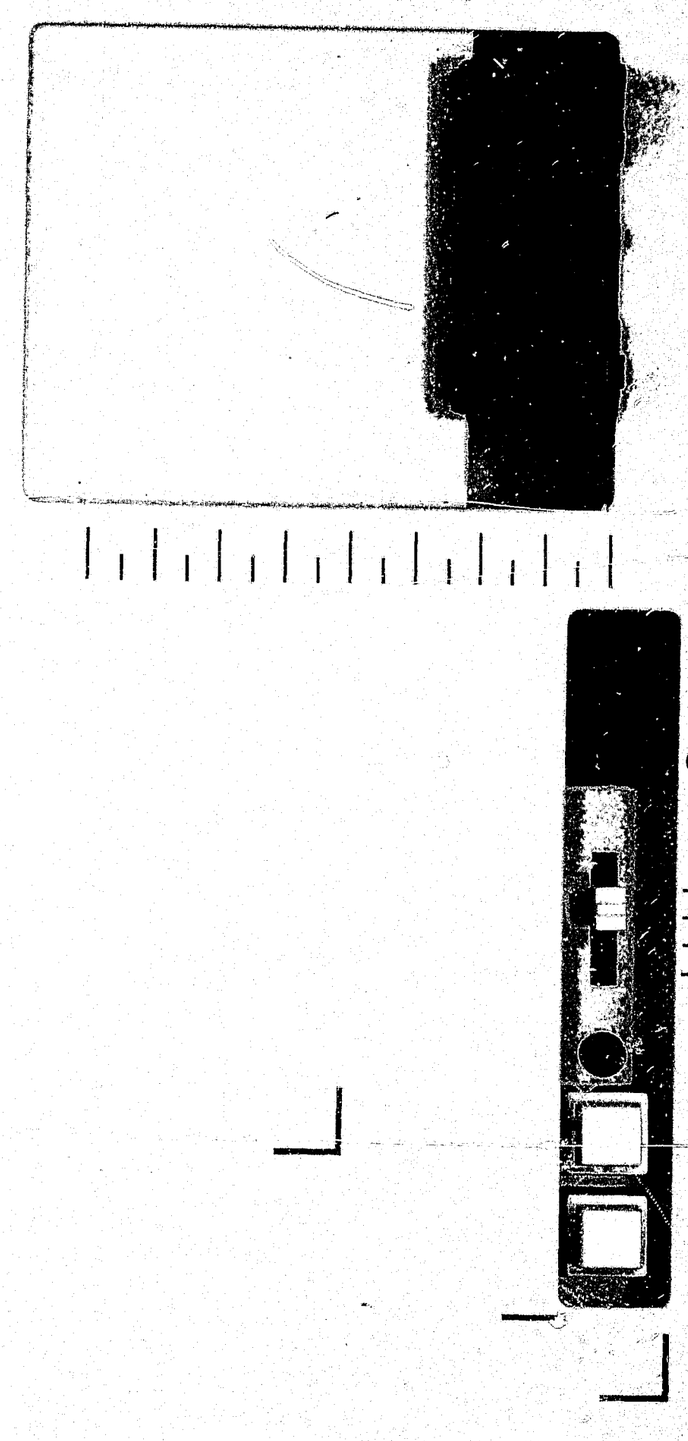
LOAD	1.20	MINUTES
HAUL	9.09	"
DUMP & TURN	1.50	"
RETURN	5.45	"
SPOT	1.00	"
	18.24	MINUTES/CYCLE

27.4(3) = 82 CU YDS/HOUR

.50 MINUTE HOUR
18.24 MIN./CYCLE = 2.74 CYCLES/HOUR (10) = 27.4 CU YDS

SPREAD	LABOR	EQUIPMENT	SUPPLIES
1-966 FEL	16.02	17.90	26.63
1-FARM COMBO	14.02	5.43	8.57
3-END SPILLS R/L = 83.30	40.86	28.86	42.57
1-MISC.	10.00	15.00	20.00
1-LOADER OPERATOR	35.97		
1-COMBO OPERATOR	35.00		
3-TEAMSTERS	101.16		
5-LABORERS	160.90		10.00
1-4MAN	34.00		
1-PICKUP	2.40	0.97	5.71
COST PER HOUR	450.33	68.06	113.48

SUMMARY	TOTAL	UNIT PRICE	TOTAL
DIRECT LABOR	367.03	4.48	36938
SUPPLIES	10.00	0.12	989
REPAIR LABOR	83.30	1.02	8410
EQUIPMENT	68.06	0.33	6844
EQUIP. SUPPLIES	103.45	1.26	10339
	131.87	7.21	13170



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DIVERSIFIED CROSS-PIN

OPERATION Common Excavation ITEM NO. 332.221 SHEET ___ OF ___ PAGE 3

JOB Watana Dam

BID QUANTITY 1.000 UNIT C.Y. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SAME UNIT PRICES AS ITEM 331.12A	1000	CY	1.12	0.02	0.04	0.71	0.03			3.32
			1120	20	640	710	030			3320

FOLD LENGTH
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MANUAL

FEED

DIVERSIFIED CONSTRUCTORS INC.

OPERATION Rock and Gravel ITEM NO. 332.222 SHEET ___ OF ___ PAGE ___

JOB Watana Dam

BID QUANTITY 52,000 UNIT C.Y. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
PER DETAIL	52000	CY	3.81 198120	0.12 6240	0.97 50440	0.77 40040	1.23 63960			6.90 358800

OPERATION IRRIGATION FIELD

OPERATION IRRIGATION FIELD ITEM NO. 332- SHEET 1 OF 1 PAGE 7-5

JOB VISTA

QUANTITY 52000 UNIT CU.YDS. EST. BY CK'D. BY DATE

FORM 2

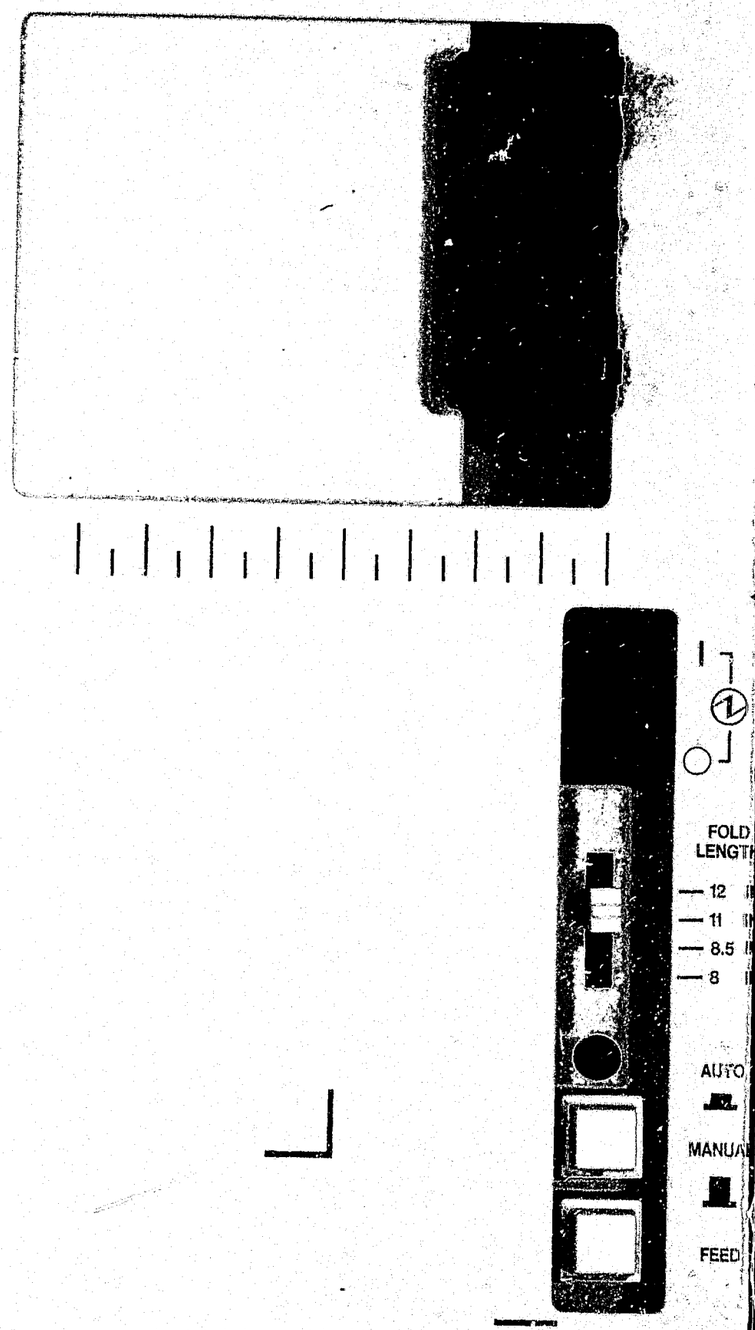
SOURCE

FROM REQUIRED EXCAVATION OR STOCKPILE

FIGURE SAND PRODUCTION AS GRANULAR BACKFILL

SPREAD	LABOR	EQUIPMENT	SUPPLIES
1-966 F.E.L.	16.62	17.90	26.63
1-FARM COMBO	14.02	5.43	8.57
3-END DUMPS R/L = 79.31	40.86	28.86	42.57
1-COMPACTOR	6.01	9.81	17.09
1-PICKUP	2.46	0.97	5.71
1-LOADER OPERATOR	35.97		
1-COMBO OPERATOR	55.00		
3-TEAMSTERS	101.16		
1-COMPACTOR OPERATOR	35.97		
2-LABORERS	64.36		10.00
1-FOREMAN	29.59		
COST PER HOUR	391.36	62.87	110.77

SUMMARY	TOTAL	UNIT PRICE	TOTAL
DIRECT LABOR	312.05	3.81	198120
SUPPLIES	10.00	0.12	6240
REPAIR LABOR	79.31	0.97	50440
EQUIPMENT	62.87	0.77	40040
EQUIP. SUPPLIES	100.77	1.23	63960
	565.00	6.90	358800



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DIVERSIFIED CONSTRUCTIONS, INC.

OPERATION Rock and Gravel Pit ITEM NO. 332.223 SHEET ___ OF ___ PAGE ___

JOB Watana Dam

BID QUANTITY 313,000 UNIT C.Y. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
PER DETAIL	313000	CY	0.83 259790	0.01 3130	0.52 162760	0.52 162760	0.63 197190			2.51 785630

FOLD LENGTH

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DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Rock & Gravel Fill ITEM NO. 332-22 SHEET 1 OF PAGE 25

JOB Watana

QUANTITY 313,966 UNIT C.Y. EST. BY CK'D. BY DATE

FORM 2

SOURCE.

FROM REQUIRED EXCAVATION

AVERAGE HAUL DISTANCE = 4500 L.F.

HAUL SPEED = 15 MPH. = 3.41 MINUTES

RETURN SPEED = 20 MPH. = 2.56 MINUTES

LOAD - 4 PASSES @ 0.50 = 2.00 MINUTES

TRUCK CYCLE USE 769

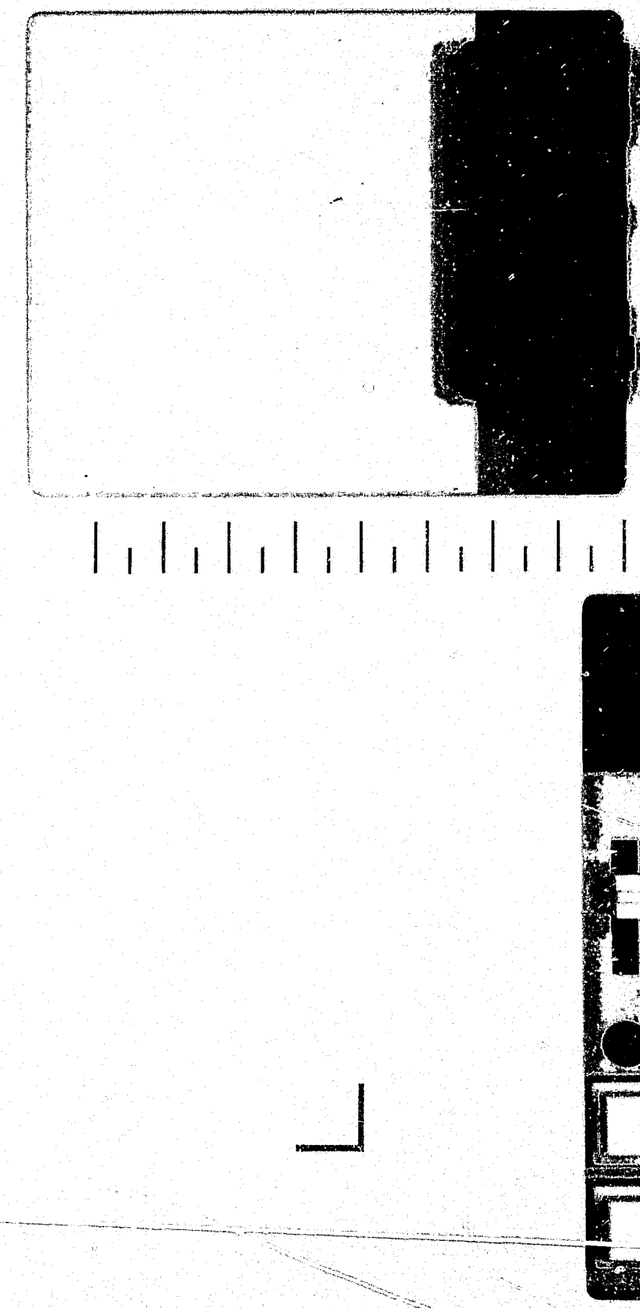
LOAD	2.00
HAUL	3.41
DUMP & TURN	1.00
RETURN	2.56
SPOT	1.00
	9.97 MIN./CYCLE

50 MINUTE HOUR

9.97 MIN./CYCLE = 5.02(23) = 115 CU YDS/HOUR/UNIT

SPREAD	LABOR	EQUIPMENT	SUPPLIES
1-988 F.E.L	30.05	33.00	45.85
1-D8 FEED CAT R/C = 178.66	40.06	25.91	33.85
1-D8 SPREAD CAT	40.06	25.91	33.85
3-769 END SPILLS	66.09	94.50	97.23
1-PICKUP	2.40	0.97	5.71
1-LOADER OPERATOR	38.04		
2-CAT OPERATORS	71.94		
3-TEAMSTERS	105.33		
1-DUMPMAN	31.28		5.00
1-4MAN	39.59		
COST PER HOUR	414.84	180.29	221.49

SUMMARY	TOTAL	UNIT PRICE	TOTAL
DIRECT LABOR	206.10	0.83	259790
SUPPLIES	5.00	0.01	3130
REPAIR LABOR	178.66	0.57	162760
EQUIPMENT	180.29	0.52	162760
EQUIP. SUPPLIES	216.49	0.63	197190
	861.33	2.51	785630



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DIVERSIFIED CONSTRUCTORS INC.

OPERATION Filters ITEM NO. 332.224 SHEET OF PAGE 2.5

JOB Watana Dam

BID QUANTITY 33,000 UNIT C.Y. TAKE OFF QUANTITY EST. BY A. Lee DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SAME AS ITEM 332-21H.	33000	C.Y.	4.48 147840	0.12 3960	1.02 33660	0.83 27390	1.26 41580			7.71 254430

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DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Cut-off Wall U/S ITEM NO. 332.225 SHEET ____ OF ____ PAGE 259

JOB Watana Dam

BID QUANTITY 39,000 UNIT S.F. TAKE OFF QUANTITY ____ EST. BY A. Lee DATE ____

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SUB-CONTRACT	39000	SF							20.00 780000	20.00 780000

FOLD LENGTH
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OPERATION Care of Water ITEM NO. 332.226 SHEET ___ OF ___ PAGE ___

JOB Watana Dam

BID QUANTITY 1 UNIT L.S. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
INITIAL DRAWDOWN	1	L.S.	48948	2500	31490	4691	32552			120181.
CONTINUING	12	M.O.	318165	5000	115490	17996	133049			589700
TOTAL			367113	7500	146980	22687	165601			709881.

