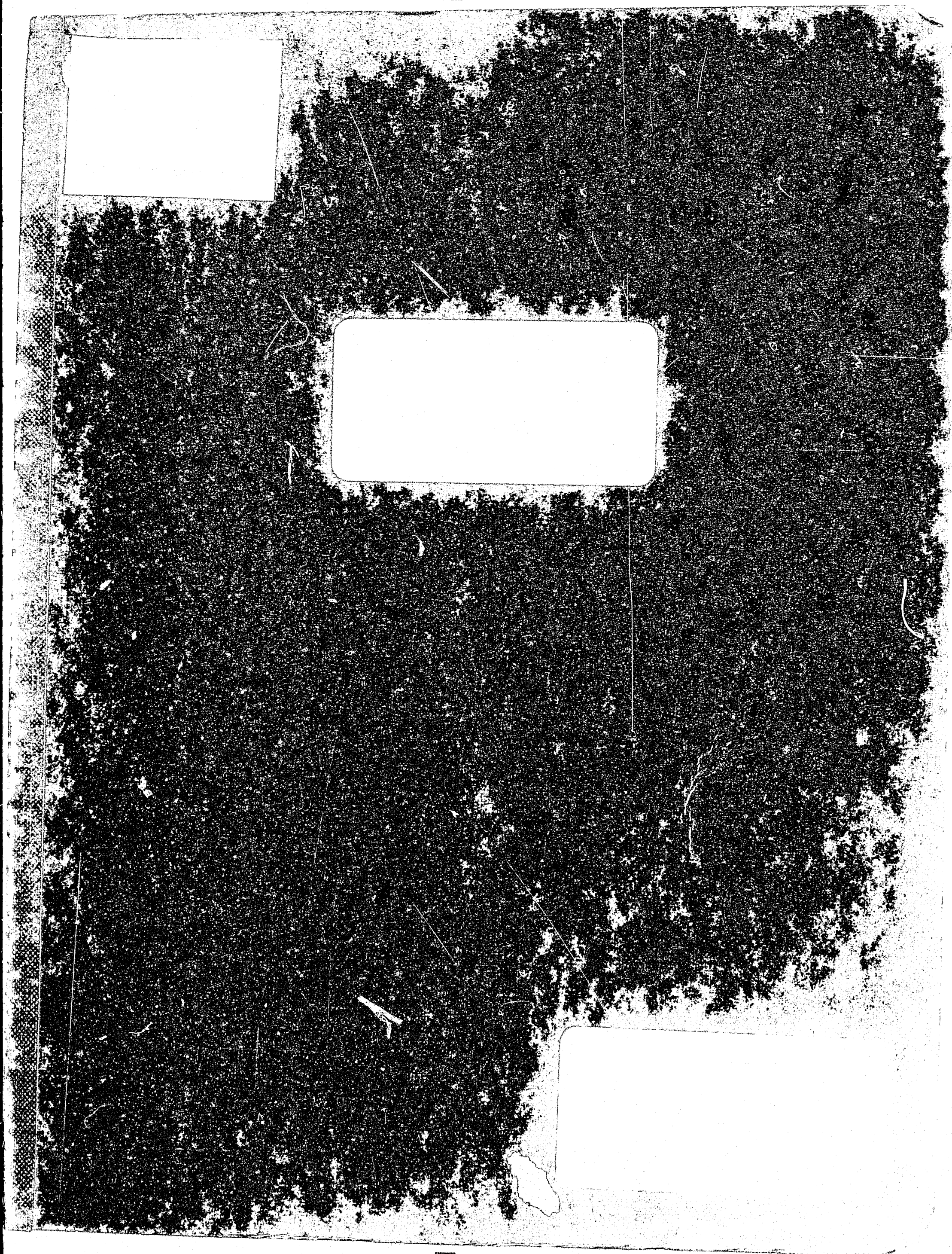


0000259



BACKUP BOOK S
SUSITNA HEP - ESTIMATE REVISIONS

Task 9 - Case 2

BOOK S

SUSITNA HEP - P5700 59/79
ESTIMATE REVISIONS
FEASIBILITY STUDY TO
FIRST DRAFT - FERC APPLIC.

(S)

UNIT PRICES - BACKUP CALCULATIONS

ESTIMATE REVISIONS

FEASIBILITY STUDY TO FIRST DRAFT F.E.R.C. APPLICATION

Estimate Price Changes

Manday Calculations

Watana/Devil Canyon Cash Flows

Access Road Changes

Additional Rail Head Facilities

NOTE:

1. Quantities are included in Quantity Files.
2. Final computer Cash Flows are included with Final Summary & Detail Estimates

000259

NO. 47, 518. DATA SHEET, GENERAL PURPOSE.

IN STOCK DIRECT FROM CODEX BOOK CO. NORWOOD, MASS. 01906

Estimate/
Costs

(S) Feasibility Study to First Draft FERC Application
Estimate Price Changes



Calculations

SUBJECT: ADJUSTMENTS TO COST ESTIMATES 1 MARCH 1982

JOB NUMBER P5700.57
FILE NUMBER _____
SHEET 1 OF _____
BY R. H. Lang DATE 10-27-82
APP _____ DATE _____

WATANA

- Increase Labor Unit Costs 4% for Underground Work other than Diversion & Up & Downstream Cofferdams
This will adjust the labor cost from 2-9 hour shifts/day, 6 days/week to 2-10 hr shifts/day 6 days/week.
 - Increase Labor Unit Costs ^{28%} for Diversion Tunnel excavation as indicated on 1 March 82 computer printout.
Crew sizes changed and increased shifts from 9 hours/day 6 days/week to 2-12 hour shift/day 7 days/week
 - Increase Labor Unit Cost for Diversion Tunnel (other than excavation) 18%
This will adjust the labor cost from 2-9 hour shifts/day 6 days/week to 2-12 hour shift/day 7 days/week
 - Increase Labor Unit Cost for Diversion Tunnel Portal excavation, ^{and up & downstream cofferdams} as indicated on computer printout 1 March 82
Crew sizes changed and increased shifts from 2-10 hour shifts/day to 2-12 hour shift/day 7 days/week. = 13.5% increase
 - No change to Labor Unit Costs for work other than Diversion portals & cofferdams.
Labor already based on 2-10 hour shifts/day.
-
- MATERIAL Increase "All" Material Unit prices by factor 1.01844. This will adjust for Logistics increase of \$12,300,000.
 - EQUIPMENT Increase Underground Diversion Activities Ownership Cost 25% to allow for spare equipment and changing shift hours from 9 to 12 hours.

DEVIL CANYON

- Increase Labor Unit Costs 4% for "All" Underground work.
This will adjust labor cost from 2-9 hour shifts/day to 2-10 hour shifts/day.



Calculations

SUBJECT: LOGISTICS COSTS

JOB NUMBER	
FILE NUMBER	
SHEET	OF
BY <u>R. Lang</u>	DATE <u>10/26/82</u>
APP	DATE

Reference: R&M Consultants, Inc.
Access Planning Study Report Jan 1982
TABLE F-10.4 page F43

Reference: R&M Consultants Inc.
Supplement Access Planning Study Sept 1982
TABLE F10.4 page 44A

WATER \$134,388,000
Rail to Gold Creek 66,522,573
Rail to Confluence -
Rail to Devil Canyon 5,390,906
Truck to Watana 8,159,722

\$134,388,000
66,522,573
9,758,058
2,277,527
13,826,196

TOTALS \$214,461,201 in March 82 Estimate

\$226,772,354 Revised Total

$$\% \text{ Increase} = \frac{\$226,772,354}{214,461,201} = 1.057 = 5.7\% \text{ Increase for Watana Logistics Cost}$$

$$\text{Amount of Increase for Watana Job of Permanent Materials Cost} = \$226,772,354 - 214,461,201 = \$12,311,153$$

from March 82 Estimate (Watana)

Job Materials	\$232,450,000
Perm Materials	435,064,000
Addition Logistics Costs	\$667,514,000
	12,311,153
	\$679,825,153

$$\text{Factor to Adjust April 82 Estimate for Job of Perm. Materials Unit Costs} = \frac{\$679,825,153}{667,514,000} = \underline{\underline{1.01844}}$$



Calculations

SUBJECT: WATANA - DIVERSION TUNNEL

EXCAVATION ADJUSTMENTS.

ADJUSTMENTS DUE TO INCREASING FROM 9 HOUR TO 12 HOUR SHIFT

JOB NUMBER P5700.59

FILE NUMBER

SHEET 1 OF 2

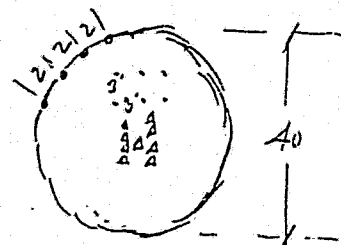
BY R. J. King DATE 6.23.88

APP R. BEAL DATE 6.24.88

Reference: Book C page 33 for previous cost information

Changes in estimating assumptions

- Drill production rates increased from 1.1 to 2.2 ft./min.
- Increased heading advance to 60% of diameter
OR 40' ϕ x .60 = 24 ft. drill = 23 ft. pull.
- Reduced crew sizes since crews will not have a second area to work
- Assume drill & blast by drill crew on 1st shift
- Muck, rock bolt, services, etc. on 2nd shift



Full Face EXCAV.

$$\text{AREA } .7854 \times 40^2 = 1257 \text{ sf}$$

$$\text{VOLUME } 1257 \times 23' \text{ pull} / 27 = 1070.5 \text{ cu yd} / \text{ROUND}$$

$$1070.5 \times 1.25 = 1338 \text{ Loose cu yd} / \text{ROUND}$$

$$\text{PERIMETER HOLES} = 40 \times \pi / 2 = 62 \text{ Holes}$$

$$\text{PATTERN HOLES } 40 - 2(3) = 34^2 \times .7854 / 9 = 101$$

BURN HOLES

$$172 \text{ HOLES} \times 2.4 \text{ ft} = 4128 \text{ ft.}$$

$$\text{USING } 2 \text{ Boom Jumbos @ } 2.2 \text{ ft/min} \times 50 \text{ min/hr.} = 880 \text{ ft/hr.}$$

$$4128 \text{ ft} \div 880 \text{ ft/hr.} = 4.7 \text{ Hours Drill}$$

$$1.0 \text{ Hours Set up Drill}$$

$$172 \times 5 \text{ min/hole} = 860 \text{ min}$$

$$860 \div 50 \text{ min/hr.} = 17.2 \text{ hrs.}$$

$$17.2 \text{ hrs} \div 4 \text{ men loading } 4.3$$

$$\text{BLAST \& VENTILATE } 1.0 \text{ Hours}$$

$$11.0 \text{ Hours} \approx \text{Say } 12 \text{ hr. shift}$$

$$\text{LABOR UNIT COST} = \$17.45 / \text{cu yd}$$

$$\text{PREVIOUS} = 13.59 / \text{cu yd}$$

$$\text{DIFFERENCE } \$3.86 / \text{cu yd} =$$

28% increase

Haul Cycle 2 MILES

$$\text{Load} = 3.5 \text{ min}$$

$$\text{Travel loaded} = 6.5 \text{ min } 20 \text{ MPH (1760 fpm)}$$

$$\text{Dump} = 2.0 \text{ min}$$

$$\text{Return} = 4.8 \text{ min } 25 \text{ MPH (2200 fpm)}$$

$$\text{Spot} = 3.0 \text{ min}$$

$$19.3 \text{ min/cycle}$$

$$19.3 \text{ min} / 6.5 \text{ min/load} = 2.97 \approx 3 \text{ Trucks Reg'd.}$$

$$\text{Muck } \frac{1338 \text{ cu yd}}{20 \text{ cu yd/trk.}} = 67 \text{ loads} \times 6.5 \text{ min/load} = 435.5 \text{ min}$$

$$435.5 \text{ min} \div 50 \text{ min/hr.} = 8.7 \text{ Hours} \approx 12 \text{ hr. shift}$$

$$\text{Bull Gang \& Service Crew (same)} \approx 12 \text{ hr. shift}$$

LABOR DRILL & BLAST

1 Foreman/Production 33.15

2 Jumbo Oper (32.43) 64.88

4 Drillers (32.08) 128.32

4 Chuck Tender (31.43) 125.72

2 Drill Doctors (31.43) 62.86

2 Comp Oper (33.62) 67.24

1 Trk. Dr. 32.15

16 men 514.30

LABOR SUMMARY

DRILL & BLAST 514.30

MUCK 238.98

Bull Gang 194.46

SER. CREW 252.14

\$1199.88

Undergrad. + 10%

119.98

1319.86

Shift increase +18%

\$1557.32

X 12 HRS 18,687.84

÷ 1070.5 cu yd

= 17.45 / cu yd

MUCK

1 Foreman 34.30

3 Trk Dr. (33.90) 101.70

2 Oper. (36.22) 72.44

1 Flagman 30.56

238.98

Bull Gang

Foreman from Mucking

4 laborers (30.54) 122.16

1 Rigger 37.80

1 Cherry Pick Oper 34.41

194.46

SER. CREW foreman 45.33

1 pipe fit. 44.33

2 helpers (40.79) 81.58

1 Elect. 40.45

1 Elect. help. 40.45

252.14



Calculations

SUBJECT: DIVERSION TUNNEL

JOB NUMBER P5700.57
 FILE NUMBER _____
 SHEET 2 OF 2
 BY R. J. [signature] DATE 6-23-82
 LAPP R. B. [signature] DATE 2-4-1982