FOLD LENGTH
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OPERATION Care of Water ITEM NO. 332- SHEET 1 OF 2 PAGE 7[illegible]

JOB

QUANTITY 1 UNIT L.S. EST. BY CK'D. BY DATE

FORM 2

SCOPE:

1- INITIAL DRAWDOWN

2- CONTINUING DEWATERING [illegible]

DAY IS OUT OF FLOOD [illegible]

INITIAL DRAWDOWN

FIGURE 3-8" PUMPS FOR A PERIOD OF 4 WEEKS FOR 2 SEASONS

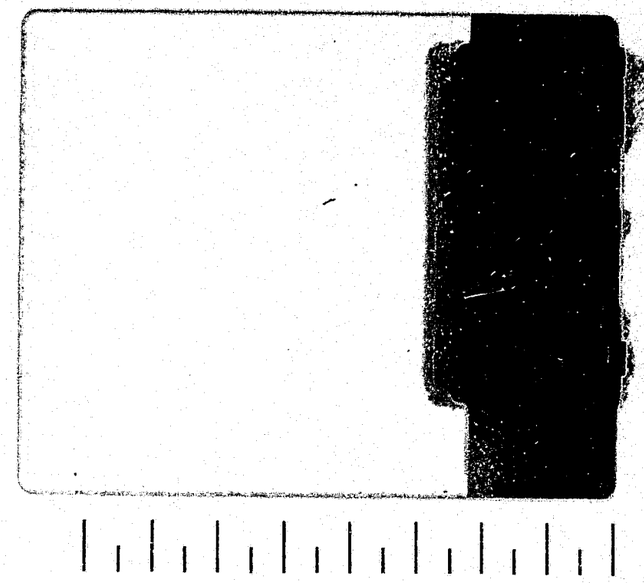
SPREAD	LABOR	EQUIPMENT	SUPPLIES
3-8" PUMPS	19.23	1.77	17.01
1- PICKUP	2.40	0.97	5.71
1- MISC.	1.80	0.75	1.50
1- PUMPMAN	36.42		
COST PER HOUR	59.85	3.49	24.22
COST 8 WEEKS	80435	4691	32552

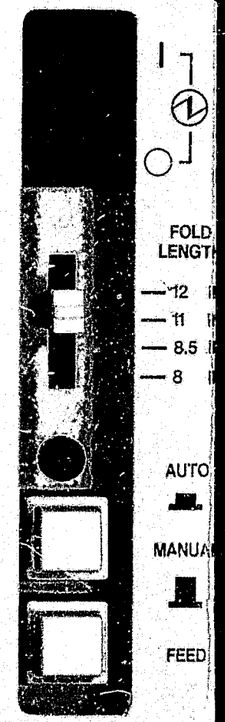
SUMMARY	TOTAL
DIRECT COST	48948
SUPPLIES	2500
REPAIR LABOR	31490
EQUIPMENT	4691
EQUIP. SUPPLIES	32552
	120181

CONTINUING DEWATERING

FIGURE A TOTAL OF 12 MONTHS

SPREAD	LABOR	EQUIPMENT	SUPPLIES
1-8" PUMP	6.41	0.59	5.67
1-4" PUMP	4.41	0.50	3.85
1- PICKUP	2.40	0.97	5.71
1- PUMPMAN	36.42		
COST PER HOUR	49.64	2.06	15.23
COST 52 WEEKS	433655	17996	133049





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OPERATION ITEM NO. SHEET 1 OF 2 PAGE 10

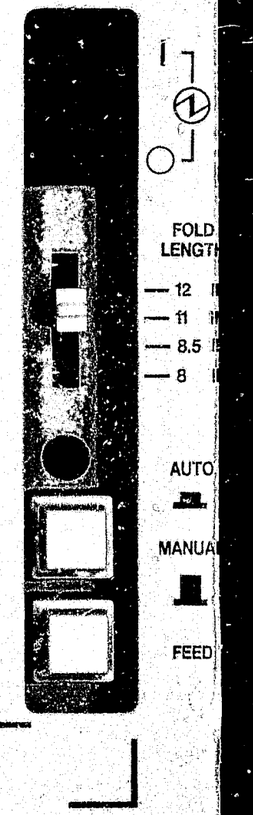
JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

JUDICIARY	774.4
DIRECT LABOR	318165
SUPPLIES	5000
REPAIR/MAINT	115490
EQUIPMENT	17996
EQUIP. SUPPLIES	133049
	589700





OPERATION Common Excavation ITEM NO. 332.231 SHEET OF PAGE

JOB Watana Dam

BID QUANTITY 5,000 UNIT C.Y. TAKE OFF QUANTITY EST. BY A. Lee DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SAME AS ITEM 332.221	5000	CY	1.12 5600	.002 100	.064 320	.071 355	.083 415			3.32 16600

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OPERATION Impervious Fill ITEM NO. 332.232 SHEET ___ OF ___ PAGE 25

JOB Watana Dam

BID QUANTITY 47,250 UNIT C.Y. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SAME AS ITEM 332-222	47250	CY.	3.81 180023	0.12 5670	0.97 45832	0.77 36383	1.23 58117			6.90 326025

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OPERATION Rock and Gravel Fill ITEM NO. 332.233 SHEET ___ OF ___ PAGE 26

JOB Watana Dam

BID QUANTITY 42,800 UNIT C.Y. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SAME AS ITEM 332.223	42,800	CY	0.83 35524	0.01 428	0.52 22256	0.52 22256	0.63 20964			2.51 107428

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DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Cut-off Wall D/S ITEM NO. 332.235 SHEET ___ OF ___ PAGE 10'

JOB Watana Dam

BID QUANTITY 29,500 UNIT C.Y. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
T.I.B - CONTRACT	29500	CY							20.00 590000	20.00 590000

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OPERATION Removal of Cofferdam ITEM NO. 332.236 SHEET ___ OF ___ PAGE 737

JOB. Watana Dam

BID QUANTITY 90,000 UNIT C.Y. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS		TOTAL DIRECT COST	
PER DETAIL	90000	CY.	0.84	75600	0.02	1800	0.53	47800	0.50	45000	0.61	54900					2.49	224100

FOLD LENGTH
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OPERATION REMOVAL OF COFFERDAM ITEM NO. 332 SHEET 1 OF PAGE 25

JOB VIETNAM

QUANTITY 90000 UNIT CY. EST. BY CK'D. BY DATE

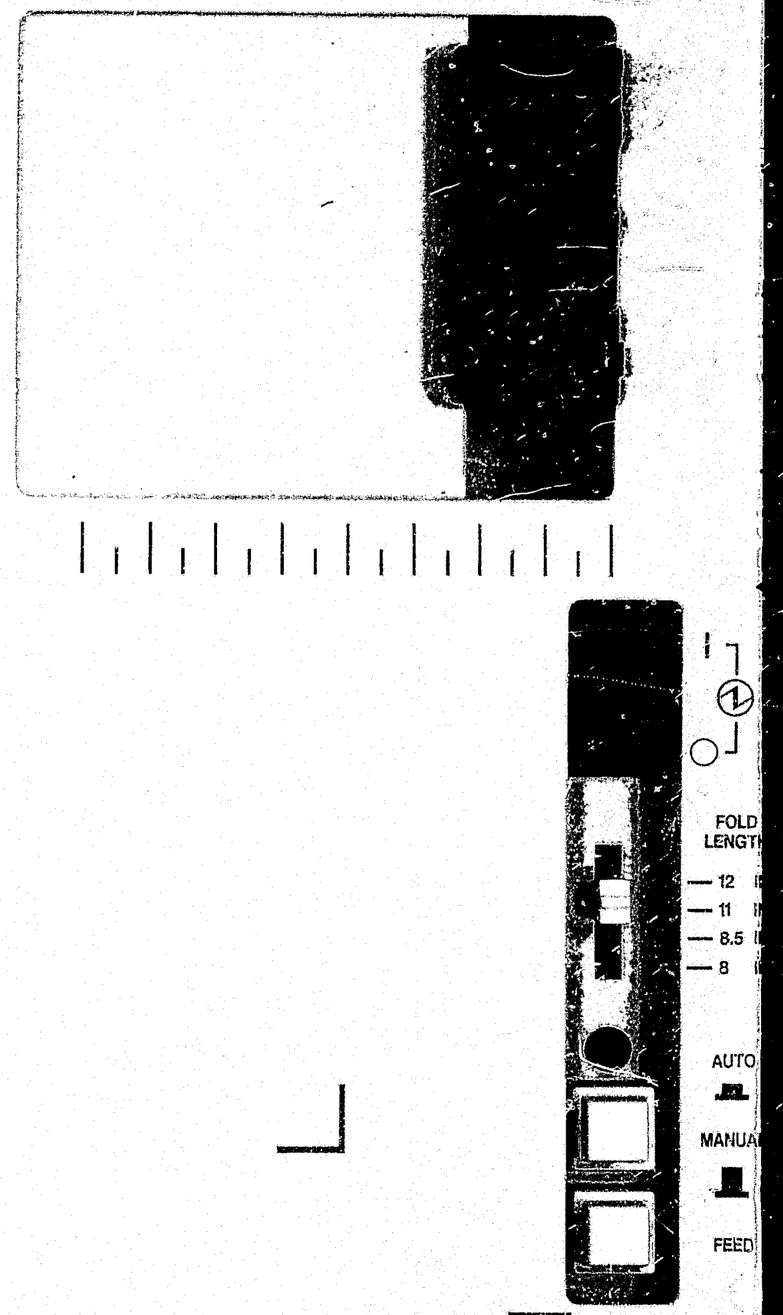
FORM 2

FIGURE THAT BLENDER PROPERLY-CAN BE PLACED ON D/S RIVER BANKS

FIGURE A PRODUCTION OF 300 CU.YDS./HOUR WITH THE FOLLOWING SPREAD

SPREAD	LABOR	EQUIPMENT	SUPPLIES
1-988 F.E.L.	30.05	33.00	45.85
1-D8 FEED CAT	40.06	25.91	33.85
1-D8 DUMP CAT	40.06	25.91	33.85
2-769 END SPILLS	44.06	63.00	64.82
1-PICKUP	2.40	0.97	5.71
1-LOADER OPERATOR	38.04		
2-CAT OPERATORS	71.94		
2-TEAMSTERS	70.22		
1-DUMPMAN	31.28		5.00
1-YIMAN	39.59		
COST PER HOUR	407.70	148.79	189.08

SUMMARY	TOTAL	UNIT PRICE	TOTAL
DIRECT LABOR	251.07	0.84	75600
SUPPLIES	5.00	0.02	1800
REPAIR LABOR	156.63	0.52	46800
EQUIPMENT	148.79	0.50	45000
EQUIP. SUPPLIES	184.08	0.61	54900
	745.57	2.49	224100



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OPERATION Common Excavation ITEM NO. 332.311 SHEET OF PAGE 12

JOB Watana Dam

BID QUANTITY 4,936,000 UNIT C.Y. TAKE OFF QUANTITY EST. BY A. Lee DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
PER DETAIL – EXCAVATION	4,936,000	C.Y.	0.56 2764160	.01 49360	0.42 2073120	0.61 3010960	0.75 3702000			2.35 11599600
" " – FOUNDATION CLEANUP	14,532,219	S.F.	1.08 15694797	0.07 1017255	0.10 1453222	0.08 1162578	0.17 2470477			1.50 21798329
	4,936,000	C.Y.	3.74 18458957	0.22 1066615	0.71 3526342	0.85 4173538	1.25 6172477			6.77 33397929

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OPERATION Common Excavation ITEM NO. 332 SHEET 1 OF 2 PAGE 770

JOB Natalia

QUANTITY 4936,000 UNIT C.Y. EST. BY CK'D. BY DATE

FORM 2

WORK DOWN FROM TOP OF ABUTMENTS AND HAUL TO DISPOSAL

HAUL DISTANCE = 9000 L.F.

USE 992 F.E.L. WITH BUCKET EFFICIENCY OF 85% - 11.5 CU. YDS./PASS - FIGURE 5 PASSES TO LOAD 777 END SPILLS.

HAUL AT 15 MPH

RETURN AT 20 MPH.

LOADER CYCLE

LOAD	0.15 SECONDS
BACK & TURN	.05 "
FORWARD & DUMP	.15 "
BACK & TURN	.05 "
FORWARD	.10 "
	0-50 SECONDS/CYCLE

3000

50 = 60/50 MINUTE HOUR = 690 CU. YDS./HOUR

TRUCK CYCLE

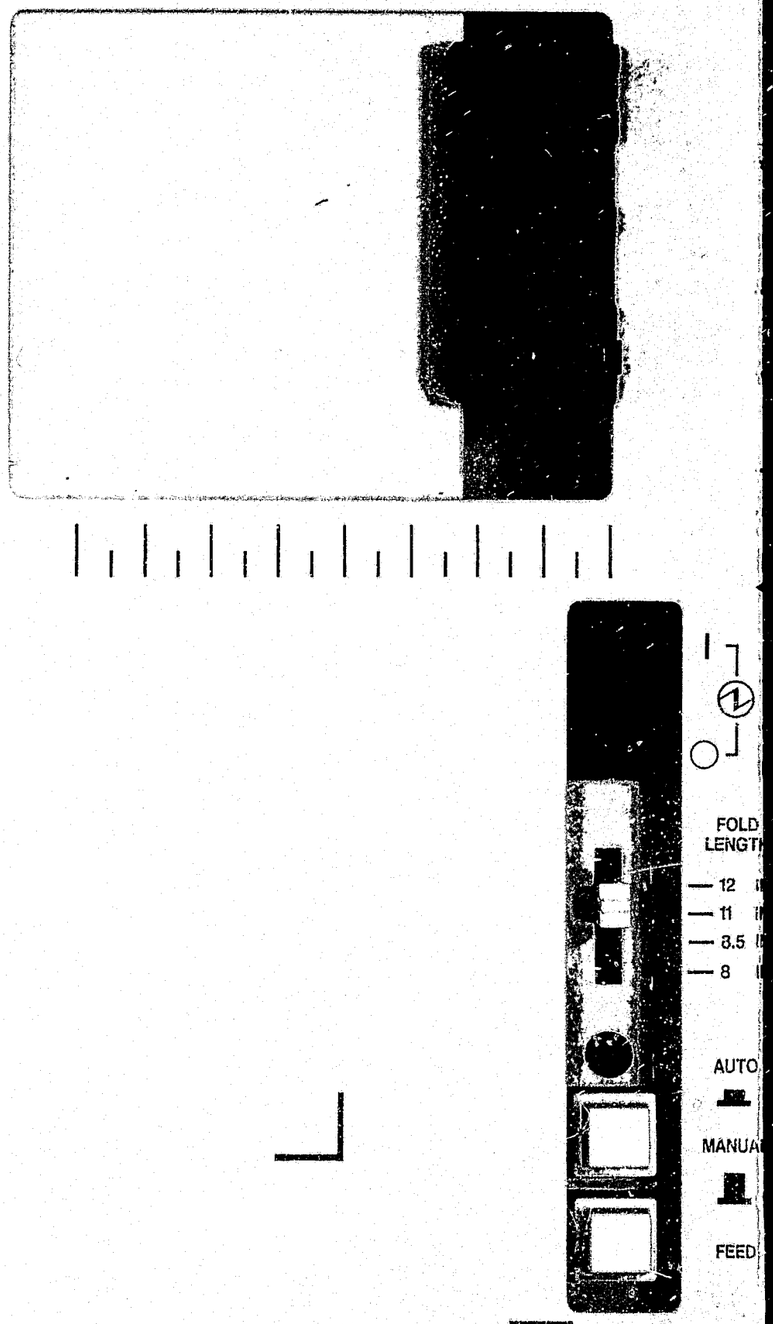
LOAD	4.17 MINUTES
HAUL	6.82 "
DUMP & TURN	1.50 "
RETURN	5.11 "
SPOT	1.00 "
	18.60 MIN./CYCLE

50 MINUTE HOUR

18.60 MIN/CYCLE = 2.69 (57.5) = 154.68 CU. YDS/UNIT HOUR

690

154.68 = 4.46 (SAY 5 UNITS)



DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 1 OF 2 PAGE 271

JOB

QUANTITY UNIT EST BY CK'D. BY DATE

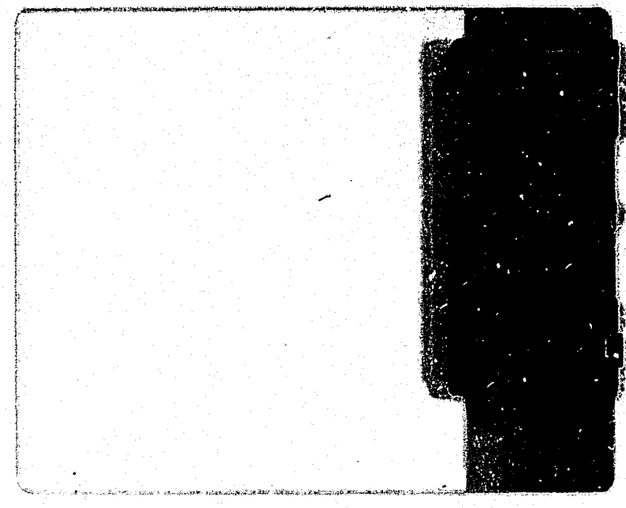
FORM 2

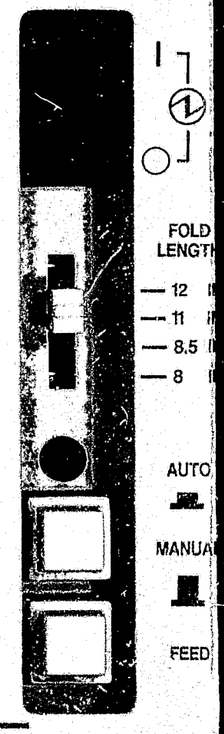
SPREAD	LABOR	EQUIPMENT	SUPPLIES	
1-992 F.E.L.	40.06	75.00	77.37	
2-D8 FELL SUITS R/L =	80.12	51.98	67.70	
1-D8 QUAD CAT	40.06	25.91	33.95	
1-No. 14 PETROL	14.82	12.93	19.51	
5-777 ENG. FILLS	150.25	300.00	394.70	
1-PICKUP	2.40	0.94	5.71	
1-LOADER OPERATOR	28.04			
3-CAT OPERATORS	107.91			
1-PATROL OPERATOR	35.97			
5-TEAMSTERS	191.85			
1-QUICKMAN	31.28		5.00	
1-4 MAN	37.59			
COST PER FOOT	702.45	471.63	583.84	

SUMMARY	TOTAL	UNIT PRICE	TOTAL
DIRECT LABOR	434.74	0.56	2764160
SUPPLIES	5.00	0.01	49360
REPAIR LABOR	327.71	0.42	2073120
EQUIPMENT	471.63	0.61	3010960
EQUIP. SUPPLIES	578.84	0.75	3702000
	1817.92	2.35	11599600

FOUNDATION CLEANUP
14,532,219 S.F.

SUMMARY	UNIT PRICE	TOTAL
DIRECT LABOR	1.08	15694797
SUPPLIES	0.87	12617355
REPAIR LABOR	0.10	1453382
EQUIPMENT	0.08	1162878
EQUIP. SUPPLIES	0.17	2470477
	1.50	21798329





OPERATION Rock Excavation ITEM NO. 332.312 SHEET OF PAGE 212

JOB Watana Dam

BID QUANTITY 1,214,000 UNIT C.Y. TAKE OFF QUANTITY EST. BY A. Lee DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
DRILL & SHOOT	1214000	CY.	2.63 3194482	0.04 48805	1.29 1564298	0.46 555987	0.91 1106897			5.33 6470469
DRILL & SHOOT SUPPLIES	1214000	CY		1.81 2198390						1.81 2198390
LOAD & HAUL	1214000	CY.	1.47 1780182		1.28 1554282	1.46 1777921	1.60 1942049			5.81 7054434
	1214000	CY.	4.10 4974664	1.85 2247195	2.57 3118580	1.92 2333908	2.51 3048946			12.35 15723293

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DIVERSIFIED CONSTRUCTORS, INC.

332-

OPERATION ROCK EXCAVATION ITEM NO. 312 SHEET 1 OF 3 PAGE 273

JOB WATANA

QUANTITY 1,214,000 UNIT C.Y. EST. BY CK'D. BY DATE

FORM 2

LOCATION

CORE TRENCH.

AVERAGE DEPTH = 20 FEET

LENGTH = 4,350 FEET

1214000

4350 = 279 CU.YDS. / L.F.

279 (27) = 7533 S.F.

20 FT DEEP = AVERAGE WIDTH OF 376.65 FT.

DRILL & SHOOT

FIGURE LINE DRILLING @ 2'C-C.