EQUIPMENT

DRILL & BLAST { 2 - 4800 LUMBO'S (215) 430'
 2 - 1000 cfm compr. (45) 90'
 2 - Bit Grinders (10)³ 20'
 1 Pickup 4x4 25'

$$565' \times \text{Say } 6 \text{ Hrs} = 3390'$$

BLAST { 1 EXPLO LOADER 41'
 1 PANEL TRK 25'
 1 PICK UP 4x4 25'

$$91' \times \text{Say } 6 \text{ Hrs} = 546' \div 1070' = \underline{\underline{\$3.68/\$}}$$

MUCK { 3 - R50 TRUCKS (140) 420'
 1 FEL EIMU 87'
 1 DOZER D-7 85'
 1 PICK UP 25'

$$617' \times 12 \text{ Hrs} = 7404' \div 1070' = \underline{\underline{\$6.91/\$}}$$

BULL GANG & SERVICE CREW { 2 - PICK UP (25) 30'
 1 - CHERRY PICKER 60'
 1 - F.O. TRUCK 25'

$$135' \times 12 \text{ Hrs} = 1620' \div 1070' = \underline{\underline{\$1.51/\$}}$$

$$\begin{array}{r} 12.10 \\ 3.02 \\ \hline 15.12 \end{array} + 25\% \text{ allowance for 24 hr/day and increase in repair costs}$$

$$+ 13.14/\$ \text{ previous Unit Cost.}$$

$$\underline{\underline{\$1.98}} = 15.0\% \text{ difference } \approx \text{ Say } 15\%$$

MATERIAL — NO CHANGE FROM PREVIOUS ESTIMATE $\underline{\underline{\$5.50/\$}}$



Calculations

SUBJECT:

SCHEDULE ACTIVITY DURATION CHANGES
AS A RESULT OF CHANGING LENGTH OF SHIFTS

JOB NUMBER _____
FILE NUMBER _____
SHEET _____ OF _____
BY Elany DATE _____
APP _____ DATE _____

Underground Work (Not Including Diversion) change from 2-9 hr shifts/day to 2-10 hr shifts/day
$$= \frac{18 \text{ hrs/day}}{20 \text{ hrs/day}} = \underline{90\%} \text{ of 9 hr shift duration - Assume Same Productivity}$$

Underground Work (Diversion) change from 2-9 hr shifts/day 6 days/week to 2-12 hr shifts/day 7 days/week

$$\frac{18 \text{ hrs/Day}}{24 \text{ hrs/Day}} = \frac{17 \text{ hrs Worked/day} \times 6 \text{ Days} = 102 \text{ hrs/week}}{21 \text{ hrs Worked/day} \times 7 \text{ Days} = 147 \text{ hrs/week}} = .694 \approx \underline{70\%} \text{ of 9 hr shift duration}$$

Surface Work Main Dam Rock Excav. Below Elev. 1470 change from 2-10 hr shifts/day 6 days/week to 2-12 hr shifts/day 7 days/week

$$\frac{20 \text{ hrs/Day}}{24 \text{ hrs/Day}} = \frac{19 \text{ hrs Worked/Day} \times 6 \text{ Days} = 114 \text{ hrs/week}}{21 \text{ hrs Worked/Day} \times 7 \text{ Days} = 147 \text{ hrs/week}} = .775 \approx 78\% \text{ of 10 hr shift duration}$$



Calculations

SUBJECT: SUSITNA

LABOR RATE ADJUSTMENTS REQUIRED
DUE TO WORKING 2-12 hour shifts
7 Days per week

JOB NUMBER _____
FILE NUMBER _____
SHEET _____ OF _____
BY R. Long DATE 10-22-82
APP _____ DATE _____

LABOR RATE ADJUSTMENTS

Due to maintaining the construction schedule completion date for the Diversion Tunnel it will be necessary to work 2-12 hour shifts per day 7 days per week or 84 hours worked per man week.

It is assumed that all hours over 40 will be at the premium rate as follows:

40 hours (straight time) = 40 hours
28 hours (time & a half) = 42 hours
16 hours (double time (12 hrs Sunday & 4 hrs Sat.)) = 32 hours

84 hours worked 114 hours pay

$\frac{114 \text{ pay}}{84 \text{ worked}} = 1.357 \approx 36\% \text{ overtime allowance}$

TRAVEL ALLOWANCE

The estimating assumption used is that after every three weeks worked, the employee will have one week off without pay and the contractor will pay for the travel expenses and 4 hours pay.

Therefore, 52 weeks/year - 12 weeks off/year = 40 weeks worked
and 40 weeks X 84 hours worked/week = 3360 hours/year

Allowing for 12 Round trips @ 8 hours pay each = 96 hours

$\frac{96 \text{ hours}}{3360 \text{ hours}} = .027 = 2.7\%$

ADJUSTED RATES (Reference Labor Section in Estimate Back up)

A. OVERTIME	36.0%
B. TWO SHIFT ALLOWANCE	3.0%
C. LABOR BURDENS	
• WORKMANS COMPENSATION	9.60%
• STATE UNEMPLOYMENT	4.45
• FEDERAL UNEMPLOYMENT	.70
• LIABILITY INSURANCE	2.00
• SOCIAL SECURITY INS.	6.70
• HOLIDAY PAY	1.60
• TRAVEL ALLOWANCE	2.70
	27.75% $\approx$ 28.0%

The overtime and two shift allowance (39.0%) is a percentage markup to the base rate and that sum is adjusted by the labor burden (28.0%) to which the Fringe Benefits are added resulting in an average hourly rate.

Ex. $(\text{Base Rate} \times 1.39)(1.28) + \text{Fringe Benefits} = \text{Adjusted Rate}$
 $= (\text{Base Rate} \times 1.779) + \text{Fringe Benefits} = \text{Adjusted Rate}$

The labor adjustment factor to be used for activities being performed in 2-12 hour shift schedule is based on the following:

Base Laborer Rate = \$20.25 X 1.779 + \$5.20 Fringe = \$41.22
 Previous Adjusted Laborer Rate 18 hrs/day = 35.03
 \$ 6.19

percent/factor change = $\frac{6.19}{35.03} = .177 \approx 18\%$ 10



Calculations

SUBJECT:

JOB NUMBER _____
FILE NUMBER _____
SHEET _____ OF _____
BY R. Long DATE 10/2/82
APP _____ DATE _____

EQUIPMENT RATE ADJUSTMENT

Due to the accelerated construction schedule it is assumed that an increase in spare/standby equipment will be required to allow for equipment downtime for routine maintenance and breakdowns.

An allowance of 25% for the Equipment Ownership Cost only should be included for the accelerated construction schedule.

Since the current estimate (March '82) has allowed 45% Ownership and 55% Operating cost the revised equipment cost, total adjustment should be an increase of 11% based on the following:

Ownership Cost	45%	+ 25% increase	=	56%
Operating Cost	55%	—	=	55%
	100%			111%

$$111\% - 100\% = 11\% \text{ increase}$$

Revise % breakdown = Say Own = 50%
Open = 50%
100%



Calculations

SUBJECT: DIVERSION TUNNEL

JOB NUMBER _____
FILE NUMBER _____
SHEET _____ OF _____
BY R. Lang DATE 10-22-82
APP _____ DATE _____

40' ϕ tunnel

CYCLES

Drill, load & blast $\approx$ 12 hours

Muck & Services $\approx$ 12 hours

24 hours

PRODUCTION = $1070.5 \text{ CY} \div 24 \text{ hrs} = 44.6 \text{ CY/Hour}$

QUANTITIES & DURATION

LOWER TUNNEL Exc. (Includes Plug excav) $208,700 \text{ CY} \div 44.6 \text{ CY/hr} = 4679 \text{ hrs} \div 24 \frac{\text{hr}}{\text{day}} = 195 \text{ days} \div 7 \frac{\text{day}}{\text{week}} \approx 28 \text{ WEEKS}$

UPPER TUNNEL Exc. $221,000 \text{ CY} \div 44.6 = 4955 \text{ hrs} \div 24 = 207 \text{ days} \div 7 \approx 30 \text{ WEEKS}$

DOWNSTREAM PORTAL $148,000 \text{ CY} = 8 \text{ WEEKS}$

UPSTREAM PORTAL $140,950 \text{ CY} = 8 \text{ WEEKS}$



Calculations

SUBJECT: PORTAL EXCAVATION
DIVERSION TUNNEL

2-12 hr shifts/day x 7 days/week

JOB NUMBER _____
FILE NUMBER _____
SHEET _____ OF _____
BY R. King DATE 10-22-82
APP _____ DATE _____

Downstream Portal 148,000 cu ft to be excavated in 8 Weeks
productive
8 Weeks x 7 days/Week = 56 Days x 21 Hrs/day = 1176 Hrs

$$\frac{148,000 \text{ cu ft}}{1176 \text{ Hrs}} = 125.8 \approx \underline{126 \text{ cu ft/Hour}} \text{ Avg. Required Production Rate}$$

Assume that drill crews can continue drilling during muck operations

Excavation Volume/Round - Drill 23 ft & Pull 20' x 21' x 50' long = 27,777.8 cu ft
x 1.30 Swell = 1011 cu ft

Production Drilling 1/2 ft/min/drill x 6 Drills = 3 ft/min.

Allow 7x7 ft. drill pattern w/ 2 ft. c.c. line drilling at face

Drilling Requirements (7x7 spacing) 3 Rows x 7 / Row = 21 holes
line drilling 50' ÷ 2 ft. c.c. (40') = 10 holes
31 holes

31 holes x 23 ft depth = 713 LF ÷ 3 ft/min = 238 min.

238 min ÷ 50 min/hr = 4.76 Hrs. = Say 2 Cycles per 12 hr shift

OR $\frac{777.8 \times 2 \text{ Rds}}{12 \text{ hr. shift}} = \underline{130 \text{ cu ft/Hr}} \text{ Avg. \& within Avg Req'd. of } 126 \text{ cu ft/Hour}$

Blast 31 holes x 10 min/hole = 310 min ÷ 50 min/hr = 6.2 hrs
w/ 2 men = 3.1 hrs = 3 Hrs = 2 Rds/shift same as drilling
130 cu ft/Hr

Muck/SCALE/HAUL 4.0 min to spot & load = 20 cu ft/trk.

$\frac{1011 \text{ cu ft}}{20 \text{ cu ft/trk}} = 51 \text{ Loads} \times 4.0 \text{ min} = 204 \text{ min.} \div 50 \frac{\text{min}}{\text{hr}} = 4.08 \text{ hrs.}$
Blast & Move Allow 1 hr.
Say 5.0 hrs.