PATTERN DRILLING ON 5'X5'

DRILLING DEPTH = 22 FEET

LINE HOLES = 4350

PATTERN HOLES = 65537

69887 EACH = 1537514 L.F.

FIGURE DRILL SPEED AT 90 L.F./HOUR

DRILL CYCLE

SETUP	1.00 MINUTES
DRILL	24.00 "
RETRACT	1.00 "
MOVE	2.00 "
	28.00 MINUTES

50 MINUTE HOUR

28 MIN./HOLE = 1.79 HOLES/HOUR

69887

1.79 = 39043 DRILL HOURS

4 DRILLS = 9761 HOURS

0024493

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 2 OF 5 PAGE 274

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	LABOR	EQUIPMENT	SUPPLIES
SPREAD			
4-AIR TRACS	120.20	32.88	48.40
2-1200 CFM COMPRESSORS	35.26	22.14	58.58
2-PICKUPS R/L = 160.26	4.80	1.94	11.42
4 DRILLERS	131.36		
4-CHUCKTENDERS	128.72		5.00
1-POWDERMAN	33.19		
1-HIAB	34.00		
COST PER HOUR	487.53	56.96	118.40
COST 9761 HOURS	4758780	555927	1155702

SUMMARY	TOTAL	UNIT PRICE
DIRECT LABOR	3194487	2.03
SUPPLIES	481305	0.04
REPAIR LABOR	1564298	1.29
EQUIPMENT	555927	0.46
EQUIP. SUPPLIES	1106897	0.91
	6470469	5.33

DRILL & SHOOT SUPPLIES	QUANTITY	UNIT	TOTAL
DRILL STEEL	1537514	0.20	307503
EXPLOSIVES	1214000	1.50	1821000
DETONATORS	69887	1.90	69887
			2198390

DISPOSAL

HAUL TO ROCK FILL EQUIPMENT

USE 992 FEL & TRAIN TO EQUIPMENT

SPREAD	LABOR	EQUIPMENT	SUPPLIES
1-992 F.EL	40.06	75.00	77.37
1-D8 FEED CAT R/L = 130.59	40.06	25.91	33.85
1-D9 SPREAD CAT	48.07	47.50	46.24
1-PICKUP	2.40	0.97	5.71
1-LOADER OPERATOR	35.04		
2-DOZER OPERATORS	71.94		
1-HIAB	22.19		
COST PER HR.	259.76	149.38	163.17

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 3 OF 3 PAGE 275

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

FIGURE TRUK DISTANCE OF 1500 C.F.

CYCLE TIME

LOAD	0.20 MINUTES	
BACK & TURN	0.20	"
FORWARD & DUMP	1.50	"
BACK & TURN	0.20	"
FORWARD	1.50	"
	3.60 MIN./CYCLE	

50 MINUTE HOUR

3.6 MIN./CYCLE = 13.89 (11) = 153 CU. YDS./HOUR

1,214,000 (1.5)

153 = 11902 HOURS

COST 11902 HOURS.	3334464	1777921	1942049

SUMMARY	TOTAL	UNIT PRICE
DIRECT LABOR	1780182	1.47
SUPPLIES	-0-	-0-
REPAIR LABOR	1554282	1.28
EQUIPMENT	1777921	1.46
EQUIP. SUPPLIES	1942049	1.60
	7254434	5.81

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Impervious Fill ITEM NO. 332.31A SHEET ___ OF ___ PAGE 276

JOB Watana Dam

BID QUANTITY 7,077,000 UNIT C.Y. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
STRIP BORROW	1000000	CY.	0.63 629448	0.01 8695	0.49 493233	0.09 886575	0.79 787054			2.01 2607005
LOAD, HAUL & PLACE	7,077,000	CY.	1.36 9596957	0.01 89770	0.77 5429828	0.97 6884641	1.02 7225406			4.13 29226599
	7,077,000	CY.	1.45 10226400	0.01 98465	0.84 5973061	1.07 7571216	1.13 8014462			4.50 31833604

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11 IN
8.5 IN
8 IN

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MANUAL

FEED

OPERATION IMPERVIOUS FILL ITEM NO. 211 SHEET 1 OF 4 PAGE 277

JOB VILLAGE

QUANTITY 1,000,000 UNIT CU. YDS. EST. BY CK'D. BY DATE

FORM 2

SOURCE = AREA "D"
FIGURE AREA TO BE 3000' X 2000'

HAUL DISTANCE = 14,000 C.F.
ACCESS ROAD WILL BE INCLUDED
IN 336.12 SITE ROADS.

STRIPPING OF BORROW AREA.
$\frac{3000(2000)}{43560}$ = 207 ACRES
FIGURE AVERAGE DEPTH OF 5 FEET
$\frac{2000(2000)(5)}{27}$ = 1,000,000 CU. YDS.
4,000 FT. HAUL TO DISPOSAL

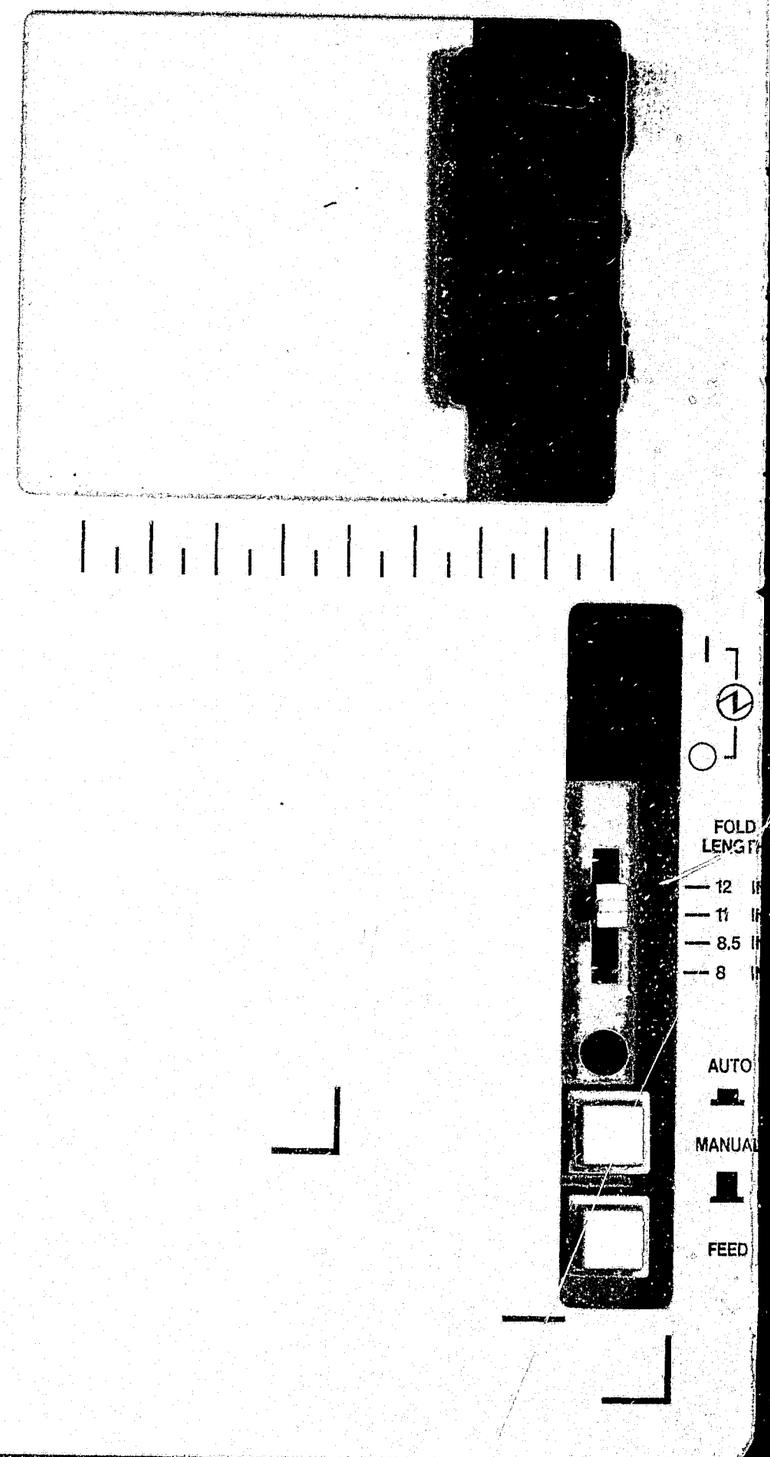
USE 992 F.E.L & 777 ENG. SPECS
SAME LOADER PRODUCTION AS
ITEM 332-211 = 690 CU. YDS. / HOUR

TRUCK CYCLE

LOAD	4.17
HAUL	3.03
DUMP & TURN	1.50
RETURN	2.27
SPOT	1.00
	11.97 MIN. / CYCLE

50 MINUTE HOUR
11.97 MIN / CYCLE = 4.18 (57.5) = 240.35 CU. YDS. / UNIT HOUR

$\frac{690}{240.35}$ = 2.87 (SAY 3 UNITS)



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OPERATION | ITEM NO. | SHEET 2 OF 4 PAGE 277

JOB

QUANTITY | UNIT | EST. BY | CK'D. BY | DATE

FORM 2

1,000,000 [illegible] = [illegible]

1,200,000
690 = 1739 HOURS

SPREAD	LABOR	EQUIPMENT	SUPPLIES
1- 992 FEL.	40.06	75.00	77.37
2- D9 FEED CATS	96.14	95.00	92.48
1- D8 DUICA CAT	40.06	25.91	33.85
1- No 14 PATROL R/L. = 283.63	14.82	17.93	19.51
3- 777 ENK SPILLS	90.15	180.80	324.82
1- PICKUP	2.40	0.97	5.71
1- LOADER OPERATOR	38.04		
3- CAT OPERATORS	107.91		
1- PATROL OPERATOR	35.97		
3- TEAMSTERS	109.17		
1- DUMPMAN	31.28		5.00
1- 4MAN	39.59		
COST PER HOUR	645.59	394.81	458.74
COST 1739 HOURS	1122681	686575	797749

SUMMARY	TOTAL	UNIT PRICE
DIRECT LABOR	629448	0.63
SUPPLIES	8695	0.01
REPAIR LABOR	493733	0.49
EQUIPMENT	686575	0.69
EQUIP. SUPPLIES	789054	0.79
	2607005	2.61

FOLD LENGTH
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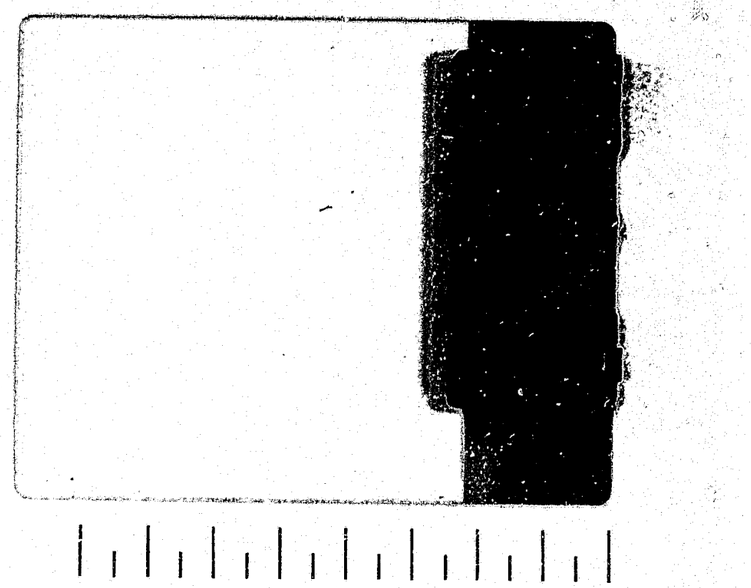
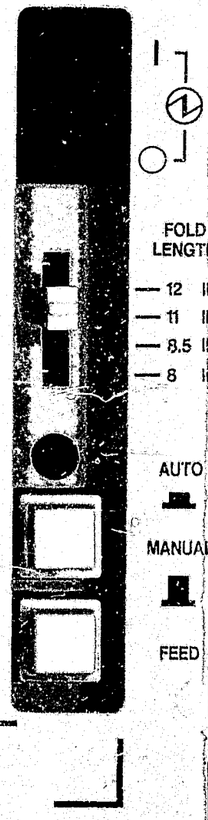




DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 3 OF 4 PAGE 279

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

LOAD, HAUL & PLACE IN DAM

QUANTITY INVOLVED IN RELATION TO OTHER ZONE MATERIALS IS LOW NOT A HIGH PRODUCTION ITEM - KEEP 5 TO 10 FT ABOVE OTHER ZONES.

USE 988 FEL & 769 END SPREAD
LOADER AT 6.3 CU.YDS./CYCLE
5 PASSES = 31.5 CU.YDS./LOAD.

LOADER CYCLE

LOAD	0.05	SECONDS
BACK & TURN	0.10	"
FORWARD & DUMP	0.10	"
BACK & TURN	0.10	"
FORWARD	0.05	"
	0.40	SECONDS/CYCLE

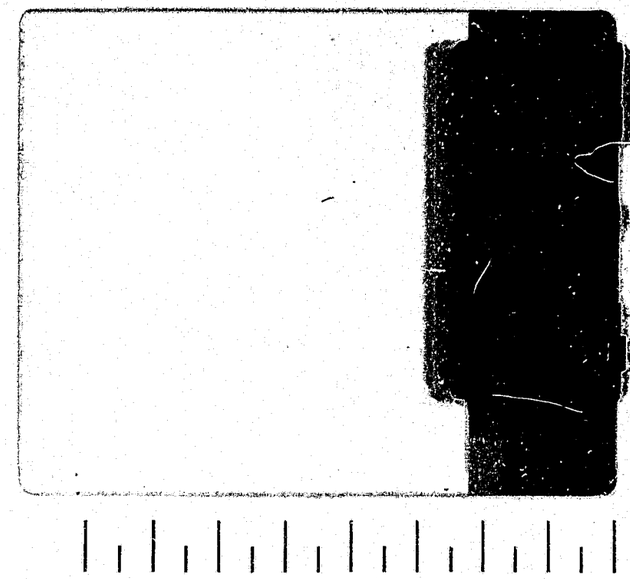
3000
40 = 75 (6.3) = 473 CU.YDS./HOUR

TRUCK CYCLE

LOAD	3.33	MINUTES
HAUL	10.61	"
DUMP & TURN	1.00	"
RETURN	7.95	"
SPOT	1.00	"
	23.89	MIN./CYCLE

50 MINUTE HOUR
23.89 MIN./CYCLE = 2.09 (31.5) = 65.84 CU.YDS./UNIT HOUR

473
65.84 = 7 UNITS



DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 4 OF 4 PAGE 153

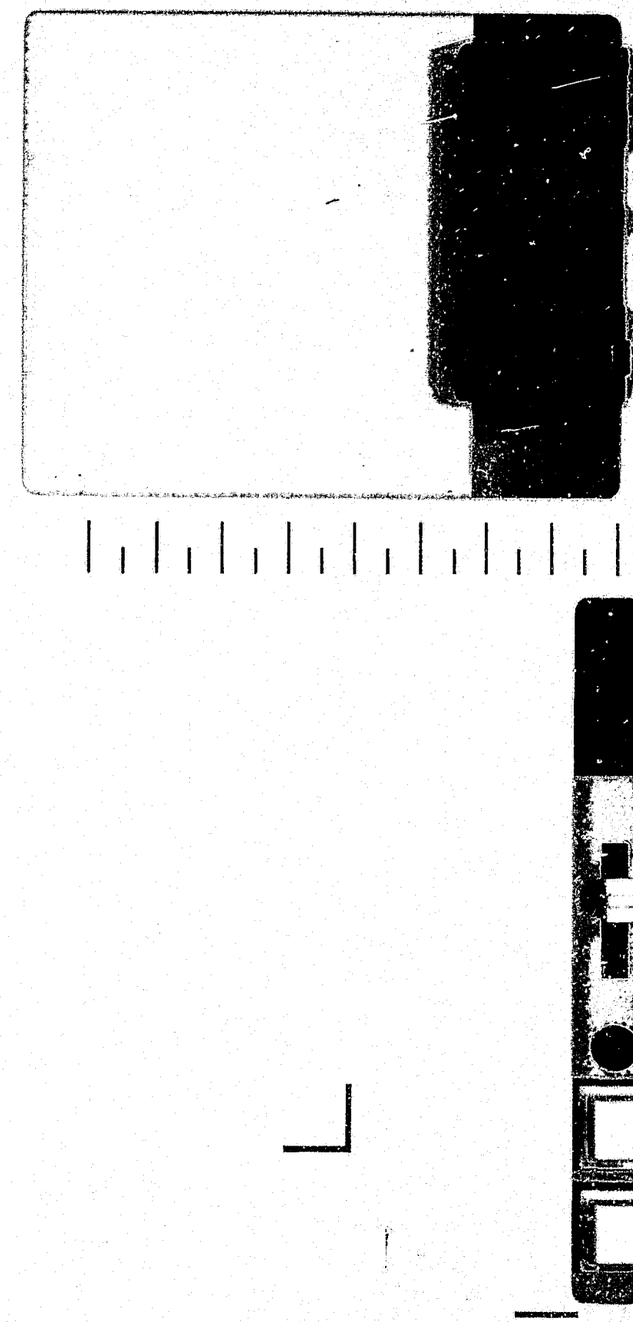
JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	LABOR	EQUIPMENT	SUPPLIES
SPREAD			
1-988 FEL.	50.55	73.60	415.85
7-769 END. SPILLS	164.21	220.50	221.87
1- " " " - SPARE		31.50	
2-NO. 14 PATROLS B/C.=388.43	29.64	35.86	37.08
1-D8 FEED CAT	40.06	25.91	33.85
1-D8 SPREAD CAT	40.06	25.91	32.85
1-PAYGO COMPACTOR	6.61	9.81	17.29
1-SICKLE	2.40	2.97	5.71
1-FEL OPERATOR	38.64		
2-TEAMSTERS	145.77		
2-PATROL OPERATORS	71.94		
2-CAT OPERATORS	71.94		
1-COMPACTOR OPERATOR	35.97		
1-LUBRICAN	31.28		5.00
1-HIAB	39.59		
COST PER HOUR	836.96	383.46	467.44
SEC. 17954 HOURS	15026780	6884641	7515178

SUMMARY	TOTAL	UNIT PRICE
DIRECT LABOR	9596952	1.36
SUPPLIES	89770	0.01
REPAIR LABOR	5429828	0.77
EQUIPMENT	6884641	0.97
EQUIP. SUPPLIES	7225408	1.02
	29226599	4.13



OPERATION Provide Drying Facilities for Impervious ITEM NO. 332-31B SHEET ___ OF ___ PAGE 75

Fill JOB Watana Dam

BID QUANTITY 1 UNIT L.S. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
PER DETAIL	1	LS								LS. -0-

OPERATION [illegible] ITEM NO. [illegible] SHEET ___ OF ___ PAGE ___

FOR [illegible] JOB [illegible]