Say 2 cycles/shift

Truck Requirements $\frac{50 \text{ min/hr}}{4 \text{ min/load}} = 12.5 \text{ loads/hr.}$

2 mile haul = 20 min = 3 Trips/Hr/trk

12.5 Loads/hr. ÷ 3 loads/trk = 4 Trucks Req'd.

LABOR

DRILLING 1 fireman 33.23
6 Drills (32.08) 192.48
3 Helpers (31.43) 94.29
1 Drill Doc 31.43
2 Equip. Oper. (34.29) 68.58
\$420.01/hr. + 18% = \$495.61/hr.
 $(\$495.61/\text{hr.} + 18\%) \div 130 \text{ cu ft/hr.} = \underline{\$3.81/\text{cu ft}}$

BLAST 1 Powderman 32.43
2 helpers (31.75) 63.50
\$65.93/hr.
 $(\$65.93/\text{hr.} + 18\%) \div 130 \text{ cu ft} = \underline{\$0.60/\text{cu ft}}$

MUCK DG Oper 35.10
FEL Oper 36.96
4 Trk Dr. (25.58) 102.32
1 Lab 30.54
1/2 Backhoe (35.10) 17.55
\$260.61
 $(\$260.61/\text{hr.} + 18\%) \div 130 \text{ cu ft} = \underline{\$2.36/\text{cu ft}}$

MATERIALS

Explosives 777.8 cu ft x 2.2 x 1.5 = \$2567
Fused Cord 3.00 x 31 holes = 93
Bits, etc. (Say .50/LF x 713 ft.) = 214
Acc. 15% exp. 385
Delays 13 x 1.75 = 23

$\$3282 \div 777.8 \text{ cu ft} = \underline{\$4.22/\text{cu ft}}$

SUMMARY

	LABOR	MATL	EQUIP.	TOTAL
DRILL	\$3.81		\$2.86	
BLAST	.60	4.22	.56	
MUCK	2.36		8.14	
	\$6.77	\$4.22	\$11.56	\$22.55

OWN 5.78
OPER. 5.78

EQUIPMENT

6 Air Tracs (\$28.50) \$171.00
3 -100 Comp. (45.00) 135.00
Grinder 10.00
pickup 20.00
\$336.00/11 hr.
 $\$336 \times 1.11 = \$373.00 \div 130 \text{ cu ft/hr.} = \underline{\$2.86/\text{cu ft}}$

Expl. Loader \$41.00
Truck 25.00
\$66.00
 $\$66 \times 1.11 = \$73.26 \div 130 \text{ cu ft/hr.} = \underline{\$0.56/\text{cu ft}}$

DG \$175.00
FEL 185.00
4 (RSO Trks) (140) 560.00
1/2 Backhoe (66) 33.00
\$953.00
 $\$953 \times 1.11 = \$1058.00 \div 130 = \underline{\$8.14/\text{cu ft}}$



Calculations

SUBJECT: SUSITUA

LABOR RATE ADJUSTMENT

2-10 hour shifts from
2-9 hour shifts
6 days/WEEK

JOB NUMBER _____
FILE NUMBER _____
SHEET _____ OF _____
BY R. J. King DATE 10/25/82
APP _____ DATE _____

For All Underground Work (except Diversion Tunnels)

40 hours (straight time) = 40 hours
18 hours (time & half) = 27
2 hours (double time) = 4

60 hours worked = 71 hours paid.

$\frac{71 \text{ paid}}{60 \text{ worked}} = 1.183 = 18.3\% \text{ premium pay.}$

No change in travel assumptions (same as 6-9 hour days)

Adjusted Rates

A Overtime 18.3% > 21.3%
B Shift Allow 3.0%
C Labor Burdens 27.0% - 27.0%

$(\text{Base Rate} \times 1.213) + (\text{Fringe Benefits}) = \text{Adjusted Rate}$
 $= (\text{Base Rate} \times 1.54) + \text{Fringe Benefits} = \text{Adjusted Rate}$

Use Laborer Rate $\$20.25 \times 1.54 + \$5.20 = \$36.39$
previous Adjusted Rate for 9 hour day = $\frac{35.03}{\$1.36}$

percent factor change $\frac{\$1.36}{\$35.03} = .0388 \approx \text{say } \underline{\underline{4.0\% \text{ increase}}}$

~~Additional Equipment Ownership Costs~~

~~Previous Equipment Cost Assumptions for~~

~~$2 - 12 \text{ hr shifts per day} \times 7 \text{ days/week} = 168 \text{ hrs} = 125\%$
of ownership cost for
 $2 - 9 \text{ hr shifts per day} \times 6 \text{ days/week} = 108 \text{ hrs} = 100\%$
 $60 \text{ hrs} = 25\%$~~

~~Since 60 hours increases the equipment ownership costs 25% or .417% per hour~~

~~Working 2-10 hour shifts per day
6 days per week will increase
the ownership cost.~~

~~$(2 \times 10 \times 6) - (108 \text{ hrs}) = 12 \text{ hours}$~~

~~$12 \text{ hours} \times (.417\%) = \underline{\underline{5.0\% \text{ increase for ownership costs.}}}$~~



Calculations

SUBJECT:

DRAFT APPROX. FINAL COST w/ ADJUSTMENTS
(\$1,000)

JOB NUMBER _____
FILE NUMBER _____
SHEET _____ OF _____
BY _____ DATE _____
APP _____ DATE _____

	CACOR	LIC MATLS	PERM. MATLS	SUB CONT.	Equip Own	Equip Oper.	Total	Factor	NEW TOTAL	△
WATANA	709,912	232,450	435,064	59,260	323,057	385,455	2,145,107	1.29	2,759,025	
f=1.29	915,786				416,743					
Contingency 1.175	1,076,049				489,673					
Engring 1.125	1,210,555				550,882					
Additions Approx (4%)	48,422				5% 27,544					
DEVIL CANYON	315,086	102,308	225,344	22,050	79,282	96,588	840,658	1.33	1,119,684	
f=1.33	419,064				105,445					
Contingency 1.175	492,400				123,898					
Engring 1.125	553,951				139,305					
Additions 4%	4% 22,158				5% 5,575					



Calculations

SUBJECT: JUSITNA

LABOR RATE ADJUSTMENT

from 2-10 Hour Shifts/Day 6 days/week
to 2-12 Hour Shifts/Day 7 days/week

JOB NUMBER	
FILE NUMBER	
SHEET	OF
BY <u>R. Lang</u>	DATE <u>10/28/82</u>
APP	DATE

2-12 Hour Shifts/day / 7 day week

40 hours (straight time)	40 hours
28 hours (time & half)	42
16 hours (double time)	32
<u>84 hours worked</u>	<u>114 hours paid</u>

ADJUSTED RATE

A - OVERTIME 36%
B - TWO SHIFTS 3%
C - LABOR BURDENS 28%

$$\text{(Base Rate} \times 1.39) (1.28) + \text{Fringes} = \text{Adjusted Rate}$$

$$\text{Use laborer Base } (20.25 \times 1.39 \times 1.28) + 5.20 = \$41.22$$

$$\frac{114 \text{ hours paid}}{84 \text{ hours worked}} = 1.357 \approx \underline{36\%} \text{ overtime allowance}$$

2-10 Hour Shifts/day / 6 day week

40 hours (straight time)	40 hours
18 hours (time & half)	27
2 hours (double time)	4
<u>60 hours worked</u>	<u>71 hours paid</u>

ADJUSTED RATE

A. OVERTIME 18%
B TWO SHIFTS 3%
C LABOR BURDENS 27%

$$\text{(Base Rate} \times 1.21) (1.27) + \text{Fringes} = \text{Adjusted Rate}$$

$$\text{Use laborer Base } (20.25 \times 1.21 \times 1.27) + 5.20 = \$36.31$$

$$\frac{71 \text{ hours paid}}{60 \text{ hours worked}} = 1.183 \approx \underline{18\%} \text{ over time allowance}$$

$$\frac{\$41.22 \text{ Adjusted 2-12 hr shift/7 day week rate}}{36.31 \text{ 2-10 hr shift/6 day week}} = 1.135 = \text{say } \underline{13.5\%} \text{ increase.}$$

0000259

(S) Feasibility Study to First Draft FERC Application
Manday Calculations

12

11/4/82

GROSS ^{check of} MANDAYS

LABOR \$000

WATANA RUN C

\$ 708 704 DIRECT

ADD 8% FOR STAFF

56 696

ONSITE

INDIRECTS (613,196) X .4 245 784

TOTAL LABOR 1 011 184

÷ 342

= 2 956 000 MANDAYS

CARRYING 2,970,000 :

170,000

3,140,000

DEVIL CANYON RUN B

\$ 324,422 DIRECT

ADD 8% FOR STAFF

25 953

INDIRECTS (310 223) (.4) = 124 089

TOTAL LABOR 474 464

÷ 342

1 387.300 MANDAYS

CARRYING 67 500

1 490 000

1 557 500

Calculations

SUBJECT: *D/C Mandays*

JOB NUMBER _____

FILE NUMBER

SHEET 2 OF 2

BY CPD DATE 11/9/8

APP _____ DATE _____

a- Total

342. —

less trans line

- 28

3/4

6 - Repair Labor (200-5) 15%

29

c - Add Sup'y (310) 35%

109

d - Mat: / -

10

e- Vendors Inc

2

~~472~~ 470

2- Eng'r/owner (1,203) 5%

60

532

Agencies etc - 4%

21

~~555~~ 551

Man-days $553 \div 342 =$

1618 ~ 1620

1610

In-Access Rd etc.

70

1550

1540

INPUT TO (B) 4E



Calculations

SUBJECT: WATANA

Re WAPCOST DAT 13

JOB NUMBER	
FILE NUMBER	
SHEET	OF
BY <u>DM</u>	DATE <u>11/3/8</u>
APP	DATE

TOTAL LABOUR COST See ~~Run off~~

1 - CONTRACTORS

a - Total Site Labour	711.7 less 122.3 38.4	TRANS ACCESS	551.0 581 x 10 ⁶
b - Add Equip Repair Labour			90 95 x 10 ⁶
	TOTAL LESS TRANS ACCESS	OWN 319.1 OPER 381.1 11.2 14.0 36.8 36.1	676 x 10 ⁶ 641
.15 OF TOTAL			192
c - Supervy Lab	3056 271.1	331.0	→ 602.1 x .15
d - Repair on c.	10 ⁶		19 20 x 10 ⁶
e - Add for transport costs	5% of 419 x 10 ⁶		21 25 x 10 ⁶
f - Vendors, etc --		2%	873 18 17
			942 x 10 ⁶

2 - ENG. / OWNER

Eng ~ 4% of 2,815 x 10 ³	2736	}	= 123 127 x 10 ⁶
Owner - 0.5% "			

TOTAL M-DAYS 1013 1069 x 10⁶ ÷ 342 = 3159 x 10³

2962 x 10³

USE 2965 Mandays

TRANSPORT COST

WATANA

OM 11/3/92

JOB MAT 219.0
PERM 442.8

TRANS LINE 239.6
ACCESS ROAD 7.1
OWNER PLANT +5.0
BLOK CREDIT - 9.1
418.6



Calculations

SUBJECT: *Review of
Mandays*

JOB NUMBER _____
FILE NUMBER _____
SHEET _____ OF _____
BY _____ DATE _____
APP _____ DATE _____

*Previous Work based upon 9 hour days @ \$33/hr
= \$297/labor*

*Going to 10 hours use 4% additional
re R.L. 10/27/82*

or \$34.22 or \$342.20 / DAY SAY \$342

USE SAME APPROACH JRP 2/24/82

See attached

WATANA

1 of -
Nov 3/82

Manday Estimate for Access Rd / Railhead

1) Acc't 336 - Access Rd / Railhead REM Part

Total Labor Acc't - - - 38,378 x 10³

less - - - 20,362

3,090

365

1122

230

→ - 25,169

Access Rd / Railhead Constr 13,209 x 10³

Average Labor Cost / day is -

10 hour ~ 35- / hr = 350.

No. Mandays $13,209,000 \div 350 = \underline{\underline{37,740}}$

Add for

TD
SAT 10%
OPERATION

Equip't Repair $3.7 \times 10^6 \div 350 = 10,637$

48,377

Add Supervising 33% = 15,964

64,341

Add Support Staff / Eng'r / Owner 3,217

5%

67,558

Say 68,000 ±

2 of
Nov 3/82

Railhead Storage Facilities

Direct Labor \$1430.7 x 10⁶

Equip't Repair 250.4

1,691.1

Supervision 33% 558.1

2249.2

Eng'r, Owner 5% 112.5

2361.7

Man-days 6,747 ~ 7,000

Total Man-Days for Access Facilities

Constn -

a. Road / Railhead 68,000 m-d

b. Storage Fac. 7,000 --

c. Camp Personnel (Support) 5,000

80,000 ✓ X

TRACT

DESCRIPTION

SHEET

OF

OPERATION No.

REF.

BY

DESCRIPTION

CKD

DATE _____

[illegible]

TRACT

DESCRIPTION

OPERATION No.

DESCRIPTION

REF.

JOB NO.