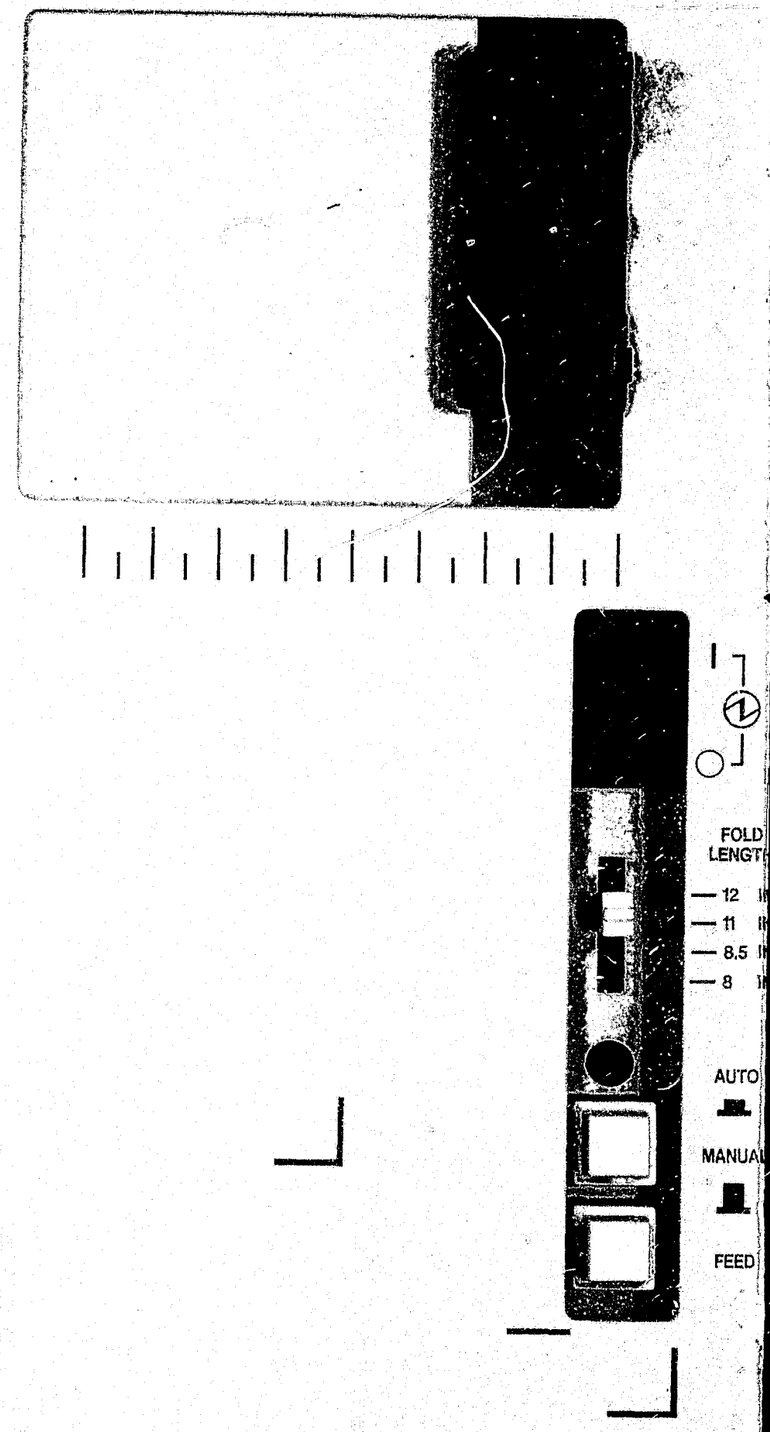
QUANTITY 1 UNIT LS EST. BY CK'D. BY DATE

FORM 2

THE ARRANGEMENT DRAWING OF THIS ITEM IS TO PROVIDE FACILITIES FOR HANDLING UNPREVIOUS MATERIAL AVAILABLE FOR AN EARLY SPRING START IN OF EMBANKMENT OPERATIONS -

WE WILL TAKE ANOTHER LOOK AT ALL THAT IS TO STOCKPILE EXTRA MATERIAL DURING SUMMER MONTHS AND PROTECTING DURING WINTER MONTHS.

NO CHANGE FOR THIS ITEM -0-



OPERATION Drying Impervious Fill ITEM NO. 332.31C SHEET OF PAGE 23

JOB Watana Dam

BID QUANTITY 1,576,000 UNIT C.Y. TAKE OFF QUANTITY EST. BY A. Lee DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
GRADING	25	AC.	12754	600	3797	3277	4582			25010.
LAY PVC	1	LS.	30831	1800	481	617	2010	45284		80573.
BUILD STOCKPILE	1,576,000	CY.	0^{75} 1188275	0^{01} 16590	0^{42} 661875	0^{44} 690244	0^{53} 840416			2^{15} 3397400
COVER PVC.	1	LS.	30831	1800	481	617	2010	45284		80573.
	1,576,000	CY.	0^{80} 1262791	0^{01} 20770	0^{42} 666634	0^{44} 694755	0^{54} 849018	0^{06} 90568		2^{27} 3583556

FOLD LENGTH
12
11
8.5
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AUTO

MANUAL

FEED

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION CRYING TIGER ACCESS FILL ITEM NO. 22C SHEET 1 OF 4 PAGE 284

JOB BELTANA

QUANTITY 1,576,000 UNIT CU. YDS. EST. BY CK'D. BY DATE

FORM 2

208.71 (208.71)(20)
27 = 32,267 CU. YDS. / ACRE 20 FT HIGH

1576000
32267 = 48.8 ACRES.

SAY 40 FEET HIGH = 24.4 OR (25 ACRES - USE)

COVER BASE WITH P.V.C. & DRAIN TOES
OVER TOP AND DOWN TO BOTTOM.
AREA = 1044' x 1044'

P/C = 2,346,912 S.F.

OPERATIONS

1- GRADE AREA
2- LAY PVC
3- BUILD STOCKPILE
4- COVER WITH PVC.

GRADE

FIGURE 1 WEEK OR 60 HOURS
WITH THE FOLLOWING SPREAD

SPREAD	LABOR	EQUIPMENT	SUPPLIES
1- D8 DOZER	40.06	25.91	33.85
1- NO. 14 PATROL R/C = 63.29	14.82	17.93	19.51
1- RAYGO COMPACTOR	6.01	9.81	17.29
1- PICKUP	2.40	0.97	5.71
1- DOZER OPERATOR	35.97		
1- PATROL OPERATOR	35.97		
1- COMPACTOR OPERATOR	35.97		
2- GRADE CHECKERS	65.04		10.00
1- 4 MAN	39.59		
COST PER HOUR	275.83	54.62	86.36
COST 60 HOURS.	16,550	3277	5182

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 2 OF 4 PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

RM 2

		TOTAL	UNIT PRICE
	SUMMARY		
25 ACRES.	DIRECT LABOR	12754	510.16
	SUPPLIES	600	24.00
	REPAIR LABOR	3797	151.88
	EQUIPMENT	3277	131.08
	EQUIP. SUPPLIES	4582	183.28
		25010	1000.40

LAY PVC

FIGURE 2 WEEKS OR 120 HOURS

WITH THE FOLLOWING SPREAD

SPREAD	LABOR	EQUIPMENT	SUPPLIES
6-LADDERS	187.68		15.00
1-TEAMSTER	32.94		
1-FOREM.	34.00		
1- NIP TRUCK	4.01	4.17	11.04
1- PICKUP	2.40	0.97	5.71
COST PER HOUR	260.93	5.14	31.75
COST 120 HOURS	31312	617	3810

	SUMMARY	TOTAL
1 L.S.	DIRECT LABOR	30931
	SUPPLIES	1800
	REPAIR LABOR	481
	EQUIPMENT	617
	EQUIP. SUPPLIES	2010
1,137,296 C 0.04	PERM. MATERIAL	45284
		80573

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 3 OF 4 PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

BUILD STOCK PILE
USE 988 FEL & 769 END SPILLS
FIGURE A PRODUCTION OF
475 CU. YDS. / HOUR
SPREAD

	LABOR	EQUIPMENT	SUPPLIES
1-988 FEL	30.05	33.00	45.85
1-D8 FEED CAT R/C. = 199.49	40.06	25.91	33.85
1-D8 STOCKPILE CAT	40.06	25.91	33.85
1-No. 14 PATROL - SCARIFYING	14.82	17.93	19.51
1-RAYGO COMPACTOR	6.81	9.81	17.29
3-769 END SPILLS	66.09	94.50	99.23
1-PICKUP	2.40	0.97	5.71
1-LOADER OPERATOR	38.04		
2-CAT OPERATORS	71.94		
1-PATROL OPERATOR	35.97		
1-COMPACTOR OPERATOR	35.97		
3-TEAMSTERS	105.33		
1-QUINLAN	31.28		5.00
1-4MAN	39.59		
COST PER HOUR	557.01	208.03	258.29
COST 3318 HOURS	1850150	690244	857006

SUMMARY

	TOTAL	UNIT PRICE
DIRECT LABOR	1198275	0.75
SUPPLIES	16590	0.01
REPAIR LABOR	661875	0.42
EQUIPMENT	1902244	0.44
EQUIP. SUPPLIES	840416	0.53
	3397400	2.15

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DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 4 OF 4 PAGE 237

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

COVER WITH PVC.
SAME SPREAD & TIME AS
LAY PVC.

	SUMMARY	TOTAL
I.L.S.	DIRECT LABOR	30831
	SUPPLIES	1800
	REGID LABOR	481
	EQUIPMENT	617
	EQUIP. SUPPLIES	7010
	PERM MATERIAL	45284
		80573

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION U/S Gravel and D/S Sand Fill ITEM NO. 332.31D SHEET ___ OF ___ PAGE 295

JOB Watana Dam

BID QUANTITY 20,626,000 UNIT C.Y. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
PER DETAIL	20,626,000	CY.	1.44 29683817	0.01 1654410	0.92 18967233	1.35 27828909	1.61 33360881			5.33 110006250
STRIPPING BORROW	1	LS.	1290399	20483	1003644	1413294	1618120			5345940
RESTOKING BORROW	1	LS.	1290399	20483	1003644	1413294	1618120			5345940
	20,626,000	CY.	1.56 32264615	0.01 206376	1.02 20974521	1.49 30655497	1.77 36597121			5.85 120698130

FOLD LENGTH
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OPERATION U/S. GRAVEL & C/S. [illegible] ITEM NO. 332-[illegible] SHEET 1 OF 2 PAGE [illegible]

JOB [illegible]

QUANTITY 20,676,000 UNIT [illegible] EST. BY CK'D. BY DATE

FORM 2

SOURCE

14,000 FEET D/S OF DAM.

METHOD

RUN MATERIAL OVER A BELT LOADER WITH GRIZZLY OR SCREEN SET-UP.

USE A 42"X50' @ 1250 TPH = 750 CY./HOUR ±

	LABOR	EQUIPMENT	SUPPLIES
USE RATE	4.06	18.50	46.44

USE 777 HAUL UNITS AND FIGURE 55 CU.YDS./LOAD = 35 ± ±

HAUL SPEED AT 15 MPH = 1320 FPM = [illegible] MINUTES

RETURN " " 20 " = 1760 " = 7.95 "

LOADING

[illegible]

AND CYCLE TIME OF 45 SECONDS. LOAD 777 IN 3.75 MINUTES

TRUCK CYCLE

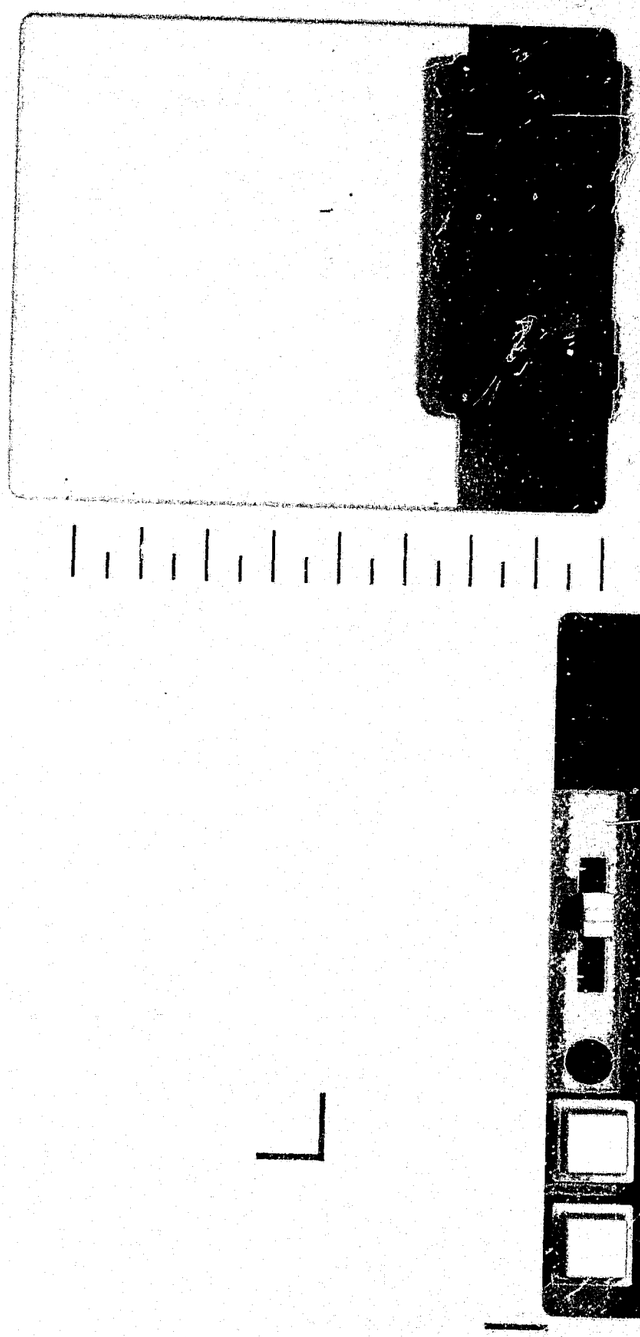
LOAD	3.75	MINUTES
HAUL	10.61	"
DUMP & TURN	1.50	"
RETURN	7.95	"
SPOT	1.00	"
	24.81	MIN./CYCLE

50 MINUTE HOUR

24.81 MIN./CYCLE = 2.02 (55) = 111 CU.YDS./UNIT HOUR

[illegible]

[illegible]



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DIVERSIFIED CONSTRUCTORS, INC.

OPERATION | ITEM NO. | SHEET 2 OF 2 PAGE [illegible]

JOB

QUANTITY | UNIT | EST. BY | CK'D. BY | DATE

FORM 2

20,676,000 (1.20) = 24811200

750 = 33,082 HOURS

SPREAD	LABOR	EQUIPMENT	SUPPLIES
1- BELT LOADER / SCREEN	4.06	18.50	46.44
2- D9 FEED CATS	96.14	95.00	92.48
1- 992 FEL R/C = 573.34	40.06	75.00	77.37
1- D9 FEED CAT	48.07	47.50	46.24
7- 777 END SPILLS - WORK	210.35	420.00	524.58
1- " " " - SPARE		60.00	
2- No. 14 PATROLS	29.64	35.86	39.02
2- 5M WATER TRUCKS	24.04	12.60	35.82
2- D8 FILL CATS	80.12	51.82	67.70
2- RAYGO COMPACTORS	12.02	19.62	34.58
1- 300KW GENERATOR	17.63	2.78	27.11
2- PICKUPS	4.80	1.94	11.42
1- LOADER OPERATOR	38.04		
5- CAT OPERATORS	179.85		
2- PATROL OPERATORS	71.94		
2- COMPACTOR OPERATORS	71.94		
7- END SPILL TEAMSTERS	254.73		
2- WATER TRUCK TEAMSTERS	67.44		
1- BELT OPERATOR	35.69		
1- BELT OILER	35.09		
2- GRADE CHECKERS	63.38		5.00
2- 4 MEN	79.18		
1- 8" PUMP.	6.41	0.59	5.67
COST PER HOUR	1470.62	841.21	1013.43
COST 33082 HOURS	48651050	27828409	33526291

SUMMARY	TOTAL	UNIT PRICE
DIRECT LABOR	29683817	1.44
SUPPLIES	165410	0.01
REPAIR LABOR	18967233	0.92
EQUIPMENT	27828909	1.35
EQUIP. SUPPLIES	33360591	1.61
	[illegible]	[illegible]

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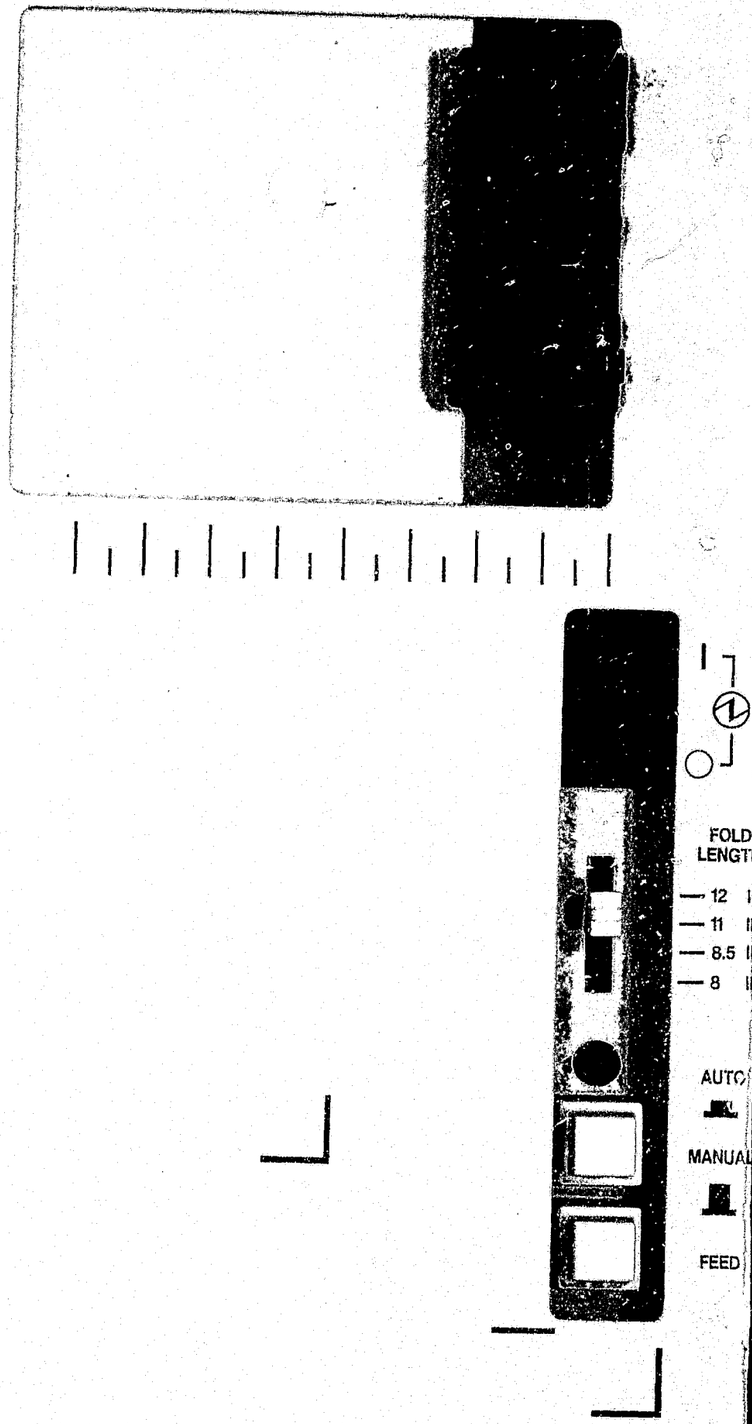

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Filters ITEM NO. 332.31E SHEET OF PAGE 23

JOB Watana Dam

BID QUANTITY 6,338,000 UNIT C.Y. TAKE OFF QUANTITY EST. BY A. Lee DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
PER DETAIL	6,338,000	CY.	1.44 9,126,720	0.01 63,380	0.92 5,830,960	1.35 8,556,300	1.61 10,204,180			5.33 33,781,540
STRIPPING BORROW	1	LS.	407,494	644.8	316,940	446,304	510,985			1,686,191
RESTORING BORROW	1	LS.	407,494	644.8	316,940	446,304	510,985			1,686,191
	6,338,000	CY.	1.57 9,941,708	0.01 76,316	1.02 6,464,840	1.49 9,448,908	1.77 11,226,150			5.86 37,157,922

FOLD LENGTH
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MANUAL

FEED

OPERATION FILTERS ITEM NO. 3/E SHEET ___ OF 2 PAGE ___

JOB [illegible]

QUANTITY [illegible] UNIT [illegible] EST. BY CK'D. BY DATE

FORM 2

SAME SOURCE AS GRAVEL & SAND.

USE SAME PRODUCTION AND UNIT COSTS.

SUMMARY	TOTAL	UNIT PRICE
DIRECT LABOR	9126720	1.44
SUPPLIES	13380	0.01
REPAIR LABOR	5830760	0.92
EQUIPMENT	8556300	1.35
EQUIP. SUPPLIES	10204180	1.61
	33731540	5.33

STRIPPING BORROW AREA.

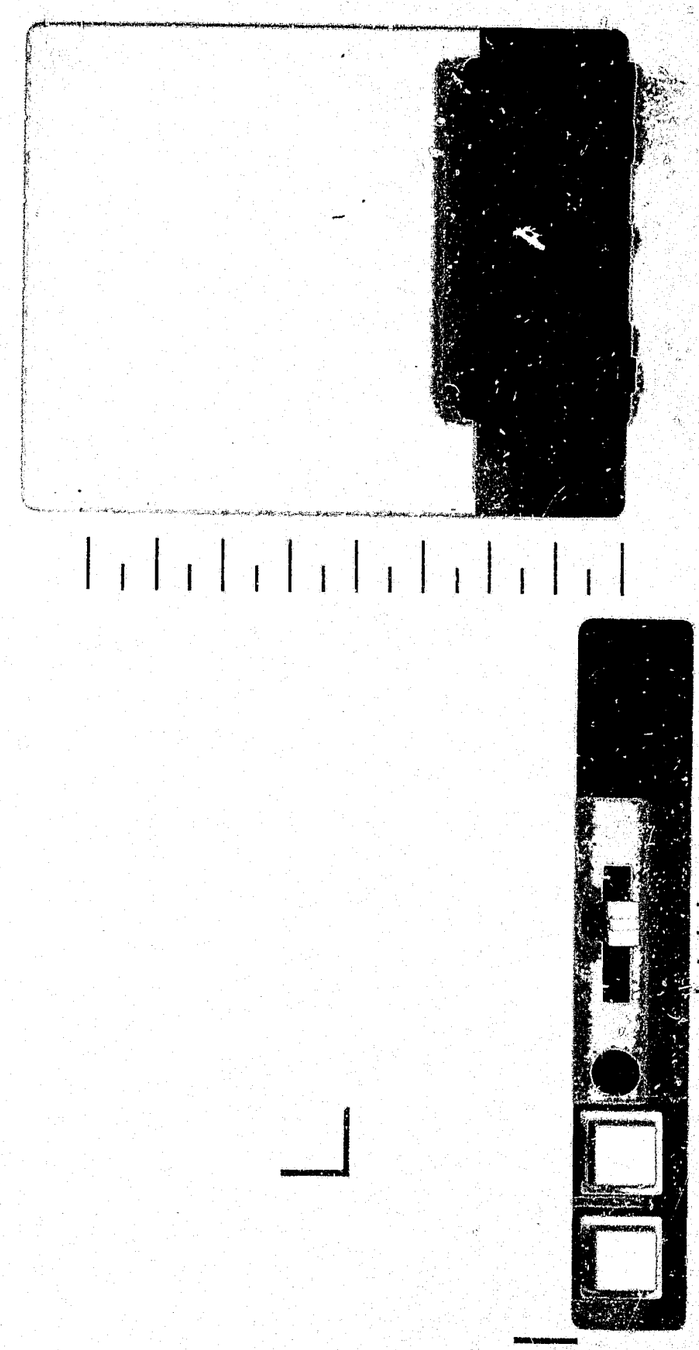
AREA AT THIS POINT & TIME IS ANYBODIES GUESS, BASED ON A MORE CLEARLY DEFINED AREA FOR THE [illegible] MATERIAL, WERE WE FIGURE AN AREA OF 207 ACRES TO GET 7,047,000 CU. YDS. TO A DEPTH OF 21 FEET. IN THE CASE OF GRAVEL, SAND & FILTER WITH A TOTAL QUANTITY OF 26,964,000 CU. YDS., PLAN ON AN AVERAGE DEPTH OF 30 FEET.

FIGURE AREA $\frac{4925' \times 4925'}{43560}$ = 557 ACRES

FIGURE STRIPPING TO AN AVERAGE DEPTH OF 3' =

$\frac{4925(4925)(3)}{27}$ = 2,695,069 CU. YDS.

USE SAME UNIT PRICES AS FOR [illegible] FILL STRIPPING



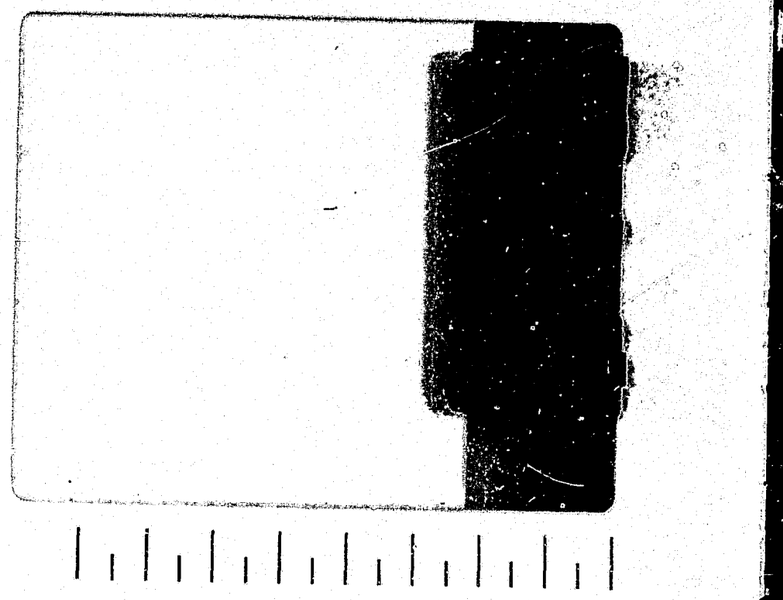
OPERATION ITEM NO SHEET 1 OF 2 PAGE 4

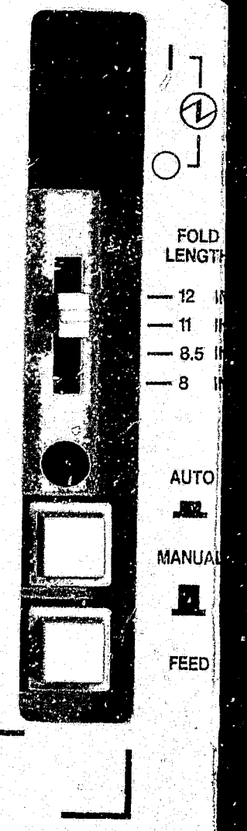
JOB

QUANTITY UNIT EST. BY CK'D BY DATE

FORM 2

SUMMARY	UNIT PRICE	TOTAL
DIRECT LABOR	0.63	1697993
SUPPLIES	0.01	26951
REPAIR LABOR	0.49	1320634
EQUIPMENT	0.69	1859598
EQUIP SUPPLIES	0.79	2129705
	2.61	7034881
PRORATE TO THIS ITEM AND GRAVEL & SAND FILL BY THE PERCENTAGES OF QUANTITIES		
FILTERS	6339000 = 24%	
O/S GRAVEL & O/S SAND	20616000 = 76%	
	26,955,000	
	SAND & GRAVEL TOTAL	FILTER TOTAL
SUMMARY		
DIRECT LABOR	1290379	407494
SUPPLIES	20493	6468
REPAIR LABOR	1003644	316840
EQUIPMENT	1413394	446304
EQUIP. SUPPLIES	1618120	510965
	5345940	1688191
REPLACE & RECTIFY STRIPPING. SAME COSTS AS ABOVE.		





OPERATION Rockfill From Quarry ITEM NO. 332.31F SHEET ___ OF ___ PAGE ___

JOB Watana Dam

BID QUANTITY 18,563,400 UNIT C.Y. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
STRIP & RESTORE	720	AC.	3049.20 219542.4	48.40 34848	257.60 1707552	3339.40 2404512	3823.60 2752992			12032.40 9095328
DRILL & SHOOT	18,563,400	CY.	1.64 30388726	0.01 237415	0.49 9086962	0.37 6878554	0.84 15576918			3.35 62163575
DRILL & BLASTING SUPPLIES.	18,563,400	CY.		1.32 24453710						1.32 24453710
LOAD, HAUL & PLACE	18,563,400	CY.	1.06 19733092	0.01 150920	0.81 14994506	1.31 24276991	1.41 26197901			4.60 85353410
	18,563,400	CY.	2.82 52317247	1.34 24871893	1.39 25789020	1.81 33560057	2.40 44527811			9.76 181066023

FOLD LENGTH
— 12
— 11
— 8.5
— 8

AUTO

MANUAL

FEED

OPERATION STOCKPILE FIELD DUMP ITEM NO. 332-31F SHEET 1 OF PAGE 10

JOB VIETNAM

QUANTITY 18563400 UNIT CU.YDS. EST. BY CK'D. BY DATE

FORM 2

SOURCE:

10000 FT SOUTH OF DAM EMBANKMENT

AREA

FIGURE AN EXCAVATION DEPTH OF 40 L.F.±

$\frac{3960\ (3960)}{43560} = 360$ ACRES OF STRIPPING 31±

$\frac{3960\ (3960)\ (3)}{27} = 1,742,400$ CU.YDS.

SAME STRIPPING & RESTORATION PRICES AS SAND & GRAVEL FIELD

SUMMARY	UNIT PRICE	TOTAL
DIRECT LABOR	0.63	1097712
SUPPLIES	0.01	17424
REPAIR LABOR	0.49	853776
EQUIPMENT	0.69	1202256
EQUIP. SUPPLIES	0.79	1376496
	2.61	4547664

DRILL PATTERN AT 5'x7' = 1 L.F. DRILL HOLE / 1.3 CU.YDS.

$\frac{18,563,400}{1.3} = 14,279,538$ L.F. DRILL HOLE

FIGURE ON 20 FOOT LIFTS

$\frac{14,279,538}{20} = 713977$ HOLES- 22'

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 2 OF ____ PAGE 11

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

WHEN IT COMES DOWN TO THE WIRE YOU WILL USE LARGE ROTARY DRILL RIGS FOR THIS OPERATION AT A LESS COST THAN AIR TRACS, BUT NOT KNOWING EXTENT OF ROCK OR POSSIBLE CAVE-INS, LINES, ETC. WE WILL USE AIR TRACS FOR THIS ESTIMATE.

AIR TRAC CYCLE

SETUP	1.0	MINUTES
DRILL	22.0	"
RETRACT	1.0	"
MOVE	2.0	"
	26.0	MIN./HOLE

50 MINUTE HOUR

26 MIN./HOUR = 1.92 HOLES/DRILL HOUR

FIGURE 8 DRILL SPREAD =

1.92 (8) = 15 3/6 HOLES/HOUR

713977

15336 = 46483 HOURS

SPREAD	LABOR	EQUIPMENT	SUPPLIES
8-AIR TRACS R/L. = 19549	118.56	98.56	201.20
4-1200 CFM COMPRESSORS	70.52	44.28	17.16
1-FLATBED	4.01	4.17	11.04
1-PICKUP	2.40	1.99	5.71
8-DRILLERS	262.72		
8-DRILLER HELPERS	257.44		5.00
1-TEAMSTER	32.84		
1-POWDERMAN	33.19		
1-POWDERMAN HELPER	32.52		
1-4 MAN	35.95		
COST PER HOUR	849.25	147.98	240.11
COST 46483 HOURS	39475485	6878354	15509333

0024693

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 5 OF PAGE

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

SUMMARY	TOTAL	UNIT PRICE
DIRECT LABOR	30398726	1.64
SUPPLIES	232415	0.01
REPAIR LABOR	9086962	0.49
EQUIPMENT	6878994	0.37
EQUIP. SUPPLIES	15576918	0.84
	62163575	3.35

DRILL SUPPLIES	QUANTITY	UNIT	TOTAL
DRILL STEEL	14279538	0.20	2855908
EXPLOSIVES 18,563,400 CY. @ 0.75#	13922550	1.50	20883825
DETONATORS	713777	1.00	713777
			24453710
			1.32

LOAD, HAUL & PLACE

USE 992 FEL & 777 END SPILLS.

FOR HAULING FIGURE A SWELL FACTOR OF 1.40

18,563,400 (1.40) = 25,988,760 CU. YDS.

USE 777 END SPILLS & 992 FEL, PLACE IN 2 FOOT LIFTS, DUMPING ON PREVIOUS PLACED LIFT AND DOZING FORWARD.

FIGURE 11.48 CU. YDS / LOADER CYCLE

FIGURE 5 PASSES / LOAD

FIGURE LOAD AT 60 CU. YDS

OPERATION ITEM NO. SHEET 11 OF PAGE 298

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

LOADER CYCLE TIME

LOAD	0-10	SECONDS
BACK & TURN	0-10	"
FORWARD & DUMP	0-05	"
BACK & TURN	0-10	"
FORWARD	0-05	"
	0.40	SECONDS / CYCLE

2000

40 = 75 CYCLES / 50 MIN. HOUR

75(11.48) = 861 CU. YDS. / HOUR = 1248 TONS / HOUR.

TRUCK CYCLE

HAUL DISTANCE = 10,000 FT

HAUL AT	10	MPH	= 11.36 MINUTES
RETURN AT	15	"	= 7.58 "

CYCLE TIME

LOAD	3.33	MINUTES
HAUL	11.36	"
DUMP + TURN	1.50	"
RETURN	7.58	"
SPOT	1.00	"
	24.77	MIN. / CYCLE

50 MIN. HOUR

24.77 MIN. / CYCLE = 2.02 (LO) = 121 CU. YDS. / UNIT HOUR

861

121 = 7.12 (SAY 7 TRUCKS + 1 SPARE)

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 5 OF PAGE 7:9

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	LABOR	EQUIPMENT	SUPPLIES
SPREAD			
1-992 FEL	40.06	75.00	77.37
2-D9 FEED CATS	96.14	95.00	92.48
2-D9 SPREAD CATS	96.14	95.00	92.48
1-PATROL R/L = 456.77	14.82	17.93	19.51
1-WATER WAGON	24.44	30.00	32.55
1-PUMP	4.41	0.59	5.67
7-777 END SPILLS - WORK	210.35	420.00	524.58
1- " " " - SPARE		60.00	
1-COMPACTOR	6.01	9.81	17.29
1-PICKUP	2.70	0.97	5.71
1-LOADER OPERATOR	38.04		
4-CAT OPERATORS	143.88		
1-PATROL OPERATOR	35.97		
1-COMPACTOR OPERATOR	35.97		
1-WATER WAGON-TEAMSTER	33.72		
7-END SPILL TEAMSTERS	263.02		
1-DUMPMAN	31.28		5.00
1-GRADE CHECKER	31.09		
1-HMAN	39.59		
COST PER HOUR	1150.53	804.30	872.94
COST 30,184 HOURS	34727598	24276991	26348821

18,563,400 CY. SUMMARY

	TOTAL	UNIT PRICE
DIRECT LABOR	19733092	1.06
SUPPLIES	1580920	0.01
REPAIR LABOR	14994506	0.81
EQUIPMENT	24276991	1.31
EQUIP. SUPPLIES	26197901	1.41
	85853410	4.60

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Rockfill From Stockpile

BID QUANTITY 2,307,000 UNIT C.Y. TAKE OFF

		PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
PER DETAIL	70			92 21385890
PUT INTO STOCKPILE	47			32 7577441
	72			125 28963331

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		EQUIPMENT MATERIALS	SUB-CONTRACT
OIL	2307000	CY.	2.70	6228900	1.34	3091380	1.30	2999100	1.68	3875760	2.25	5190750		
STOCKPILE	2307000	CY.	0.72	1659908			0.79	1813877	0.83	1914094	0.95	2189542		
	2,307,000	CY.	3.42	7888828	1.34	3091380	2.09	4812977	2.51	5789854	3.20	7380292		

12

11

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Rockfill From Stockpile ITEM NO. 332.31G SHEET ___ OF ___ PAGE 300

JOB Watana Dam

BID QUANTITY 2,307,000 UNIT C.Y. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
PER DETAIL	2307000	CY	2.70 1708900	1.34 3091380	1.30 2999100	1.68 3875760	2.25 5190750			9.27 21385890
PUT INTO STOCKPILE	2307000	CY	0.72 1659928		0.79 1813877	0.83 1914094	0.95 2189547			3.29 7577441
	2,307,000	CY	3.42 7888828	1.34 3091380	2.09 4812977	2.51 5789854	3.20 7380297			12.56 28963331

FOLD LENGTH
12 IN
11 IN
8.5 IN
8 IN

AUTO

MANUAL

FEED

0024493

OPERATION POCKFICL FROM STOCKPILE ITEM NO. 332-316 SHEET 1 OF PAGE 301

JOB WATANG

QUANTITY 2,307,000 UNIT C.Y. EST. BY CK'D. BY DATE

FORM 2

SAME UNIT COST AS ITEM 332-31F
EXCEPT ELIMINATE STRIP & RESTORE
BUT ADD PUTTING MATERIAL INTO
STOCKPILE

ITEM 332-31F
2,307,000 C.Y.

SUMMARY	TOTAL	UNIT PRICE
DIRECT LABOR	6228900	2.70
SUPPLIES	3091380	1.34
REPAIR LABOR	2999100	1.30
EQUIPMENT	3875760	1.68
EQUIP. SUPPLIES	5190750	2.25
	21395890	9.27

FIGURE TRAM HAUL OF 500 L.F.
WITH 992 F.E.L. @ 11.48 CU.YD.
PER CYCLE
HAUL AT 5 M.P.H.
RETURN AT 7 M.P.H.