SHEET

OF

BY

CKD

DATE _____

DESCRIPTION AND BASIS OF ESTIMATE	QUANTITY	UNIT	LABOR		JOB MATERIALS		PERM. MATERIALS		SUBCONTRACTS		EQPT. OWNERSHIP		EQPT. OPERATION		DIRECT	
			UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	EQUIV UNIT	TOTAL
MAIN CAMP.																
WATER																
PUMPING STATION.																
1 Pump	1	No.	50 ^K	25%	20 ^K	10%	80 ^K	40%	-	20 ^K	10%	30 ^K	15%	-	20	
4 PIPES	4	No.	72.1 ^K	10%	540.75	75%	36.05 ^K	5%	-	36.05 ^K	5%	36.05 ^K	5%	-	2,8	
1 TANK	1	No.	20 ^K	20%	60 ^K	60%	-	-	-	5 ^K	5%	15 ^K	15%	-	103	
2 FUEL STORAGE TANKS	2	No.	40 ^K	20%	120 ^K	60%	-	-	-	10 ^K	5%	30 ^K	15%	-	400	
			438,400		2483000		224,200			189200		249200			3584	
ELECTRIC																
POWER AND LIGHT SECTION																
1 Radiator - 40x100'	1	NO		25%	1	10%	2	40%	-		10%		15%	-	20	
4 GENERATOR - 4NO @ 2.5MW	4	NO		10%	1	75%	2	5%	-		5%		5%	-	2,88	
1 DAY TANK - 20,000 GALL	1	NO		20%	15	75%	15	5%	-		5%		5%	-	100	
2 FUEL STORAGE - 400,000 GALL	2	NO.		20%	65	75%	65	5%	-		5%		5%	-	400	
ELECTRIC POWER																
1 Amp Power -	105,000															
- DIESEL GENERATOR	104896	MW/Hr		20%	70%		-	-		5%		5%		150	15,7	
1 Amp Power -	81,000	MW/Hr		20%	70%		-	-		5%		5%		150	12,1	
- DIESEL GENERATOR																
ELECTRIC POWER																
1 - DIESEL GENERATOR																

culations

CT: - DEVIL CANYON -

JOB NUMBER	
FILE NUMBER	
SHEET <u>1</u>	OF <u>1</u>
BY <u>JRP</u>	DATE <u>2/24/82</u>
APP	DATE

DEAPPCOST

LABOUR COST ~~227.7~~

Costs + Support

labour - computer sheets - 334×10^6

ct trans. line labour $\rightarrow - 28.6$

ACCESS $\rightarrow 22.3$

50.9

274 $\times 10^6$

284

Equip. Repair Labour

Equip. Ownership $\rightarrow 28.7$ 93.6

Operation 94.2 103.3

164.9 201.9

Trans line equip - 5.4 5.7

ACCESS 164.5 39.2

our Part 15% of 164.5 = 24×10^6

157.0

299 $\times 10^6$

308

Contractor's Supervisor Staff

30% of 299×10^6 = 92×10^6

Repair Pt of d.

10% of 90×10^6 = 9×10^6

for Transport, Handling part = 11×10^6

materials --- (See p.2)

409 $\times 10^6$

420

rs, Equip & Suppliers, etc whose

are part of mat'l, equip. 2%

Civil 10

48.4

8 = $\frac{16}{3}$



Calculations

SUBJECT:

JOB NUMBER

FILE NUMBER

SHEET

BY

APP

Material Cost - D/C

Job mat'ls	103	123.4
Perm "	<u>225</u>	<u>227.2</u>

Less Offsite Mat'l	ACCESS RD	18.6
- trans line	- 5.1	57.1
- comp bldg credit	+ 2.5	✓
- owner's - gen'l plant	- 5.0	✓

Assume transport pt 8% of 279 = 2
Assume labour pt 50% of 22 =

For Pk assume 5 yr - 8 mons or 200

Labour cost/day $\frac{11 \times 10^6}{5(200)} =$

Est'd labour $\frac{11,000}{297} =$

Civil 10
4 & 4

8 = $\frac{16}{3}$

ACRES

Estimate Work Sheet

ITEM REFERENCE No.

JOB No.

DESCRIPTION

SHEET OF

PROJECT

OPERATION No.

REF.

BY

CONTRACT

DESCRIPTION

CKD

DATE

DESCRIPTION AND BASIS OF ESTIMATE	QUANTITY	UNIT	LABOR		JOB MATERIALS		PERM. MATERIALS		SUBCONTRACTS		EQPT. OWNERSHIP		EQPT. OPERATION		DIRECT COST	
			UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	EQUIV UNIT	TOTAL AMOUNT
ACCT NO 336.0 RAILHEAD FACILITIES.																
- '22 - STORAGE AND HANDLING I. FACILITIES INSTALLATION	L.S.			430700 30%		238450 5%		30%	1430700	-		476900 10%		112250 25%	6199700	4,769,000 1.3
- '23 - OPERATION & MAINTENANCE OF FACILITIES.	L.S.			60%		5%		-	-	-		10%		25%	32724000	27,270,000 1.2
ACCT NO. 63.00 CAMP OPERATION																
• 32 - RAILHEAD CAMP FACILITIES BASED ON MAX 60 MAN AT PEAK.	90,000	H.DAY													43	3,870,000 1.4
																35,909,000

FOLD LENGTH

12

11

8.5

8

AUTO

MANUAL

FEED



Estimate Work Sheet

ITEM REFERENCE No.

DESCRIPTION

OPERATION No.

DESCRIPTION

REF.

JOB No.

SHEET OF

BY

CKD

DATE

PROJECT

CONTRACT

Mark-up

DESCRIPTION AND BASIS OF ESTIMATE

QUANTITY

UNIT

LABOR

JOB MATERIALS

PERM. MATERIALS

SUBCONTRACTS

EQPT. OWNERSHIP

EQPT. OPERATION

DIRECT COST

UNIT COST

AMOUNT

UNIT COST

AMOUNT

UNIT COST

AMOUNT

UNIT COST

AMOUNT

UNIT COST

AMOUNT

UNIT COST

AMOUNT

EQUIV UNIT

TOTAL AMOUNT

ACH. 63. MAIN CAMP.

1133 Electrical

STATION.

- Switching
- GENERATOR
- DAY TANK
- FUEL STORAGE TANK

1
4
1
2No.
No.
No.
No.50K
72.1K
20K
40K25%
10%
20%
20%20K
540.75
60K
720K10%
75%
60%
60%80K
36.05K
-
-40%
5%
-
-

-

-

20K
36.05K
5K
70K10%
5%
5%
5%30K
36.05K
15K
30K15%
5%
15%
15%

-

200,000
2,884,000
100,000
400,0001.3
1.4
1.3
1.3

438,400

2483,000

224,200

189,200

249,200

3,584,000

1234 - ELECTRICAL

GENERATOR SET

- Switching - 40X100'
- GENERATOR - 4NO @ 2.5MW
- DAY TANK - 20,000 GALL
- FUEL STORAGE - 400,000 GALL

1
4
1
2No.
No.
No.
No.25%
10%
20%
20%1
15
1510%
75%
75%7%
5%
5%40%
5%
5%

-

-

-

10%
5%
5%
5%

-

15%
5%
5%
5%

-

200,000
2,884,000
100,000
400,0001.3
1.4
1.3
1.3

ACH. 63.7 ELECTRIC POWER

CAMP POWER

117 - DIESEL GENERATOR

CONTINUOUS

173 - DIESEL GENERATOR

11000 DIESEL GALT - 1/2" x 1/2" x 1/2"

BASED ON 247 LWH.

105,000
104,896

KWH

20%

70%

-

-

5%

5%

-

-

-

5%

5%

150

15,734,400

1.3

31,000

KWH

20%

70%

-

-

5%

5%

-

-

-

5%

5%

150

12,150,000

1.3

35,750,000

28

Use previous split

FOLD LENGTH

12
11
8.5
8

AUTO

MANUAL

FEED

57.02.02 Form 131A

INPUT TO (B)

DM 11/3/82



Calculations

SUBJECT: - DEVIL CANYON -

JOB NUMBER _____

FILE NUMBER _____

SHEET 1 OF 1

BY VRP DATE 2/24/82

APP _____ DATE _____

DEAPPCOST

1- TOTAL LABOUR COST ~~Rs 4.75~~

1.1- Contractors + Support

a- Total labour - computer share - 302×10^6

5 - Deduct trans. line labour $\rightarrow$ - 28.6
ACCESS $\rightarrow$ - 22.3
50.9

- 30
~~28~~ $\times 106$
224 $\times 106$

c - Add Equip. Repair Labour

Equip. Ownership $\therefore 28.7$ 93.6

" Operation 942 103.3

169.9 201.9

Less Trans line equip - 5.4 5.7

ACCESS 164.5 39.2

Labour Part 15% of $\frac{164.5}{157.0} = \frac{28 \times 10^6}{299 \times 10^6}$

d-Add Contractor's Supervisor Staff

$$30\% \text{ of } 299 \times 10^6 = 90 \times 10^6$$

e - Add Repair Pt of d.

$$10\% \text{ of } 90 \times 10^6 = 9 \times 10^6$$

f- Add for Transport, Handling part of materials --- (See p. 2) = 11×10^6

~~409~~ $\times 10^6$

420

9 - Vendors, Equip't Suppliers, etc whose costs are part of mat'l, equip. $2\frac{1}{2}$

~~415~~ x 10⁶

(to p. 3)

428



Calculations

SUBJECT:

JOB NUMBER	_____
FILE NUMBER	_____
SHEET <u>2</u>	OF _____
BY _____	DATE _____
APP _____	DATE _____

Material Cost - D/C

Job mat'ls	403	123.4	
Perm "	<u>225</u>	<u>227.2</u>	350.6
			<u>328</u> $\times 10^6$
Less Offsite Mat'l / ACCESS RD		18.6	
- trans line	- 5.1	57.1	
- comp bldg credit	+ 2.5	-	
- owner's - gen'l plant	- 5.0	-	73.2

Assume transport pt 8% of 277.4 = 22×10^6

Assume labour pt 50% of 22 = 11×10^6

For Pk assume 5 yr - 8 mos or 200 days

Labour cost / day $\frac{11 \times 10^6}{5 (200)} = \$11,000/\text{day}$

Est'd labour $\frac{11,000}{297} = 37$

Civil 10
485.4
8 = $\frac{16}{3}$

ACRES

Calculations Devil Canyon

SUBJECT:

JOB NUMBER _____
 FILE NUMBER _____
 SHEET 3 OF _____
 BY _____ DATE _____
 APP _____ DATE _____

1.2 Eng'r, Owner

Total direct + indirect costs

1.222

1.094 x 10⁶

~~417~~ x 10⁶

428

Eng'n Cost - 5% ÷ 2 } 3% + 1
 Owner's " - 1% ÷ 2 }

= 36
~~33~~ x 10⁶
 12 #

1.3 Est'd Man-Days

487

a- On-Site labour

~~464~~ x 10⁶ ÷ ~~242~~

342

487

52
~~1575~~ x 10³
 1424

b- Adjustments

• Agencies 2%
 • Visitors 1% } 4%
 • Other 1%

2
 57.5 x 10³

1576 x 10³
~~1614~~

Say

1580 x 10³

1481

SAY

1490



Calculations

SUBJECT:

JOB NUMBER	_____
FILE NUMBER	_____
SHEET	_____ OF _____
BY	_____ DATE _____
APP	_____ DATE _____

DEVIL CANYON ACCESS ROAD/ RAILHEAD
CONSTRUCTION MANDAYS

Re 336

- Re WATANA CALCS.
NOV 3 82

\$ 600

TOTAL LABOR 22 257

less

const roads 7029

perm site roads 1225

213

airstrip NA

Access Rd/
Railhead 13 790

\$ 50/mar/day = 39 400 mandays

add equip
repair

$\$18,694,000 / 350 \times 10\% = 5342$ MANDAYS

44742

SUPER. 33%

SUPPORT

STAFF 5%

62 492 SAY 67500
MANDAYS



Calculations - MANPOWER LOADING - Rev. In Licence Application

SUBJECT:

JOB NUMBER P570079

FILE NUMBER

SHEET OF

BY JRP

DATE 11/9/82

APP DATE

<u>W</u>	<u>Peak</u> <u>CF</u>	<u>23</u> <u>Check</u>	<u>2/25/82</u> <u>Plot</u>	<u>Prev.</u> <u>CF</u>	<u>Rev.</u> <u>CF</u>		<u>Rev</u> <u>M-Power</u>
83	8.1	200	300	45.1	28.7	-36%	200
84	8.0	200	300	82.1	48.5	-41%	200
85	44.1	1000	1100	227.2	198.6	-12%	1000
86	55.3	1300	1400	294.0	282.7	-3%	1400
87	83	1900	1900	296.2	294.1		
88	90.2	2100	2500	348.3	367.4		
89	112.8	2600	2800	439.9	436.5		
90	135	3100	3500	616	624.9		
91	131	3000	3200	597	606.2		
92	121.8	2800	2500	431	427.2		
93	41.1	1000	1300	155	152.5		
94	17	400	600	75	73.4		
95			100				

Plot of 2/25/82 - See Book 'M'

<u>D/C</u>					
91			5		20
92			48		100
93			15		150
94		100	42		200
95		400	73		400
96		800	121		800
97		1300	210		1200
98		1600	292		
99		1700	287		
100		1500	255		
101		900	167		
102		100	18		

Note: Rev made only to front end base on relative change in annual cash flow.
No adjustment for changes of all work to 10 hr shift - Could have up to 5% affect.