CYCLE TIME

LOAD	0.15	MINUTES
HAUL	1.34	"
DUMP	0.05	"
RETURN	1.14	"
	2.68	MIN./CYCLE

50 MINUTE HOUR
2.68 MIN./CYCLE = 18.66 (11.48) = 214 CU.YDS./HOUR

2,307,000 (1.40) = 3229800
214 = 15,093 HOURS

0002493

OPERATION ITEM NO. SHEET 2 OF PAGE 30?

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	LABOR	EQUIPMENT	SUPPLIES
SPREAD			
1-992 FEL	40.06	75.00	77.37
1-D8 FEED CAT R/C = 120.18	40.06	25.91	33.85
1-D8 STOCKPILE CAT	40.06	25.91	33.85
1-LOADER OPERATOR	38.04		
2-CAT OPERATORS	71.94		
COST PER HOUR	230.16	126.82	145.07
COST 15,093 HOURS.	3473805	1914094	2189542

SUMMARY	TOTAL	UNIT PRICE
DIRECT LABOR	1659928	0.72
SUPPLIES	-0-	-0-
REPAIR LABOR	1813877	0.79
EQUIPMENT	1914094	0.83
EQUIP. SUPPLIES	2189542	0.95
	7577441	3.29

0024933

OPERATION PUSHING DIRECTLY FROM EXCAVATION

ITEM NO. 331-314 SHEET 1 OF ____ PAGE 25.

JOB VARIOUS

QUANTITY 3924600 UNIT C.Y. EST. BY CK'D. BY DATE

FORM 2

MATERIAL HAS EITHER BEEN STOCKPILED FROM REQUIRED EXCAVATION OR IS AVAILABLE IN THE VICINITY OF DAM EMBANKMENT.

ALL THAT HAS TO BE DONE IS LOAD, HAUL & PLACE.

FIGURE ON USING 769 END DUMPS & 955 FEL FOR THIS ITEM.

FIGURE AVERAGE HAUL DISTANCE OF 5000 LF.

FIGURE THAT THIS QUANTITY HAS BEEN CONSIDERED BY THE ENGINEER TO BE BANK MEASURE SWELL BY FACTOR OF 1.4 - 5,494,440 CU. YDS.

LOADER CYCLE — BUCKET CAPACITY OF 6 CU. YDS

LOAD	0-10	SECONDS
BACK-TURN	0-10	"
FORWARD & DUMP	0-05	"
BACK & TURN	0-10	"
FORWARD	0-05	"
	0-40	SECONDS/CYCLE

3000
40 = 75 (C) = 450 CU. YDS. / HOUR

OPERATION Rockfill Directly From Excavation ITEM NO. 332.31H SHEET OF PAGE 2 E

JOB Watana Dam

BID QUANTITY 3,924,600 UNIT C.Y. TAKE OFF QUANTITY EST. BY A. Lee DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
PER DETAIL	3,924,600	CY.	1.04 6,446,136	0.02	21,050	0.91 3,565,564	1.13 4,426,247	1.20 4,719,043		4.90 19,218,540

FOLD LENGTH
12
11
8.5
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AUTO
MANUAL
FEED

00249 93

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 2 OF ____ PAGE 30C

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

TRUCK CYCLE - FIGURE 24 CU YDS / LOAD

LOAD	2.67	MINUTES
HAUL	5.68	" 10 MPH
DUMP & TURN	1.50	"
RETURN	3.79	" 15 MPH.
SPOT	1.00	"
	14.64	MIN. / CYCLE

60 MINUTE HOUR

14.64 MIN. / CYCLE : 3.42 (24) = 82 CU. YDS. / UNIT HOUR

450

82 = 5.5 (DAY 5 TRUCKS + 1 SPARE)

SPREAD	LABOR	EQUIPMENT	SUPPLIES
1-988 FEL	30.05	35.00	45.85
1-D8 FEED CAT R/L = 292.02	40.06	25.91	33.85
1-D9 F L CAT	48.07	47.50	46.24
1-PAT 20L	14.82	17.93	19.51
1-WATER WAGON (INC. PUMP)	18.43	6.89	23.58
1-COMPACTOR	6.91	9.81	17.29
6-769 END SPILLS - WORKING	132.18	189.00	194.46
1- " " " - SPARE		31.50	
1-PICKUP	2.40	0.97	5.71
1-FEL OPERATOR	35.04		
2-DOZER OPERATORS	71.94		
1-PATROL OPERATOR	35.97		
1-COMPACTOR OPERATOR	35.97		
1-WATER WAGON TEAMSTER	32.84		
6-END SPILL TEAMSTERS	210.66		
1-DONIPHAN	31.28		
1-GRADE CHECKER	31.69		5.00
1-FOREMAN	39.59		
COST PER HOUR	820.00	362.51	591.49
COST 12,210 HOURS	10012200	4426247	7218093

0024933

OPERATION ITEM NO. SHEET 3 OF ____ PAGE ---

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	TOTAL	UNIT PRICE
SUMMARY		
DIRECT LABOR	6446136	1.14
SUPPLIES	61050	0.02
REPAIR LABOR	3565564	0.91
EQUIPMENT	4426247	1.13
EQUIP. SUPPLIES	4719043	1.20
	19318540	4.90

0 0 2 4 9 3

OPERATION Raking Rock Fill ITEM NO. 332.3H1 SHEET OF PAGE

JOB Watana Dam

BID QUANTITY 902,000 UNIT C.Y. TAKE OFF QUANTITY EST. BY A. Lee DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
PER DETAIL	902,000	CY.	012 1044738	001 27740	007 122013	004 40109	006 52400			030 2670000

FOLD
LENGTH
12 I
11 I
8.5 I
8 I

AUTO

MANUAL

FEED

0 0 2 4 9 3

OPERATION PARKING ROCK FILL ITEM NO. 341 SHEET 1 OF ___ PAGE 3[illegible]

JOB [illegible]

QUANTITY 902000 UNIT CY EST. BY CK'D. BY DATE

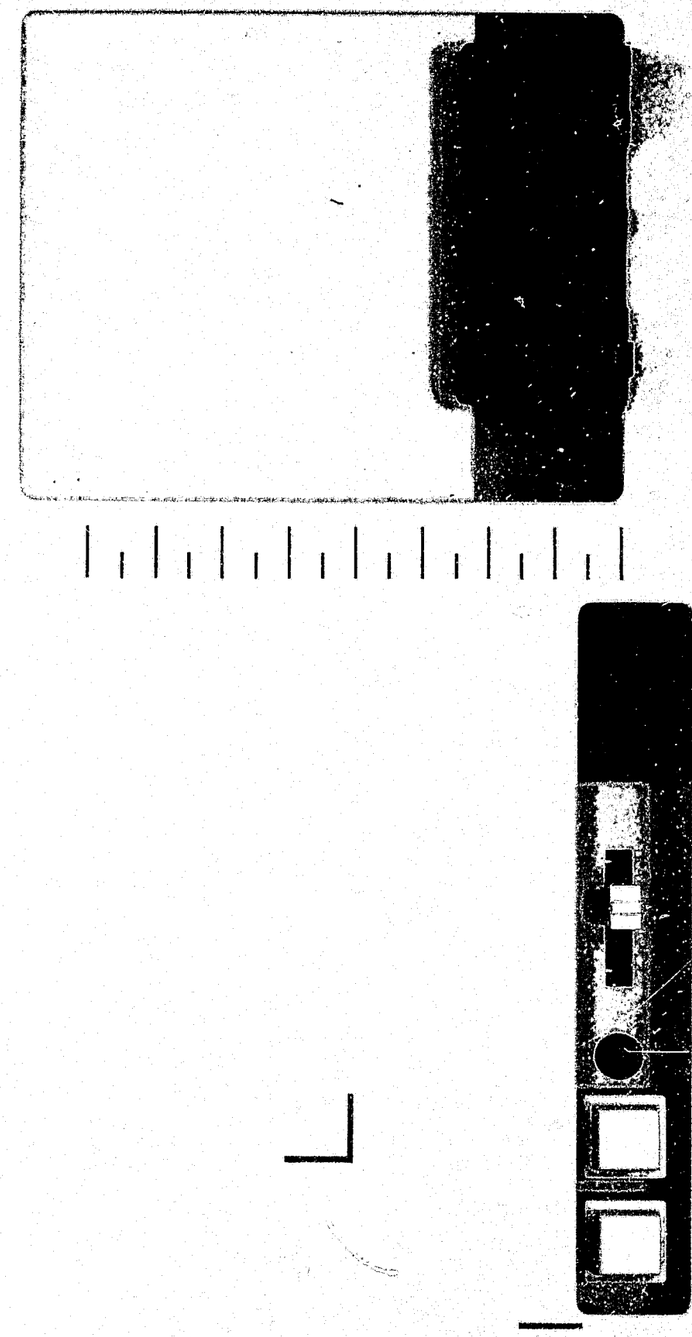
FORM 2

THIS APPEARS TO BE A USELESS ITEM SINCE THE SLOPES WILL BE DRESSED AS EMBANKMENT RISES - BUT FOR THE SAKE OF PUTTING IN DOLLARS, FIGURE THE LAST SEASON OF EMBANKMENT, AND ON A SINGLE SHIFT BASIS, HAVE A D8 WITH ROCK RAKE

SAY 6 MONTHS - 6 DAYS PER WEEK @ 10 HOURS / DAY = 1548 HOURS

SPREAD	LABOR	EQUIPMENT	SUPPLIES
1-D8 DOZER	40.06	25.91	33.85
1-DOZER OPERATOR	35.97		
1-GRADE CHECKER	31.69		5.00
COST PER HOUR	107.72	25.91	38.85
COST 1548 HOURS	166751	40109	60140

SUMMARY	TOTAL	UNIT PRICE
DIRECT LABOR	104738	0.12
SUPPLIES	7740	0.01
REPAIR LABOR	62013	0.07
EQUIPMENT	40109	0.04
EQUIP. SUPPLIES	52400	0.06
	267000	0.30



OPERATION Drill & Grout - Consolidation ITEM NO. 332.313 SHEET ____ OF ____ PAGE 309

JOB Watana Dam

BID QUANTITY 345,000 UNIT L.F. TAKE OFF QUANTITY ____ EST. BY A. Lee DATE ____

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SUB-CONTRACT	345000	LF							26-8907900	26-8907900

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Drill & Grout - Curtain ITEM NO. 332.311 SHEET ____ OF ____ PAGE 5.2

JOB Watana Dam

BID QUANTITY 203,450 UNIT L.F. TAKE OFF QUANTITY ____ EST. BY A. Lee DATE ____

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SUB-CONTRACT	203,450	LF							20.00 4069000	20.00 4069000

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Dam Dental Concrete ITEM NO. 332.314 SHEET ___ OF ___ PAGE 31

JOB Watana Dam

BID QUANTITY 85,000 UNIT C.Y. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS		SUB-CONTRACTS		TOTAL DIRECT COST	
FURNISH CONCRETE	85850	CY.	17.71	1520404	0.38	32623	9.25	794142	8.44	724574	10.24	879104	35.00	3004750			81.02	6955567
PLACE CONCRETE	85,000	CY.	15.42	1310700	0.84	71400	1.20	102000	1.06	90100	2.66	226100					21.18	1800300
CONCRETE WASTE	850	CY.																
FABRICATE & ERECT FORMS	340000	SF	25.24	8581600	3.96	1346400	0.63	214200	1.39	472600	0.99	336600					32.21	10951400
STRIP & CLEAN FORMS	340000	SF	3.23	1098200	0.10	34000	0.17	57800	0.23	78200	0.22	74800					3.95	1343000
FORM HARDWARE	340000	SF			0.75	255000											0.75	255000
FOUNDATION PREPARATION	120000	SF	2.15	258000	0.13	15600	0.20	24000	0.16	19200	0.34	40800					2.98	357600
	85000	CY.	150.22	12768904	20.65	1755023	14.02	1192117	16.29	1384674	18.32	1557404	35.35	3004750			254.85	21662867

FOLD LENGTH
12
11
8.5
8

AUTO

MANUAL

FEED

OPERATION EARTH EXCAVATION ITEM NO 332-314 SHEET 1 OF PAGE 312

JOB VIRTOLA

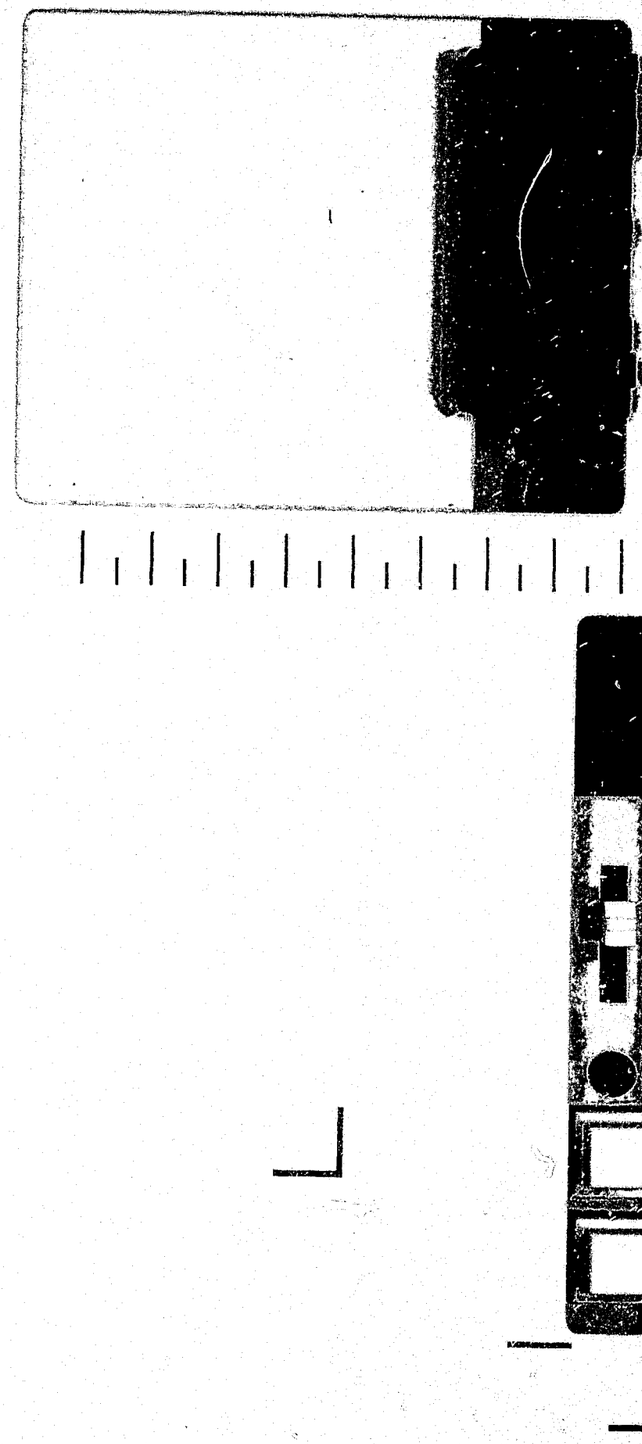
QUANTITY 25,000 UNIT C.Y. EST. BY CK'D. BY DATE

FORM 2

SEEMS LIKE A HIGH QUANTITY - MOST OF THIS WILL GO TO FILL POCKETS ENDS ON ABUTMENTS WHERE CAVITIES EXIST THAT WOULD PREVENT ADEQUATE SEALING WITH IMPERVIOUS CORE. SOME FORM WORK WOULD BE REQUIRED ON ABUTMENTS.

FIGURE ON A PUMPCRETE OPERATION - GUESS AS TO AMOUNT OF FORMWORK

PAYMENT WOULD BE BY BATCH COUNT.



OPERATION Drain Holes ITEM NO. 332.317 SHEET ___ OF ___ PAGE ___

JOB Watana Dam

BID QUANTITY 136,000 UNIT L.F. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
SAME UNIT PRICES AS ITEM 331-117	136000	LF	2.78 378080	0.21 28560	1.13 153680	0.43 58480	0.84 114240			5.41 735760

FOLD LENGTH
12
11
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8

AUTO

MANUAL

FEED

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12

11

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Grout Galleries & Portals - Horizontal ITEM NO. 332.321 SHEET OF PAGE

Galleries 10' x 10' JOB Watana Dam

BID QUANTITY 7,450 UNIT L.F. TAKE OFF QUANTITY EST. BY A. Lee DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
EXCAVATION	6380	LF	223.84 1428081							223.84 1428081
SUPPLIES	6380	LF		82.11 523846						82.11 523846
SUPPORTS	6380	LF						50.44 321105		50.44 321105
EQUIPMENT	6380	LF			66.19 422276	31.69 202203	60.90 388533			158.78 1013012
	6380	LF	223.84 1428081	82.11 523846	66.19 422276	31.69 202203	60.90 388533	50.44 321105		515.37 3288044
	7450	LF	223.84 1667608	82.11 611770	66.19 493115	31.69 236091	60.90 453705	50.44 375828		515.37 3839507

FOLD LENGTH
12
11
8.5
8

AUTO

MANUAL

FEED

12

11

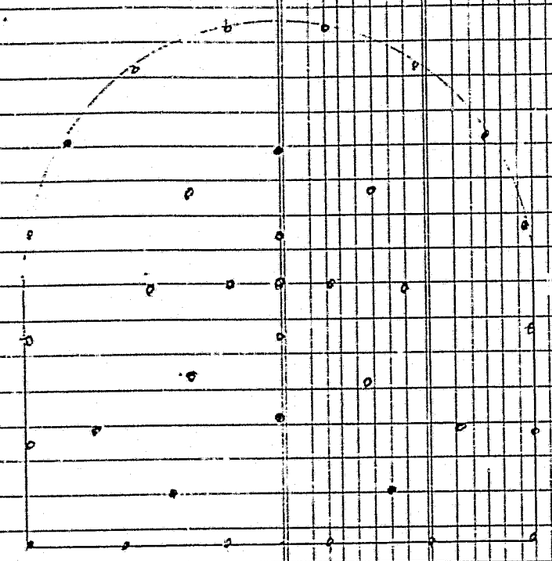
OPERATION HORIZONTAL GALLERY ITEM NO. 332 SHEET 1 OF PAGE 215

10'x10' JOB [illegible]

QUANTITY 7450 UNIT LF. EST. BY CK'D. BY DATE

FORM 2

TAKEOFF QUANTITY = 6,380 LF.



35 HOLES / ROUND

3.31 CU. YDS. / L.F.

DRILL 12 LF. & PULL 10 L.F.

FOLD LENGTH

12

11

8.5

8

AUTO

MANUAL

FEED

0 0 2 4 9 3

12
11

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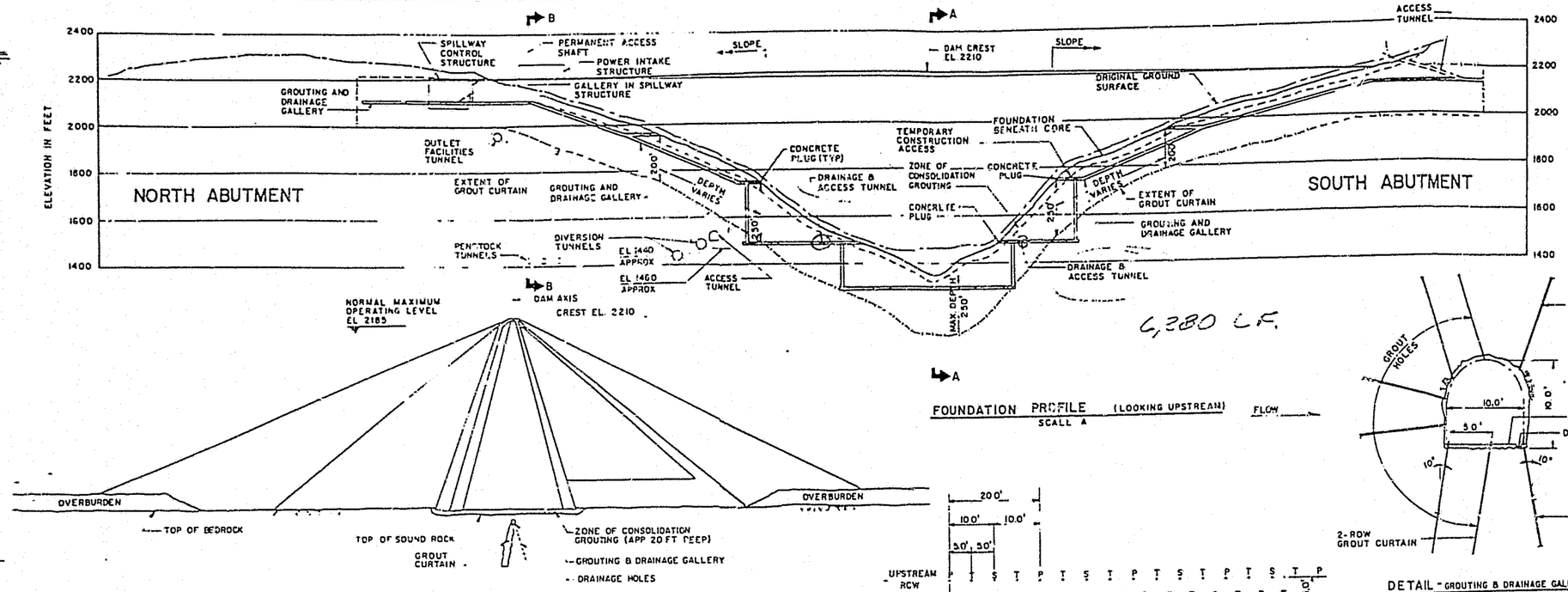
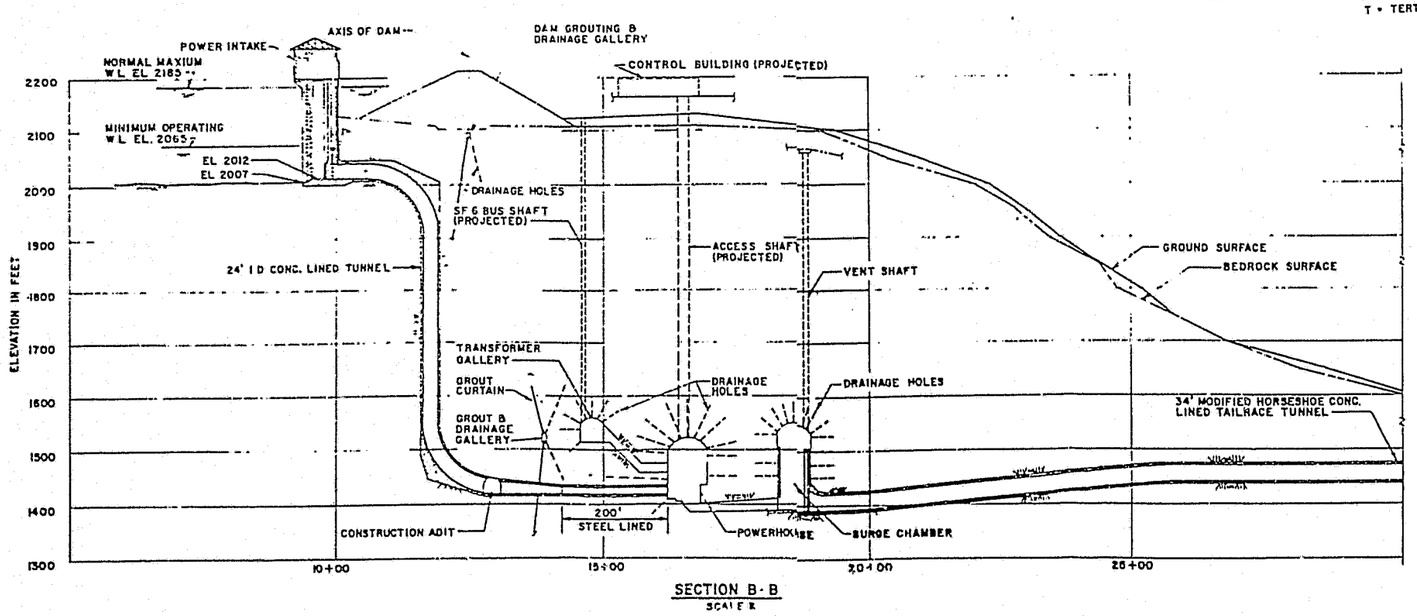




SCALE D 0 5 10 FEET (1 INCH = 5 FEET)
SCALE C 0 10 20 FEET (1 INCH = 10 FEET)
SCALE B 0 100 200 FEET (1 INCH = 100 FEET)
SCALE A 0 200 400 FEET (1 INCH = 200 FEET)

HARZA-EBASCO	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT	
WATANA MAIN DAM GROUTING & DRAINAGE	
EXHIBIT F	PLATE F 8 R.

FOLD LENGTH
12
11
8.5
8
AUTO
MANUAL
FEED

OPERATION ITEM NO. SHEET 5 OF ____ PAGE 317

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

EXCEPT FOR LOWEST GALLERY, WHERE MUCK HAS TO BE HOISTED AND REHANDLED, ALL MATERIAL CAN GO INTO EMBANKMENT. LOWER GALLERY, HOIST 200 LF TO SECOND LEVEL OR DRIVE AND INCLINED DRIFT FOR 250 L.F. (PROBABLY THE WAY TO GO).

USE A JOY 2 DRILL HYDRAULIC JUMBO - STANDARD DRILL PRODUCTION

RETRACT & SETUP	0.80 MINUTES
DRILL	2.20 "
	3.00 MINUTES / HOLE

35 HOLES
2 DRILLS = 17.5 (3) = 52.5 MINUTES

CHANGE BITS EVERY 3 HOLES
35
2 = 17.5 (0.25) = 4.38 "

56.88 MINUTES

56.88 MINUTES
50 MIN. HOUR = 1.14 HOURS

DRILL CYCLE

MOVE UP & HOOKUP JUMBO	5.0 MINUTES
SCALE	5.0 "
DRILL OUT	68.0 "
UNHOOK	5.0 "
	83.0

60.0 = 1.38 HOURS,

OPERATION ITEM NO. SHEET 4 OF PAGE 7.19

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

LOAD & SHOOT

BRING UP EXPLOSIVES 5.0 MINUTES

LOAD HOLES

350 @ B/M.H.. (4 MEN)

60 MINUTE HOUR = 55.0 "

MOVE OUT 5.0 "

60.0

60 = 1.08 HOURS

MUCKING

USE ST4A SCOOP TRAMS

HAUL AT 5 MPH. HAUL DISTANCE = 850 LF

RETURN AT 7.5 MPH.

FIGURE 3.4 CU. YDS. BULK / CYCLE

CYCLE TIME

LOAD	0.50	MINUTES
HAUL	1.93	"
DUMP & TURN	1.00	"
RETURN	1.29	"
	4.72 MIN. / CYCLE	

3.31 (10) (1.45) = 48 CU. YDS. BULK / ROUND

$\frac{48}{3.4} = \frac{14.12\ (4.72)}{50\ \text{MIN. HOUR}} = 1.33$ HOURS

0024933

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC. 9 No. Royal Avenue Eagle Point, Oregon	ENGINEERING COMPUTATIONS
Company ALASKA POWER AUTHORITY Location WATANA Description HOR. GALLERIES 10'X10'	Date Dr. Ch. Ref.

CYCLES

1. Drill In & Out	1.38
2. Load & Shoot	1.08
3. Smoke Time	0.50
4. Muck Time	1.33
5. Supports (average time/rd.)	0.50
6. Services (average time/rd.)	0.25
Sub Total Hrs. Per Round	5.04
Lost Time @ 10 %	.50
Total Hours Per Round/Cycle	5.54
Crew Hours Worked Per Day	20.0
Rounds Per Day	3.61
Peak L.F. Per Day	36.10

PRODUCTION	L. F.	L. F. /Day	W/Days
TURN UNDER	–	–	5.0
	6380	36.10	177.0
Total Work Days			182
Total L. F.			6380
Ave. L. F. Per Day			35.05

320 6

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC. 9 No. Royal Avenue Eagle Point, Oregon	ENGINEERING COMPUTATIONS
Company ALASKA POWER AUTHORITY Location . VIRTANA Description H.D.R. GALLERY 10'X10'	Date ..... Dr .....Ch ..... Ref .....

Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
36.67	SHIFTERS	1	1		2	73.34
35.56	DRILLERS	2	2		4	142.24
34.84	TENDERS	2	2		4	139.36
35.95	POWDERMAN	1	1		2	71.90
31.28	TOPMAN	1	1		2	62.56
31.28	DUMPMAN	1	1		2	62.56
41.58	ELECTRICIAN	1	1		2	83.16
38.80	MUCKER OPERATOR	1	1		2	77.60
35.97	DOZER OPERATOR	1	1		2	71.94
	Total	11	11		22	784.66

Cost Per/Day	7846.60
Cost Per M/Hr. Average	35.67
Cost Per M/Day Average	356.66
Total L. F. Or Cu. Yds.	4280
Production	35.05
Total Days Required	182
Total Cost - No. Days X Cost/Day	1428081.20
Cost Per/L. F.	223.84
Cost Per/Cu. Yd.	
Total Man Days	4004
Total Man Hours	40040

OPERATION ITEM NO. SHEET 7 OF PAGE 321

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	QUANTITY	UNIT	TOTAL
SUPPLIES			
DRILL STEEL	267960 L.F.	0.20	53592
EXPLOSIVES 2111B CU.YDS. @ 4.5#	950310 LB.	1.50	142547
DETONATORS 2233D (1.05) LOSS	23447 EA.	1.00	23447
AIR & WATER LINES	6380 LF.	12.00	76560
VENT LINE	6380 LF.	15.00	95700
LIGHT & ELECTRIC LINES	6380 LF.	5.00	31900
FOUL WEATHER GEAR	40040 M.H.	2.50	100100
			523846
			8211
SUPPORTS			
ALLOW #15.30 PER CU.YD. OF ROCK EXCAVATION.			
2111B CU.YDS.			323105
			50 64

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION EQUIPMENT SUMMARY ITEM NO. 382-321 SHEET 8 OF ___ PAGE 3[illegible]

JOB [illegible]

BID QUANTITY 7450 UNIT LF TAKE OFF QUANTITY 6380 EST. BY ___ DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR		EQUIPMENT RENT		EQUIPMENT SUPPLIES		PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST	
1- 2 DRILL JUMBO	3640	HRS.			32.50	118300	11.79	42916	8.55	31122			52.84	192338
3- FANS	10920	"			3.89	42479	2.35	25662	2.35	25662			8.59	93803
1- 300 KW GENERATOR	3640	"			17.63	64173	2.78	10119	27.11	98680			47.52	172972
2- PUMPS	7280	"			2.40	17472	0.27	1966	1.83	13322			4.50	32760
1- ST4A SCOOP TRAM	3640	"			18.96	69014	11.02	40113	21.05	76622			51.03	185749
1- PICKUP	3640	"			2.40	8736	0.97	3531	5.71	20784			9.08	33051
1- FLATBED	3640	"			4.01	14596	4.17	15179	11.04	40186			19.22	69961
1- D7 DOZER	3640	"			24.04	87506	17.23	62717	22.57	82155			63.84	232378
	6380	LF			66.19	422276	31.69	202203	60.90	388533			158.78	1013012
	7450	LF			66.19	493116	31.69	236091	60.90	453705			158.78	1182912

FOLD LENGTH

12 IN

11 IN

8.5 IN

8 IN

AUTO

MANUAL

FEED

12

11

OPERATION Grout Galleries & Portals - Inclined ITEM NO. 332.322 SHEET ___ OF ___ PAGE [illegible]

Galleries 10' x 10' JOB Watana Dam

BID QUANTITY 2,580 UNIT L.F. TAKE OFF QUANTITY ___ EST. BY A. Lee DATE ___

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE	CONSTRUCTION SUPPLIES	EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST
RELATIVELY SAME AS 332-321	2580	LF	223.84 577507	82.11 211844	66.19 170770	31.69 81760	60.90 157122	50.64 130651		515.87 1329654

FOLD LENGTH

12 IN

11 IN

8.5 IN

8 IN

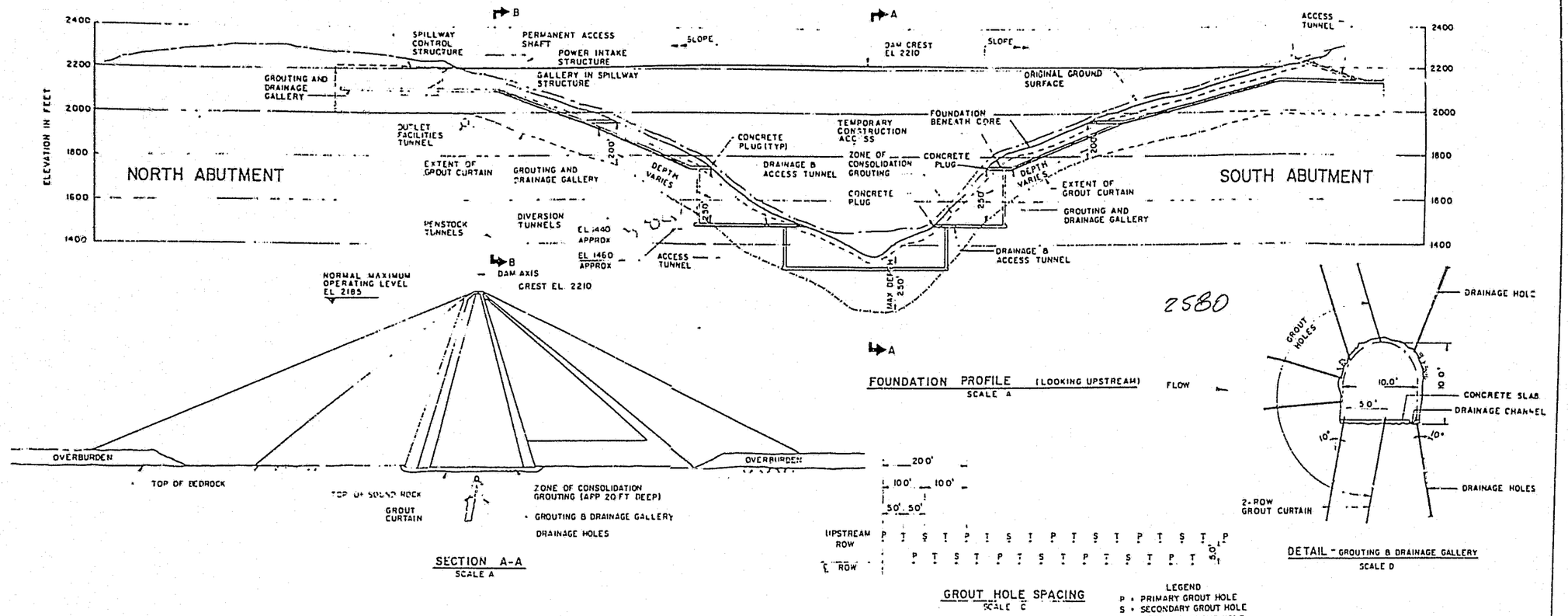
AUTO

MANUAL

FEED

12
11

324 2



SECTION A-A
SCALE A

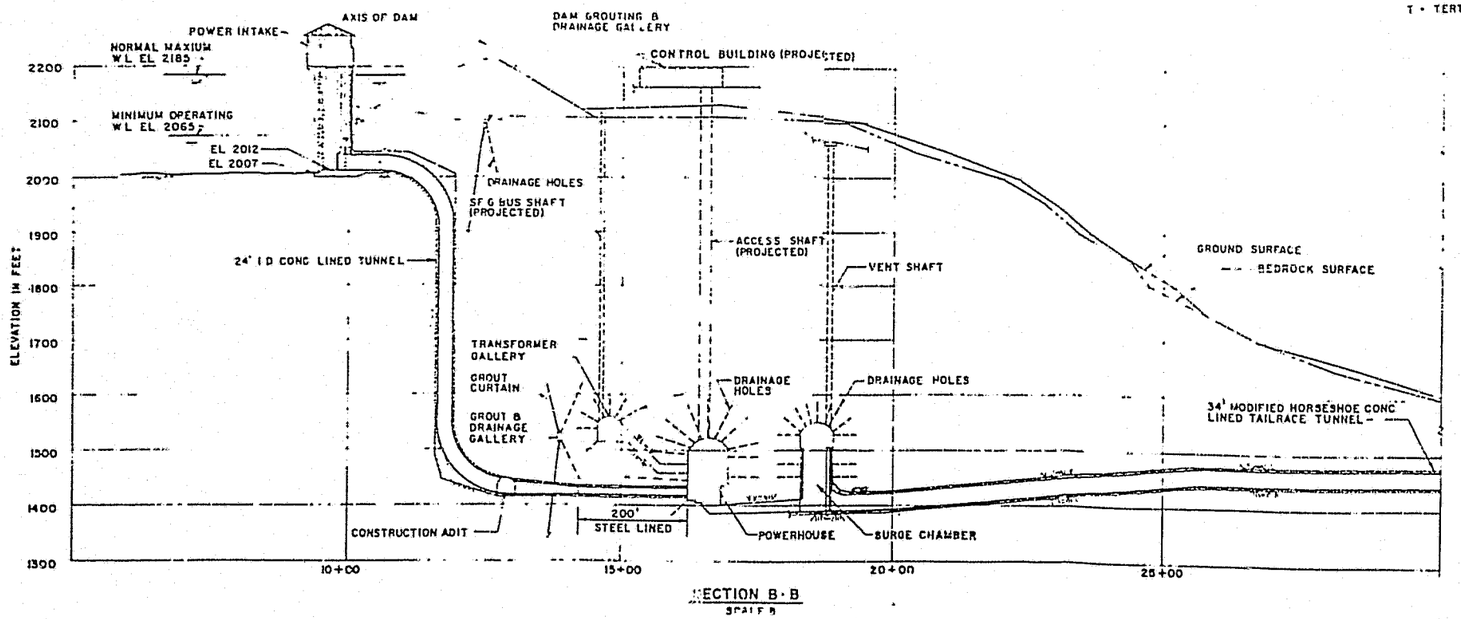
FOUNDATION PROFILE (LOOKING UPSTREAM)
SCALE A