(S) Feasibility Study To First Draft FERC Application
Watana/Devil Canyon Cash Flows



Calculations

SUBJECT:

COMPARISON
OF
CONTINGENCY
MARKUPS

JOB NUMBER 1570079
FILE NUMBER
SHEET OF
BY DATE 10/20/82
APP DATE

Present FERC

FEASIBILITY

X 1.175

BASE % CONT AMOUNT TOTAL

BASE

330	51000	20	10200	61200 -
331	72747	15	10912	83659 -
332	1531900	15	229785	1761685 -
333	64918	10	6492	71410 -
334	20986	10	2099	23085 -
335	13670	10	1367	15037 -
350	8260	20	1652	9912 -
352	11550	15	1733	13283 -
353	128658	15	19299	147957 -
354	129992	15	19499	149491 -
356	99447	15	14917	114364 -
359	13320	20	2664	15984 -
363	377736	15	56661	434397
399	<u>5000</u>	-	-	<u>5000</u> -

51000	59925
72747	85478
1531901	1799983
64918	76278
20986	24658
13670	16062
8260	9705
11550	13572
128658	151173
129992	152741
99447	116850
13320	15651
377737	443840
<u>5000</u>	<u>5875</u>

2529184 377280 2906464
1.149 0.65325
174972 20 34995 209967 -
2704155 462276
ENGR 1.125 3116431

2529186 442605 5875 2971791
229983 270231
2759169 442853 3242022

ROADS
REV. 536
FORM NO. 152
REV.

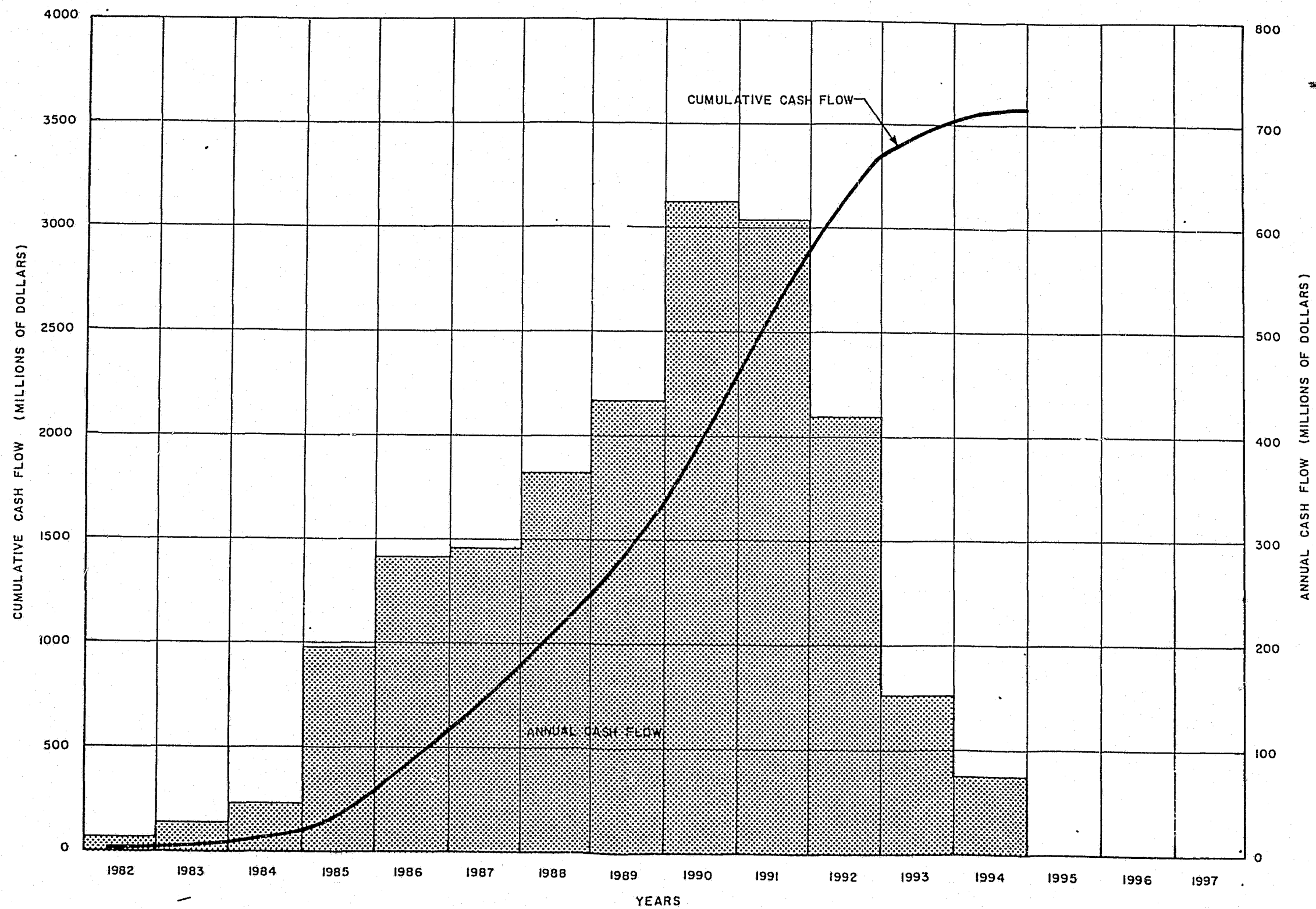
70 P 100015 R 11/8/82

TABLE D.6
 SUSITNA HYDROELECTRIC PROJECT
 Watana & Devil Canyon
Cumulative & Annual Cash Flow

JANUARY 1982 DOLLARS - IN MILLIONS

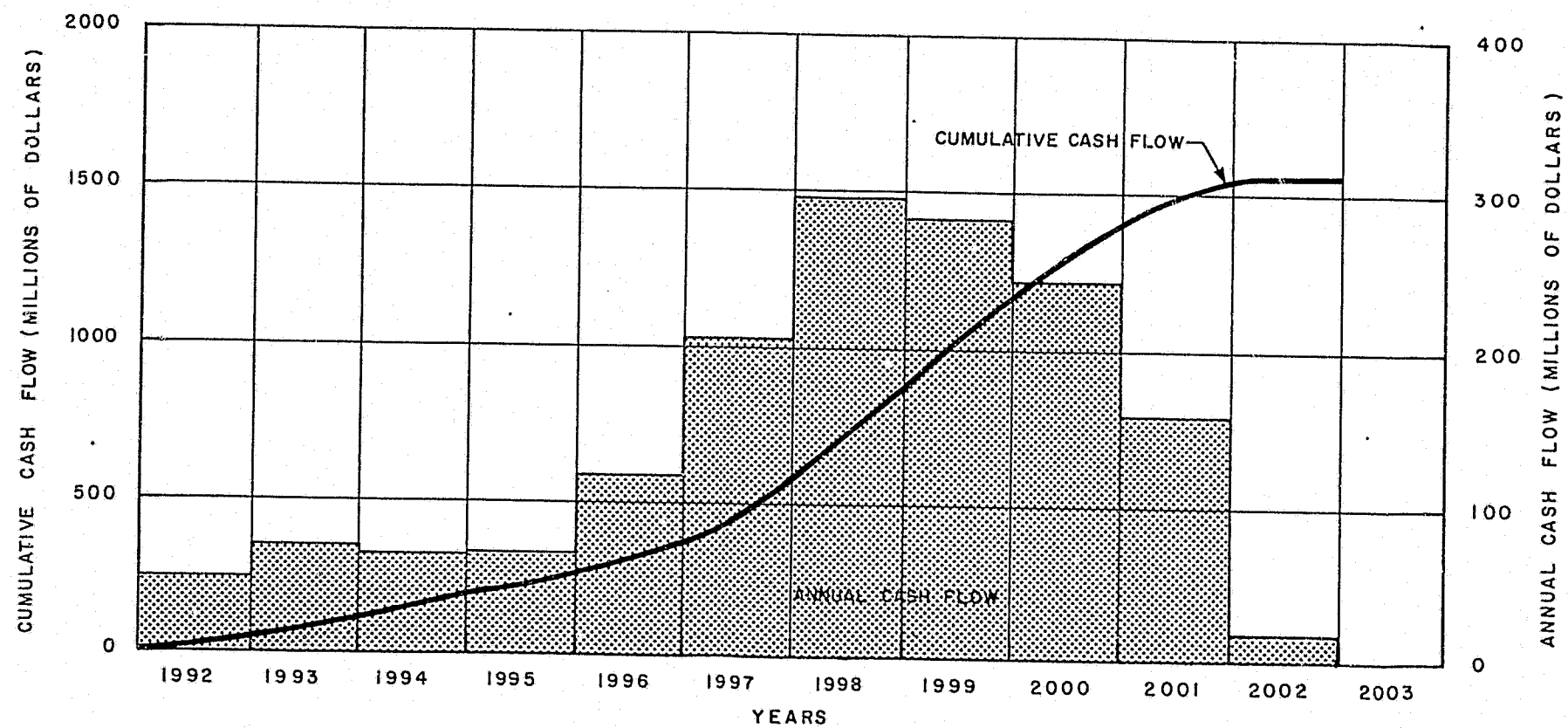
YEAR	ANNUAL CASH FLOW			CUMULATIVE CASH FLOW (TO END OF YEAR)		
	WATANA	DEVIL CANYON	COMBINED	WATANA	DEVIL CANYON	COMBINED
1981	27.6		27.6	27.6		27.6
82	12.9		12.9	40.5		40.5
83	28.7		28.7	69.2		69.2
84	48.5		48.5	117.7		117.7
85	198.6		198.6	316.3		316.3
86	282.7		282.7	599.0		599.0
87	294.1		294.1	893.1		893.1
88	357.4		367.4	1260.5		1260.5
89	436.5		436.5	1697.0		1697.0
90	624.9		624.9	2321.9		2321.9
91	606.2	4.9	611.1	2928.1	4.9	2933.0
92	427.2	48.1	475.3	3355.3	53.0	3408.3
93	152.5	68.9	221.4	3507.8	121.9	3629.7
94	73.4	64.6	138.0	3581.2	186.5	3757.7
95		65.2	65.2		251.7	3832.9
96		115.8	115.8		367.5	3948.7
97		204.2	204.2		571.7	4152.9
98		295.1	295.1		866.8	4448.0
99		281.0	281.0		1147.8	4729.0
2000		242.8	242.8		1390.6	4971.8
2001		156.7	156.7		1547.3	5128.5
2002		17.7	17.7		1565.0	5146.2
TOTAL	3581.2	1565.0	5146.2			