2580

GROUT HOLE SPACING
SCALE C

LEGEND
P = PRIMARY GROUT HOLE
S = SECONDARY GROUT HOLE
T = TERTIARY GROUT HOLE

DETAIL - GROUTING & DRAINAGE GALLERY
SCALE D



SECTION B-B
SCALE B

SCALE D 0 5 10 FEET (1 INCH = 5 FEET)
SCALE C 0 10 20 FEET (1 INCH = 10 FEET)
SCALE B 0 100 200 FEET (1 INCH = 100 FEET)
SCALE A 0 200 400 FEET (1 INCH = 200 FEET)

HARZA-EBASCO	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT	
WATANA MAIN DAM GROUTING & DRAINAGE	
EXHIBIT F	PLATE F 8 R

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION Grout Galleries & Portals - Shafts ITEM NO. 332.323 SHEET OF PAGE 22

10' x 10' JOB Watana Dam

BID QUANTITY 900 UNIT L.F. TAKE OFF QUANTITY 960 EST. BY A. Lee DATE

	QUANTITY	UNIT	CONSTRUCTION LABOR & INSURANCE		CONSTRUCTION SUPPLIES		EQUIPMENT REPAIR LABOR	EQUIPMENT RENT	EQUIPMENT SUPPLIES	PERMANENT MATERIALS	SUB-CONTRACTS	TOTAL DIRECT COST	
EXCAVATION	960	LF	357.74	343434								357.74	343434
SUPPLIES	960	LF			93.32	89585						93.32	89585
SUPPORTS	960	LF								70.52	67699	70.52	67699
EQUIPMENT	960	LF					88.69	85140	99.89	95890	106.47	102163	283193
	960	LF	357.74	343434	93.32	89585	88.69	85140	99.89	95890	106.47	102163	70.52	67699	816.58	783911
	900	LF	357.74	321906	93.32	83988	88.69	79821	99.89	89901	106.47	95778	70.52	63468	816.58	734922

12
11
FOLD
LENGTH
12
11
8.5
8
AUTO
MANUAL
FEED

OPERATION Drout Galleries ITEM NO 332-323 SHEET 1 OF PAGE 376

JOB

QUANTITY 900 UNIT L.F. EST. BY CK'D. BY DATE

FORM 2

TAKEOFF

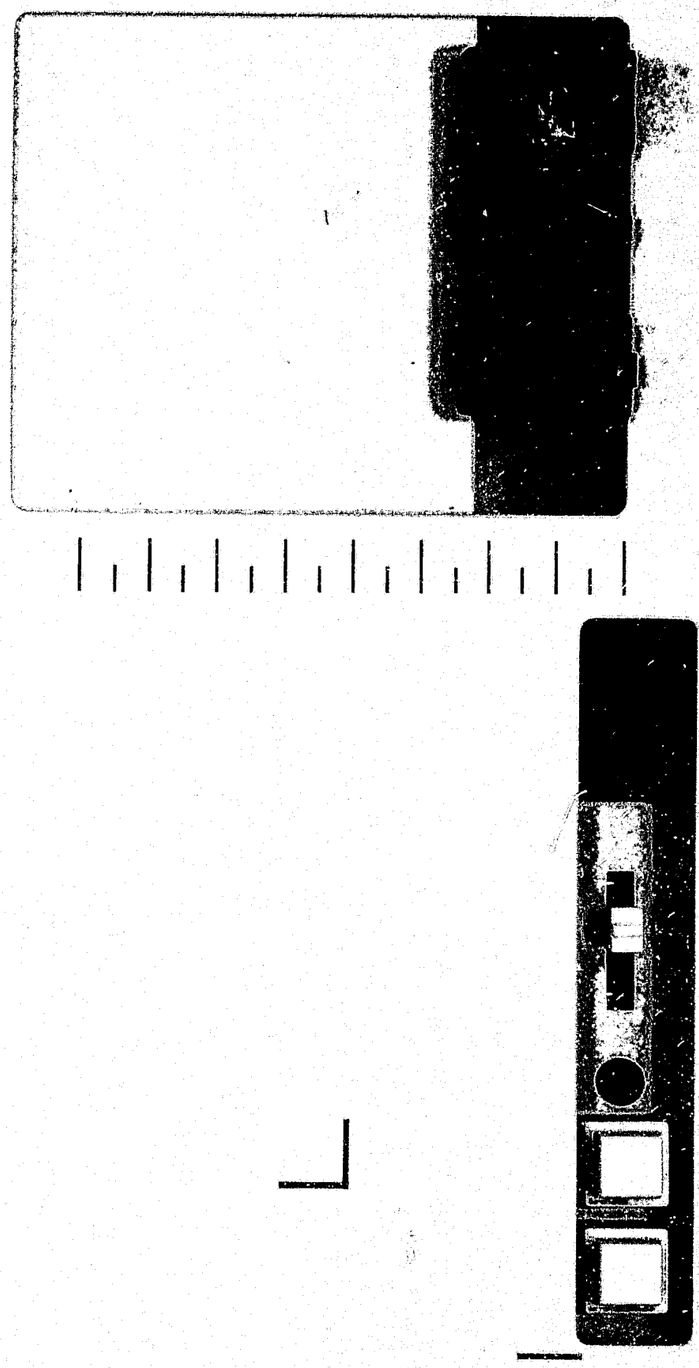
2 @ 185 L.F. = 370
2 @ 250 L.F. = 500
1 @ 90 L.F. = 90
960 L.F.

METHOD

DRIVE RAISE WITH ALIMAK.
BLAST HOLES AT 3 S.F./HOLE
PLUS 1 BURN AND 3 RELIEF
HOLES = 30 HOLES
DRILL 10 L.F. & PULL 8 L.F.
960
8 = 120 ROUNDS

RAISE CYCLE

LOAD TROLLEY & CLIMBER (3 MEN)	10 MINUTES
TRAVEL TO FACE = 96 FT. @ 40 FT/MIN	3 "
SCALE LOOSE MATERIAL & HOOK-UP	60 "
INSTALL GUIDE RAIL & VENT PIPE	60 "
SURVEY - CHECK ON DIRECTION	10 "
DRILL ROUND - 2 DRILLS - 30 HOLES - 5 MIN./HOLE	75 "
EXPLOSIVES BROUGHT UP BY THIRD MAN	5 "
LOAD HOLES - 30 @ 8/M.H. - (3 MEN)	75 "
TRAVEL TO BOTTOM - SAME AS TO FACE	3 "
PARK UNIT & BLAST	15 "
SMOKE	30 "
	346 MINUTES
	60 = 5.77 HOURS



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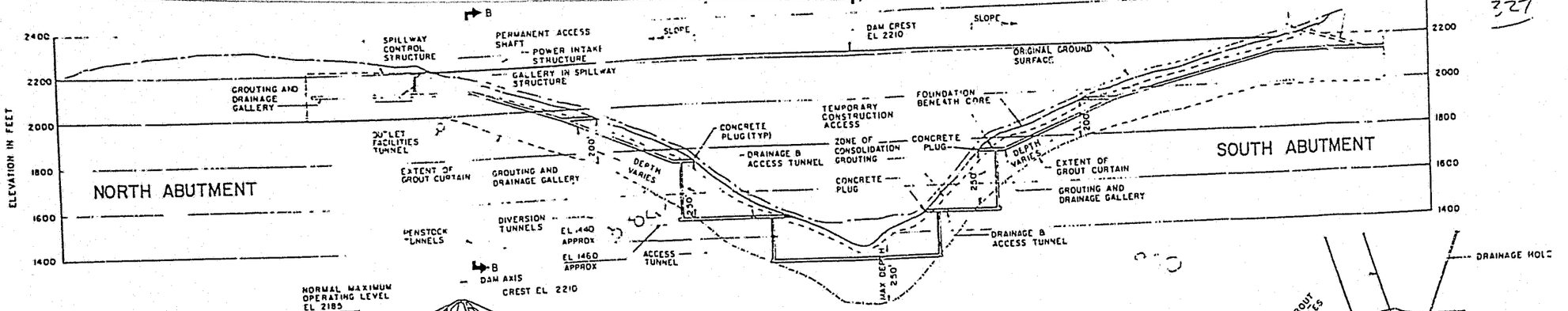
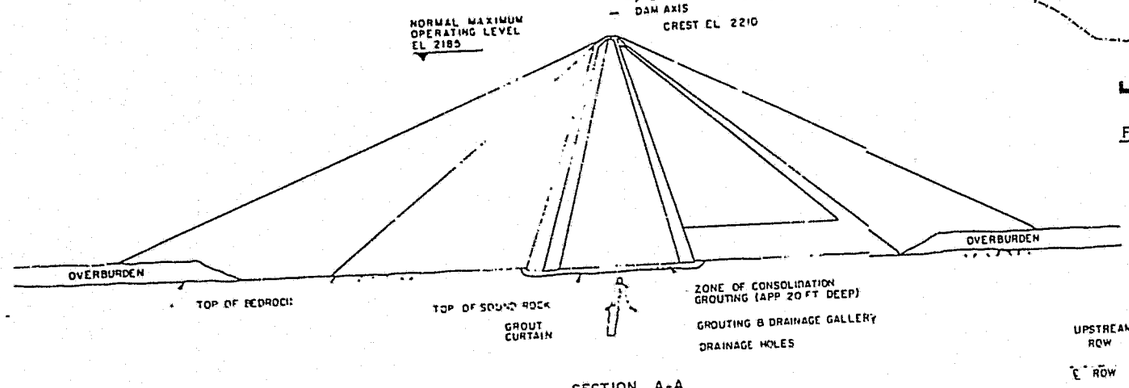
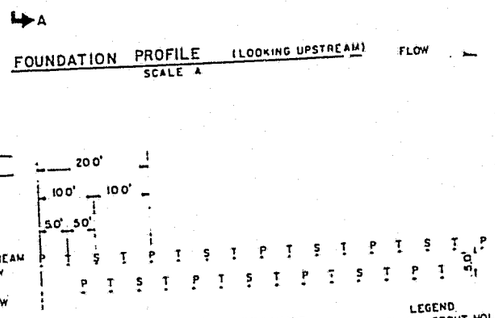




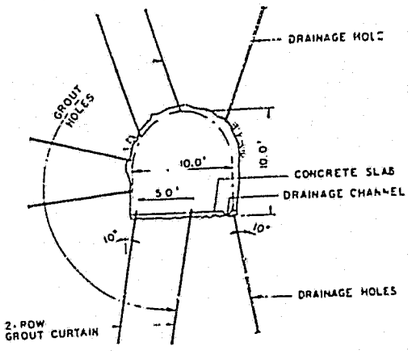
SECTION A-A
SCALE A



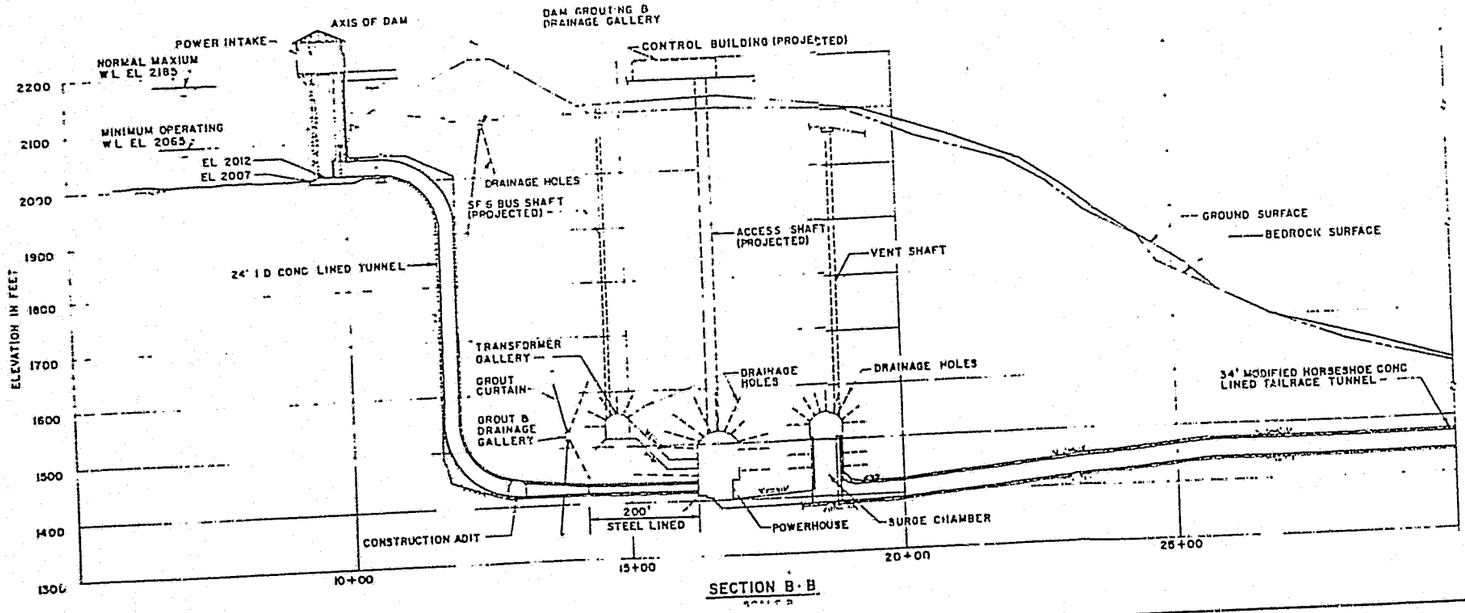
FOUNDATION PROFILE (LOOKING UPSTREAM)
SCALE A

GROUT HOLE SPACING
SCALE C

LEGEND
P = PRIMARY GROUT HOLE
S = SECONDARY GROUT HOLE
T = TERTIARY GROUT HOLE



DETAIL - GROUTING & DRAINAGE GALLERY
SCALE D



SECTION B-B

SCALE D 0 5 10 FEET (1 INCH = 5 FEET)
SCALE C 0 10 20 FEET (1 INCH = 10 FEET)
SCALE B 0 100 200 FEET (1 INCH = 100 FEET)
SCALE A 0 200 400 FEET (1 INCH = 200 FEET)

HARZA-EBASCO	ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT	
WATANA MAIN DAM GROUTING & DRAINAGE	
EXHIBIT F	PLATE F8R

OPERATION ITEM NO. SHEET 3 OF PAGE 328

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

MUCKING

2.91 CU.YDS / L.F.

USE 5T 4A SCOOP TRAINS

HAUL DISTANCE = 1150 L.F.

CYCLE TIME

LOAD	0.50	MINUTES
HAUL @ 5 M.P.H.	2.01	"
DUMP & TURN	1.00	"
RETURN @ 7.5 M.P.H.	1.74	"
	5.85	MINUTES

50 MINUTE HOUR

5.85 MIN. / CYCLE = 8.55 CYCLES @ 3.5 C.Y. / CYCLE = 30 CU. YDS / HOUR

$2.91 (8)(1.45) = \frac{34}{30} = 1.13$ HOURS

329

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location WATANA
Description GALLERY RAISE 10' Ø

Date
Dr. Ch.
Ref.

CYCLES

1. Drill In & Out	5.77
2. Load & Shoot	—
3. Smoke Time	—
4. Muck Time	1.13
5. Supports (average time/rd.)	—
6. Services (average time/rd.)	—
Sub Total Hrs. Per Round	6.90
Lost Time @ 10 %	.69
Total Hours Per Round/Cycle	7.59
Crew Hours Worked Per Day	20
Rounds Per Day	2.64
Peak L. F. Per Day	21.12

PRODUCTION	L. F.	L. F. /Day	W/Days
SETUP			5
	960	21.12	46
Total Work Days			51
Total L. F.			960
Ave. L. F. Per Day			18.82

0 0 2 4 9

330

DIVERSIFIED ENGINEERS & CONSTRUCTORS, INC.
9 No. Royal Avenue
Eagle Point, Oregon

ENGINEERING COMPUTATIONS

Company ALASKA POWER AUTHORITY
Location WATANA
Description GALLERY RAISE 10'ϕ

Date .....
Dr ..... Ch .....
Ref .....

Rate Per/Hr	Labor Classification	Shift 1	Shift 2	Shift 3	Total Men/Req'd	Total Cost/Hr.
36.67	SHIFTER	1	1		2	73.34
35.56	RAISE MINER	2	2		4	142.24
34.84	" TENDER	1	1		2	69.68
31.28	GROUNDMAN	1	1		2	62.56
38.80	MUCKER OPERATOR	1	1		2	77.60
35.95	POWDERMAN	1	1		2	71.90
41.58	ELECTRICIAN	1	0		1	41.58
35.97	DOZER OPERATOR	1	1		2	71.94
31.28	DUMPMAN	1	1		2	62.56
	Total	10	9		19	673.40

Cost Per/Day	6734.00
Cost Per M/Hr. Average	35.44
Cost Per M/Day Average	354.42
Total L. F. Or Cu. Yds.	960
Production	18.82
Total Days Required	51
Total Cost - No. Days X Cost/Day	343434.00
Cost Per/L. F.	357.74
Cost Per/Cu. Yd.	
Total Man Days	969
Total Man Hours	9690

DIVERSIFIED CONSTRUCTORS, INC.

OPERATION ITEM NO. SHEET 6 OF PAGE 331

JOB

QUANTITY UNIT EST. BY CK'D. BY DATE

FORM 2

	QUANTITY	UNIT	TOTAL
SUPPLIES			
DRILL STEEL	36000 LF.	0.20	7200
EXPLOSIVES 2794 C.Y. @ 4.5# / CU.YD.	12573 LB.	1.50	18860
DETONATORS 3600 (1.05 LOSS)	3780 EA.	1.00	3780
AIR & WATER LINE	960 LF.	12.00	11520
FAN LINE	960 LF.	20.00	19200
LIGHT & ELECTRIC LINE	960 LF	5.00	4800
FOUL WEATHER GEAR	9690 M.H.	2.50	24225
			89585
			93.32
SUPPORTS @ ALLOW 2.423 / CU.YD. OF ROCK EXCAVATION			
2794 CU.YDS.			67699
			70.52