11/08/82, Revised Devil Canyon Cash Flow

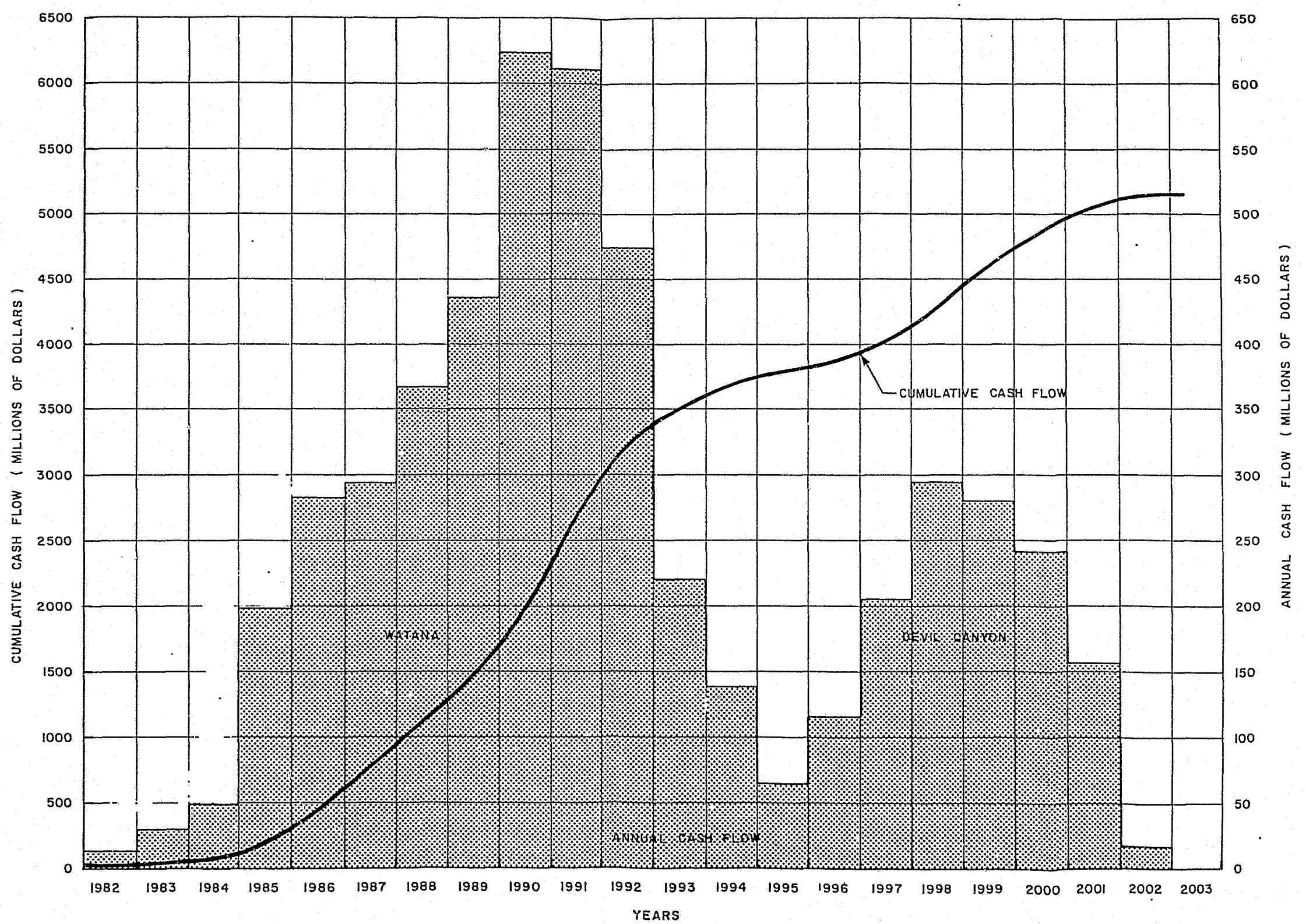


WATANA DEVELOPMENT
CUMULATIVE AND ANNUAL CASH FLOW
JANUARY, 1982 DOLLARS

FIGURE 16.1



DEVIL CANYON DEVELOPMENT
CUMULATIVE AND ANNUAL CASH FLOW
JANUARY, 1982 DOLLARS



SUSITNA HYDROELECTRIC PROJECT
CUMULATIVE & ANNUAL CASH FLOW ENTIRE PROJECT
JANUARY, 1982 DOLLARS

FIGURE 16.3



FOLD LENGTH
12
11
8.5
8
AUTO
MANUAL
FEED

WATANA DAT 21

FEI: LICENSE CASH FLOW WATANA 1000

DESCRIPTION	BASE AMOUNT	CONT. %	MARKED UP AMOUNT	81/82	83	84	85	86	87	88	89	90	91	92	93	94	95	COMMENTS
COMPUTER CASH FLOW	LIMITED INCLUDED IN TOTALS		2782105					129367	208321	227730	296090	356568	527680	511929	355158	116159	53098	
638 H&V CAP COST	2306	15%	2652				1324	1326										50/50 85 86
(A) SUBTOTAL		"	2784751				130693	209652	227730	296090	356568	527680	511929	355158	116159	53098		
ADDITIONAL ITEMS																		
636 CATER/SUPPORT	195559	15%	224893				10555	16931	18391	23912	28796	42615	41343	28682	9380	4288		
637 POWER	38295	15%	44039				2067	3315	3601	4683	5639	8345	8097	5616	1837	839		SPREAD IN PROPORTION TO (A)
336 OPER AIL HEAD	38721	20%	46709				2192	3517	3820	4966	5981	8851	8587	5957	1948	890		
638 H&V OPER.	10246	15%	11783				553	887	964	1253	1509	2232	2166	1503	491	225		
SUBTOTAL			3112181				146060	234302	254506	330904	398493	589723	572122	396916	129815	59340		
330 LAND	51000	20%	61200		6000	18000	18000	12000	7200									ASSUMED SPREAD
350 TRUNK LAND	8260	20%	9912							5112	4800							ASSUMED SPREAD
SUBTOTAL			3,183,293		6000	18000	164060	241302	261706	336016	403293	589723	572122	396916	129815	59340		
INCLUDING CONT.			3,183,300		6000	18000	164,100	241300	261700	336000	403300	589700	572100	396900	129800	59300		(Rounded)
ENGINEERING	25	37%	147200	246000 109000	17800	21600	16800	14800	10900	6900	4900	4900	3900	3900	3000	2300		SPREAD IN SAME PROPORTION AS CASH FLOW BY DATE 3/2/82
CONST MANAGEMENT		43%	171100		1900	4900	11700	14600	14600	17500	21400	23300	23300	19400	12700	5800		
OWNER		20%	79600	3000 2000	3000	4000	6000	7000	6900	7000	6900	7000	6900	7000	6900	6000		
Total			3581200	27600 12900	28700	48500	198600	282700	294100	367400	436500	624900	606200	427200	152500	73400		411
Cumulative			27600 105		69.2	117.7	316.3	599.0	893.1	1260.5	1697.0	2321.9	2928.1	3355.3	3507.8	3581.2		(\$ 000,000)

FERC LICENSE CASH FLOW DEVIL CANYON \$000

DAT 10

DESCRIPTION	BASE AMOUNT	CONT. %	MARKED UP AMOUNT	1991	1992	'93	'94	'95	'96	'97	'98	'99	2000	'01	'02	TOTAL	COMMENTS
COMPUTER CASH FLOW			1213439	✓	32863	43820	38831	38762	89163	164764	233667	221493	190328	152297	7456	1,213,439	
✓ 63.5 PERM TOWN	2140	15%	2461	✓	-	-	-	-	-	-	-	-	615	1231	615	2461	1/00 1/01 1/02
✓ 63.8 H4V CAPITAL COST	2465	15%	2835	✓	-	-	-	2835	-	-	-	-	-	-	-	2835	ALL 95
CONCRETE PLACEMENT ADJUSTMENT	more 24000 +15% ADJUSTMENT		X X X		-	-	-	-	-	-	9200	9200	9200	(27600)	-	-0-	
Ⓐ SUBTOTAL			1218735		32863	43820	38831	41597	89163	164764	242867	230293	200143	125928	8071	1,218,735	
63.6 CATERING/SUPPORT	103850	15%	119428		3220	4294	3805	4076	8737	16146	23799	22607	19613	12340	791	119,428	- PROPRATE BY Ⓐ
63.7 ELEC/OPER	15421	15%	17734		478	638	565	605	1297	2398	3534	3357	2912	1832	118	17,734	- PROPRATE BY Ⓐ
✓ 63.8 H4V OPERATION	7585	15%	8723	✓	235	314	278	298	638	1179	1738	1651	1433	901	58	8723	- PROPRATE Ⓐ
SUB TOTAL			1364620		36776	49066	43479	46576	99835	184487	271133	258308	224101	141001	9038	1,364,620	
✓ LAND	22050	20%	26460	✓	4410	8820	8820	4410								26460	
Ⓐ TOTAL			1391080	✓	41206	57886	52299	50986	99835	184487	271933	258308	224101	141001	9038	1,391,080	
ENGINEERING	12.5%	32%															
CONST MANAGEMENT		48%															
OWNER		20%															
			1564965														

ENGR/CM/ → 173885

OWNER

42

Rev 5ed 11/08/82 see additional sheet

Based UPON SPREAD 3/4/82 WAK

DEVIL CANYON

Revised cash flow 11/08/82

(ADJUST)
MOVE FUNDS
TO EARLIER
YEAR 1
PRORATE REMAINDER

		1000	MILLIONS													10 EARLIER YEAR 1 PROPRATE REMAINDER	
			91	92	93	94	95	96	97	98	99	2000	01	02			
(A)	DIRECTS/INDIRECTS w/ CONTINGENCY	1391080	1391.1	41206	57826	52299	50986	99835	184477	271933	258308	224101	141001	9038			
				41.2	57.9	52.3	51.0	99.8	184.5	272.0	258.3	224.1	141.0	9.0	1391.1		
1%	ENGINEERING	55644	55.6		7.3	8.5	8.5	7.4	5.7	5.3	4.8	2.7	2.7	2.7	55.6		
	ADJUST		(2.0)	(3.0)	6.6	7.7	7.7	6.7	5.2	4.8	4.4	2.5	2.5	2.5	✓	FACTOR	
																55.6-50 55.6 •91007	
6%	CONST/MGMT	83464	83.5		1.8	3.7	6.6	11.9	15.9	15.9	13.7	10.6	3.4		83.5		
	ADJUST		(1.0)	(1.5)	1.7	3.6	6.4	11.6	15.4	15.4	13.3	10.3	3.3			FACTOR	
																83.5-2.5 83.5 •97005	
25%	OWNER	34777	34.8		3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.3	34.8		
	ADJUST		2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9		SPREAD	
																34.8 12 = 2.9	
		1564965	1565.0	41.2	68.7	66.1	66.7	117.3	205.6	296.7	282.5	244.0	157.8	18.4	1565.0		
	TOTAL (ADJUSTED)		4.9	48.1	68.9	64.6	65.2	115.8	204.2	295.1	281.0	242.8	156.7	17.7	1565.0		
PREVIOUS (3/4/82) LINE (A) = 1315600																	
PRESENT LINE (A) = 1391080																	
∴ RATIO 1.05237																	
MULTIPLY ENGR/CM/OWNER COSTS ON 3/4 BY FACTOR																	
(ADJUST) MOVE ENGR/OWNER COST/CM TO 91 & 92 FOR ACCESS ROAD COSTS																	

FOLD
LENGTH

12

11

8.5

8

AUTO

MANUAL

FEED

Calculations

SUBJECT: SUSITNA
W AFLOW

CONVERSION For Computer CASH FLOWS

JOB NUMBER _____
FILE NUMBER _____
SHEET 1 OF _____
BY _____ DATE _____
APP _____ DATE _____

HEADINGS IN COMP.	ENTRY DATE PER. MON YR			REPRES. QTR.	ACT. START QTR.	QTR
JAN 1982	1	1	82	1	JAN 1982	1
FEB 82	1	2	82	2	APR 82	2
MAR 82	1	3	82	3	JUL 82	3
APR 82	1	4	82	4	OCT 82	4
MAY 82	1	5	82	1	JAN 83	5
JUNE 82	1	6	82	2	APR 83	6
JULY 82	1	7	82	3	JUL 83	7
AUG 82	1	8	82	4	OCT 83	8
SEPT 82	1	9	82	1	JAN 84	9
OCT 82	1	10	82	2	APR 84	10
NOV 82	1	11	82	3	JULY 84	11
DEC 82	1	12	82	4	OCT 84	12
JAN 83	1	1	83	1	JAN 85	13
FEB 83	1	2	83	2	APR 85	14
MAR 83	1	3	83	3	JULY 85	15
APR 83	1	4	83	4	OCT 85	16
MAY 83	1	5	83	1	JAN 86	17
JUNE 83	1	6	83	2	APR 86	18
JULY 83	1	7	83	3	JUL 86	19
AUG 83	1	8	83	4	OCT 86	20
SEPT 83	1	9	83	1	JAN 87	21
OCT 83	1	10	83	2	APR 87	22
NOV 83	1	11	83	3	JUL 87	23
DEC 83	1	12	83	4	OCT 87	24
JAN 84	1	1	84	1	JAN 88	25
FEB 84	1	2	84	2	APR 88	26
MAR 84	1	3	84	3	JUL 88	27
APR 84	1	4	84	4	OCT 88	28
MAY 84	1	5	84	1	JAN 89	29
JUNE 1984	1	6	84	2	APR 1989	30

WAT DAT 1

2

3

4

5

1ST

2ND

3RD

4TH

FOLD
LENGTH

12

11

8.5

8

AUTO

MANUA

FEED



Calculations

SUBJECT: SUSITNA
WAFLOW

CONVERSION FOR COMPUTER CASH FLOWS

JOB NUMBER _____
FILE NUMBER _____
SHEET 2 OF _____
BY _____ DATE _____
APP _____ DATE _____

HEADINGS IN COMP.	ENTRY DATE PER. MDN. YR.	REPRES QTR	ACT. START QTR	QTR
JUL 1984	1 7 84	3	JUL 1989	31
AUG	1 8 84	4	OCT 89	32
SEPT	1 9 84	1	JAN 90	33
OCT	1 10 84	2	APR 90	34
NOV	1 11 84	3	JUL 90	35
DEC	1 12 84	4	OCT 90	36
JAN	1 1 85	1	JAN 91	37
FEB	1 2 85	2	APR 91	38
MAR	1 3 85	3	JUL 91	39
APR	1 4 85	4	OCT 91	40
MAY	1 5 85	1	JAN 92	41
JUN	1 6 85	2	APR 92	42
JUL	1 7 85	3	JUL 92	43
AUG	1 8 85	4	OCT 92	44
SEPT	1 9 85	1	JAN 93	45
OCT	1 10 85	2	APR 93	46
NOV	1 11 85	3	JULY 93	47
DEC	1 12 85	4	OCT 93	48
JAN	1 1 86	1	JAN 94	49
FEB	1 2 86	2	APR 94	50
MAR	1 3 86	3	JUL 94	51
APR	1 4 86	4	OCT 94	52
MAY	1 5 86	1	JAN 95	53
JUN	1 6 86	2	APR 95	54
JUL	1 7 86	3	JUL 95	55
AUG	1 8 86	4	OCT 95	56
SEPT	1 9 86	1	JAN 96	57
OCT	1 10 86	2	APR 96	58
NOV	1 11 86	3	JUL 96	59
DEC 1986	1 12 86	4	OCT 1996	60



Calculations

SUBJECT: SUSITNA
WAFLOW

CONVERSION For Computer CASH FLOWS

DB NUMBER	
FILE NUMBER	
SHEET 3	OF
DATE	
DATE	

HEADINGS IN COMP	ENTRY DATE PER MON YR	REPRES QTR	ACT. START QTR	QTR
JAN 1987	1 1 87	1	JAN 1997	61
FEB	2	2	APR 97	62
MAR	3	3	JUL 97	63
APR	4	4	OCT 97	64
MAY	5	1	JAN 98	65
JUN	6	2	APR 98	66
JUL	7	3	JUL 98	67
AUG	8	4	OCT 98	68
SEPT	9	1	JAN 99	69
OCT	10	2	APR 99	70
NOV	11	3	JUL 99	71
DEC 87	12 87	4	OCT 1999	72
JAN 88	1 88	1	JAN 2000	73
FEB	2	2	APR 2000	74
MAR	3	3	JUL 2000	75
APR	4	4	OCT 2000	76
MAY	5	1	JAN 01	77
JUN	6	2	APR 01	78
JUL	7	3	JUL 01	79
AUG	8	4	OCT 01	80
SEPT	9	1	JAN 02	81
OCT	10	2	APR 02	82
NOV	11	3	JULY 02	83
DEC 88	12 88	4	OCT 02	84
JAN 89	1 89	1	JAN 03	85
FEB	2	2	APR 03	86
MAR	3	3	JUL 03	87
APR	4	4	OCT 2003	88
MAY	5	1		
JUN 1989	1 6 89	2		

(S) Feasibility Study to First Draft FERC Application
~~Ass~~ess Road Changes

Revision to Denali Hwy - Watana ROAD PLAN 18

(A) ADDITIONAL QUANTITIES
FOR REDUNDANT WORK DUE TO
FAST INITIAL ROAD

(B) ADDITIONAL LABOR COST DUE TO
ACCELERATED SCHEDULE ^{LABOR} 18% ON 24.8% TOTAL = 5.76
EQUIP 11% ON 49.2% COST = 5.41

COMPONENTS FROM →
336.122 IN
FEAS. REPORT

2 SHIFTS @ 10 hr @ 6 day TO
2 SHIFTS @ 12 hr @ 7 DAY

LABOR 18% 7-12 x 2 per RL 7/22/82
EQUIP 11% 6-10 x 2

(A)
ADDITIONAL
FOR "WASTED" WORK
DUE TO FAST
INITIAL ROAD

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
------	-------------	----------	-------	-------	--------

18.336 ROAD & RAIL FACILITIES

.1 Road Facilities

.15 Permanent Road

.155 Denali Highway to Watana, Road C-4, (42 Mile)

Clearing	748	AC	\$ 5,760.00	\$ 4,308,480.00	+ 102 AC	1 587,520
Waste Excavation	2,080,330	CY	4.80	9,985,584.00	+ 86,240 CY	413,952
Common Excavation	2,087,400	CY	4.20	8,767,080.00		
Rock Excavation	41,800	CY	14.40	601,920.00		
Borrow	0	CY	6.00	0.00		
NFS Subbase Material	435,560	CY	8.40	3,658,704.00	+ 177,400 CY	1 490 160
Grade "A" Base Material	237,660	CY	16.80	3,992,688.00		
D-1 Base Material	198,500	TON	21.60	4,287,600.00		
A.C. Surfacing	90,820	TON	79.20	7,192,944.00		
Guardrail	7,000	LF	43.20	302,400.00		
18" Culverts	26,350	LF	28.80	758,880.00	+ 3080 CY	88 704
36" + Culverts	1	LS	373,680.00	373,680.00	+ 7040 SY	21 120
Fabric	12,907	SY	3.00	38,721.00		
Thaw Pipes	28,750	LF	43.20	1,242,000.00		
Topsoil & Seed	490	AC	3,600.00	1,764,000.00		
Traffic Control Devices	42	MI	18,000.00	756,000.00		
Bridges	0	SF	180.00	0.00		

TOTAL 40 837 737
\$45,885,153.00

373 680
1.48 = 252 490

ADJUST FROM
FEASIBILITY

LABOR 1/24 66 840
JOB MAT 22/34 170 800
EQ OWN 1/34 17 425
EQ OPR 1/34 74 25

10/13/82 Maintenance

336 Mile-Years 9,000.00 \$3,024,000.00

ROAD TO BE UNPAVED - ∴ DELETE A.C. SURFACE
D-1 TO BE 4" INSTEAD OF 2" ∴ DOUBLE D-1
ALL OTHER WORK IS SAME

2.601 456 → 46 463 193

(B) LABOR 2 676 280
EQUIP 2 513 659
51 653 132 48



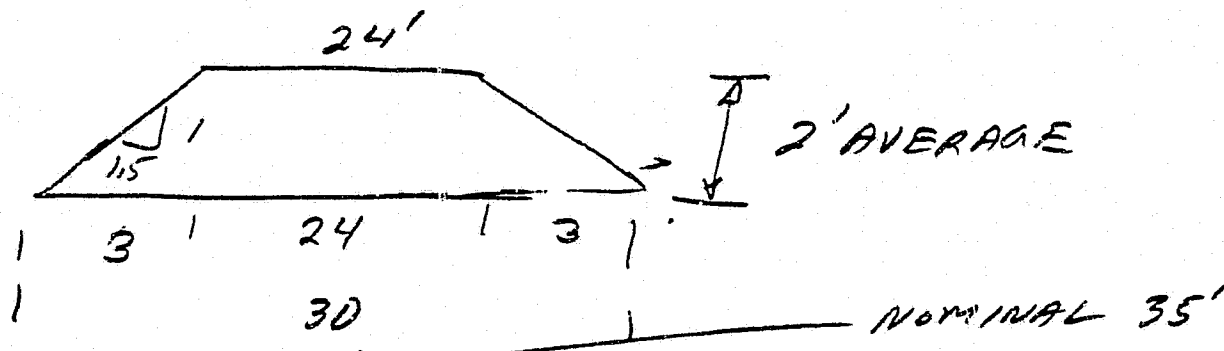
Calculations

SUBJECT:

JOB NUMBER _____
FILE NUMBER _____
SHEET _____ OF _____
BY _____ DATE _____
APP _____ DATE _____

EXTRA COSTS DUE TO FAST INITIAL ROAD

ROAD SAY 42 MILES



$$\text{END AREA} = \frac{1}{2} (30 + 24) \times 2 = 54 \text{ SF} \text{ END AREA}$$

FILL

$$\text{VOLUME} = 54 \text{ SF} \times 5280 \text{ MILE} \times 42 \text{ MI} \times \frac{1}{2} = 443500 \text{ CY}$$

$$\text{USE SUBBASE PRICE } \$8.40/\text{CY} = \$3725400$$

$$\text{FABRIC } 30 \text{ LF} \times 5280 \text{ MILE} \times \frac{1}{9} = 17600 \text{ SF}$$

$$@ \$3/\text{SF} = \$52800$$

$$\text{CULVERTS ALLOW } 1 @ 18" / 1000 \text{ LF}$$

$$\text{OR } 42 \text{ MILES} \times \frac{5280}{1000} \times 35 \text{ LF EACH} = 7700 \text{ LF}$$

$$@ \$28.80 = \$221760$$

EXCAVATION

SAY 1' DEPTH FOR
ROAD 3/4 LENGTH

$$\frac{3}{4} 1' \times 35 \text{ WIDE} \times 42 \text{ MI} \times 5280 \text{ MILE} \times \frac{1}{2} = 215600 \text{ CY}$$

$$@ \$4.80 = \$1034880$$



Calculations

SUBJECT:

JOB NUMBER _____
FILE NUMBER _____
SHEET _____ OF _____
BY _____ DATE _____
APP _____ DATE _____

CLEAR SAY 50' WIDE

$$50^{\text{LF}} \times 42^{\text{MI}} \times 5280^{\text{LF/MI}} \div 43560^{\text{SF/AC}} = 254 \text{ AC}$$

$$@ \$5760 = \textcircled{\$1463040}$$

TOTAL

6497888

SAY .4 IS "WASTED"

WORK

ADDED COST DUE TO
FAST INITIAL ROAD

$$\therefore = \$2,600,000$$

D.C.

(A)

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
18.336	<u>ROAD & RAIL FACILITIES</u>				
.16	Service Roads (Permanent)				
.164	Devil Canyon to Watana - North Road A-2 Mod*, (36 Mi)				
	Clearing	506	AC	\$ 5,760.00	\$2,914,560.00
	Waste Excavation	1,349,122	CY	4.80	6,475,785.60
	Common Excavation	1,408,366	CY	4.20	5,915,137.20
	Rock Excavation	146,527	CY	14.40	2,109,988.80
	Borrow	137,590	CY	6.00	825,540.00
	NFS Subbase Material	372,916	CY	8.40	3,132,494.40
	Grade "A" Base Material	203,478	CY	16.80	3,418,430.40
	D-1 Base Material	169,820 84,910	TON	21.60 3668112	1,834,055.00
	A.C. Surfacing	77,757	TON	79.20	6,158,354.40
	Guardrail	6,050	LF	43.20	261,360.00
	18" Culverts	23,040	LF	28.80	663,552.00
	36" + Culverts	-	LS	294,000.00	294,000.00
	Fabric	49,820	SY	3.00	149,460.00
	Thaw Pipes	24,435	LF	43.20	1,055,592.00
	Topsoil & Seed	286	AC	3,600.00	1,029,600.00
	Traffic Control Devices	36	MI	18,000.00	648,000.00
	Bridges	88,400	SF	180.00	15,912,000.00
					48,473,582
				TOTAL	\$52,797,910.80
	Maintenance	288	Mile-Years	10,000.00	\$2,880,000.00

Note: A-2 Mod. Includes A-2, high level x-ing to camp at Devil Canyon, and trans dam crossing at Watana.

D.C.

203 257

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
18.336	ROAD & RAIL FACILITIES				
	.2 Rail Facilities				
	.24 Permanent Railroad (Including Railheads)				
	.244 Gold Creek to Devil Canyon - Rail R-1, (14 MI)				
	Clearing	162	AC	\$ 5,760.00 ✓	\$ 933,120.00
	Waste Excavation	407,420	CY	4.80 ✓	1,955,616.00
	Common Excavation	798,405	CY	4.20 ✓	3,353,301.00
	Rock Excavation	2,200	CY	14.40 ✓	31,680.00
	Borrow	108,500	CY	6.00 ✓	651,000.00
	Subballast	171,634	CY	8.60 ✓	1,476,052.40
	Grade "A" Base Material	4,900	CY	16.80 ✓	82,320.00
	D-1 Base Material	2,400	TON	21.60 ✓	51,840.00
	A.C. Surfacing	2,200	TON	79.20 ✓	174,240.00
	Dock Lumber	16	MBF	580.00 ✓	9,280.00
	18" Culverts	4,850	LF	28.80 ✓	139,680.00
	36" + Culverts	1	LS	46,080.00 ✓	46,080.00
	Fabric	3,121	SY	3.00 ✓	9,363.00
	Thaw Pipes	10,100	LF	43.20 ✓	436,320.00
	Topsoil & Seed	104	AC	3,600.00 ✓	374,400.00
	Rail Yard Control Devices	1	LS	720.00	720.00
	Bridges	0	SF	360.00	0.00
	Trackage	98,975	LF	140.00 ✓	13,856,500.00
				TOTAL	\$23,581,512.40
	Maintenance				
	Rail	98	Mile-Years	5,000.00	\$490,000.00
	Railhead	7	Years	28,600.00	\$200,200.00

215

STOP

→

✓

52

(11)

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
18.336	ROAD & RAIL FACILITIES				
.18	Upgrade Existing Road				
.185	Denali Highway from Cantwell to New Road, Road C-2, (21 Mile)	$\times \frac{23}{21}$			
	Clearing	17	AC	\$ 5,760.00	\$ 97,920.00
	Waste Excavation	66,000 72,300	CY	4.80	316,800.00
	Common Excavation	264,000 287,000	CY	4.20	1,108,800.00
	Rock Excavation	0	CY	14.40	0.00
	Borrow	20,000 22,000	CY	6.00	120,000.00
	NFS Subbase Material	43,700 15,000	CY	8.40	115,080.00
	Grade "A" Base Material	51,024 55,900	CY	16.80	857,203.20
	D-1 Base Material	15334 58,604 64,200	TON	21.60	1,265,846.40
	A.C. Surfacing	53,689	TON	79.20	4,250,584.80
	Guardrail	3,000 3300	LF	43.20	129,600.00
	18" Culverts	4,000 4400	LF	28.80	115,200.00
	36" + Culverts	1	LS	55,560.00	55,560.00
	Fabric	0	SY	3.00	0.00
	Thaw Pipes	400 110	LF	43.20	4,320.00
	Topsoil & Seed	40 11	AC	3,600.00	36,000.00
	Traffic Control Devices	21 23	MI	18,000.00	378,000.00
	Bridges	1,700 1700	SF	180.00	306,000.00

USE 6 MILES ONLY
 $\frac{6}{21} (53669) = 15334$

① TOTAL w/o AC 4906329.60
TOTAL \$9,156,914.40
~~6,120,793~~
\$1,344,000.00

Maintenance
LAB 9/34 = 9940
JOB MAT 23/34 = 25400
EQ OWN 1/34 = 1100
EQ OPR 1/34 = 1100
468184 Mile-Years
8,000.00
PRORATE FROM FEASIBILITY
121

23
21 ①
5373599
1214453
6588052

55560
1.48
37540

(W)

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
18.336	<u>ROAD & RAIL FACILITIES</u>				
	.25 Railheads				
	.251 Railhead at Cantwell				
	Clearing	25	AC	\$ 5,760.00	\$144,000.00
	Waste Excavation	78,000	CY	4.80	374,400.00
	Common Excavation	505,000	CY	4.20	2,121,000.00
	Grade A Base	4,900	CY	16.80	82,320.00
	D-1 Base Material	2,400	CY	21.60	51,840.00
	A.C. Surfacing	2,200	TON	79.20	174,240.00
	Topsoil & Seed	15	AC	3,600.00	54,000.00
	Rail Yard Control Devices	1	LS	720.00	720.00
	Subballast	25,800	CY	8.60	221,880.00
	Trackage	19,700	LF	140.00	2,758,000.00
	Dock Lumber	16	MBF	580.00	9,280.00
				TOTAL	\$5,991,680.00
	Maintenance	8	Year	\$28,600.00	\$228,800.00

(S) Feasibility Study to First Draft FERC Application
Additional Rail Head Facilities

ACRES

Estimate Work Sheet

ITEM REFERENCE No.

JOB No.

DESCRIPTION

SHEET OF

PROJECT

OPERATION No.

REF.

BY

CONTRACT

DESCRIPTION

CKD

DATE

DESCRIPTION AND BASIS OF ESTIMATE	QUANTITY	UNIT	LABOR		JOB MATERIALS		PERM. MATERIALS		SUBCONTRACTS		EQPT. OWNERSHIP		EQPT. OPERATION		DIRECT COST	
			UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	EQUIV UNIT	TOTAL AMOUNT
ACT. 63. MAIN CAMP.																
123 ELECTRICAL GENERATING STATION.																
- BUILDING	1	NO.		25%		10%		40%	-			10%		15%		200,000
- GENERATOR	4	NO.		10%		75%		5%	-			5%		5%		2,884,000
- OIL TANK	1	NO.		20%		60%		-	-			5%		15%		100,000
- FUEL STORAGE TANK	2	NO.		20%		60%		-	-			5%		15%		400,000
1234 - ELECTRICAL GENERATING STATION.																
- BUILDING - 40x100'	1	NO.		25%		10%		40%	-			10%		15%		200,000
- GENERATOR - 4NO @ 2.5MW	4	NO.		10%		75%		5%	-			5%		5%		2,884,000
- OIL TANK - 20,000 GALL	1	NO.		20%		75%		5%	-			5%		5%		100,000
- FUEL STORAGE - 400,000 GALL	2	NO.		20%		75%		5%	-			5%		5%		400,000
ACT. 63.7 ELECTRIC POWER																
CAMP POWER																
72 - DIESEL GENERATION	104896	MW/Hr		20%		70%		-	-			5%		5%	150	15,734,400
CONSTRUCTION POWER																
73 - DIESEL GENERATION	81,000	MW/Hr		20%		70%		-	-			5%		5%	150	12,150,000
NOTE DIESEL G.F. = \$1.40/GALL																
BASED ON 24¢/KWH.																
DIRECT COST															-	35,052,400
INDIRECT COST															-	35,472,400
V/P = 0.17/KWH.															-	

Mark-up

FOLD LENGTH

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5702.02 Form 131A

ACRES

Estimate Work Sheet

ITEM REFERENCE No.

JOB No.

DESCRIPTION

SHEET OF

PROJECT

OPERATION No.

REF.

BY

CONTRACT

DESCRIPTION

CKD

DATE

DESCRIPTION AND BASIS OF ESTIMATE	QUANTITY	UNIT	LABOR		JOB MATERIALS		PERM. MATERIALS		SUBCONTRACTS		EQPT. OWNERSHIP		EQPT. OPERATION		DIRECT COST	
			UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	UNIT COST	AMOUNT	EQUIV UNIT	TOTAL AMOUNT
ACCT NO 336.0 RAILHEAD FACILITIES																
- '22 - STORAGE AND HANDLING 1. FACILITIES INSTALLATION	L.S.			30%		5%		30%	-			10%		25%		4,769.000 1.3
- '23 - OPERATION & MAINTENANCE OF FACILITIES.	L.S.			60%		5%		5%	-			10%		25%		27,270.000 1.2
ACCT NO. 63.00 CAMP OPERATION																
'33 - RAILHEAD CAMP FACILITIES BASED ON MAX 60 MAN AT PEAK.	90,000 120,000	M. DAY		-		-		-							43 60	3,870,000 7,200,000 1.4
RELIED BASED ON JIM PLUMBER ESTIMATE															DIRECT COST	\$ 35,900,000

58

57.02.02 Form 131A

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ACRES NFS

CEC RUSTON TOR

IS THIS AKERS DAVY MCKEE PLS?

0+
ACRES NFS

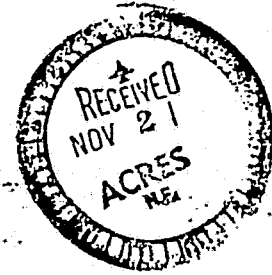
CEC RUSTON TOR

NOV 11 1982

RU 481

ATTN: PAUL SINCH

U R G E N T



RE: CONSTRUCTION POWER FOR ALASKAN HYDRO-ELECTRIC PROJECT
OUR REFERENCE: 83-625

FOR THE DUTY SPECIFIED WE OFFER EIGHT RUSTON 12RKC, 2520KW, 4162V, 900RPM DIESEL GENERATING SETS, ARRANGED FOR REMOTE OUTSIDE RADIATOR COOLING, COMPRESSED AIR-STARTING, SUPPLIED C/W ALL STATION ACCESSORIES INCLUDING SKV SWITCHGEAR, INTERCONNECTING PIPING, CABLE AND WIRING ASSUMING A COMPACT ARRANGEMENT

IN ADDITION TO ABOVE, WE INCLUDE ENGINE EXHAUST GAS HOT WATER HEATERS C/W CONTROLS FOR EACH ENGINE.

EXCET PRICE FOR TORONTO: 5,236,000 U.S. DLR\$

EXTRA COST FRT AND INSURANCE TO SITE: 212,000 U.S. DLR\$

PRESENT DAY EXTRA COST FOR LABOR TO INSTALL AND COMMISSION EIGHT UNITS AS OUTLINED ABOVE: 720,000 U.S. DLR\$

INSTALLATION COST IS BASED ON ASSUMPTION THAT CAMP ACCOMMODATION MEALS AND MEDICAL SERVICES WILL BE PROVIDED BY OTHERS.

WE CAN COMMENCE DELIVERY IN EIGHT MONTHS

WE WILL BE RESPONSIBLE FOR CO-ORDINATION ENGINEERING, TOTAL PACKAGE CONCEPT AND OVERALL EQUIPMENT PERFORMANCE INCLUDING HEAT RECOVERY AND FUEL CONSUMPTION

OUR EQUIPMENT WILL PROVIDE FLWG:

1. 17.5 KW-HRS IMP. CALL. FUEL
2. HEAT RECOVERY OF 4.83 MILLION BTU/HR AT FULL LOAD PER ENGINE FOR HOT WATER HEATING ASSUMING A MIN. STACK TEMP. OF 300 DEG F

WE TRUST ABOVE INFO IS SUFFICIENT FOR YOUR IMMEDIATE NEEDS. PLS ADVISE IF WE CAN ASSIST FURTHER

JEAFDS
P KENNINGTON

ACRES NFS

CEC RUSTON TOR

TLX NO. 26-967542

11/1/82

R. CHAMBERLAIN
INDICATED RAM
WILL SPLIT MANDAYS BY
END OF NOV. FOR
INCLUSION IN FINAL
ESTIMATE

PROPRATE BY \$ \$
FOR NOV

ITEM	DESCRIPTION	QUANTITY	UNITS	PRICE	AMOUNT
18.63	CAMP				
.12	Access Road/Railhead Camp			\$1,353,540.00	\$1,353,540.00
	Camp Facilities		LS		
	Catering & Operation Support	311,560	Manday	39.10	12,181,996.00
					\$13,535,536.00

INCLUDE PUMP FACILITY COST IN MANDAY COST
MANDAY COST = 43.44

FEASIBILITY {

LABOR	JOB MAT	EQUIP OWNER	EQUIP OPER	FACTOR
22	15	8.89	10.37	

= $\boxed{56.76}$ $\times 1.48 = \boxed{84.00}$

USE CURRENT MANDAY COST AS ALL INCLUSIVE -
PRORATE MANDAYS BY TOTAL COST

TOTAL 336 WATANA = 210 194 = .596 → 185 690

DEVIL CANYON = 142 473 = .404 → 125 870

352 667

311 560 $\times 84 = 26 171^M$

see back
MANDAY
FACTOR

Act. -336

0.22 RAIL HEAD STORAGE / HANDLING FACILITIES.

		<u>DIRECT + INDIRECT</u>
- GENERAL PREPARATION	=	780,000
- OFFICE PARKING	=	63,000
- SITE OFFICES	=	217,000
- WAREHOUSE	=	412,000
- WORK SHOP	=	395,000
- TANK FARM	=	1,690,000
- CEMENT STORAGE	=	680,000
- TOWER HOUSE	=	1,680,000
- MISCELLANEOUS	=	250,000
	<u>\$</u>	<u>6,167,000</u>

0.23- OPERATION AND MAINTENANCE OF STORAGE / HANDLING FACILITIES

0.231 - OPERATING STAFF & LABOR COST

		<u>DIRECT + INDIRECT</u>
- MARSHALLING CREW.	=	2,100,000
- MATERIAL HANDLING CREW.	=	5,750,000
- FUEL & SILE OPERATING CREW.	=	1,300,000
- REPAIR & MAINTENANCE W/ CREW	=	1,100,000
- WAREHOUSE STAFF	=	2,400,000
- OFFICE STAFF	=	2,200,000
- SECURITY FORCE	=	1,200,000
- SAFETY & PROTECTION STAFF	=	1,000,000
	<u>\$</u>	<u>17,050,000</u>

EQUIPMENT FOR OPERATING FACILITIES

0.232 -	- LOADING / HANDLING / TRANSPORTATION	=	3,700,000
	- SNOW CLEARING / REMOVAL	=	1,300,000
	- ROAD / STORAGE AREA MAINTENANCE	=	1,100,000
	- MARSHALLING / SHUNTING EQUIP	=	3,600,000
	- MSC	=	1,300,000
		<u>\$</u>	<u>10,000,000</u>

0.233 - GENERAL upkeep OF FACILITIES.

	Hr	Up	Total
- CEMENT STORAGE	= 1600	= 50	= 80,000
- TANK FARM	= 1000	= 60	= 60,000
- REPAIR WORKSHOP	= 1000	= 70	= 70,000
- SITE OFFICES	= 500	= 30	= 15,000
- GARAGES	= 1000	= 20	= 20,000
- POWER HOUSE	= 3000	= 100	= 300,000
- PARKING LOT	= 500	= 30	= 15,000
- MISCELLANEOUS	= 1000	= 40	= 40,000
			<u>\$ 600,000</u>

0.233 - POWER GENERATION FOR FACILITIES.

- OPERATING COST = $\frac{\text{Hr}}{70080} - 110^{\text{th}} = 7,780,800$

TOTAL ITEM 0.233 = \$ 35,430,000

Acct 63.33

RAIL HEAD FACILITIES - TOTAL MAN DAYS = 90,000
BASED ON 60 MAN PEAK
FORCE FOR 10 YEARS

OPERATING CREW	=	50,000	MAN DAYS
KITCHEN BND	=	20,000	MAN DAYS
REPAIR LABS	=	15,000	MAN DAYS
SUPERVISION	=	5,000	MAN DAY

TOTAL		<u>90,000</u>	<u>MAN DAYS</u>
-------	--	---------------	-----------------

BASED ON JIM PLUMBER'S ESTIMATE

SUPERSED.

ACCOUNT. 63.33

RAIL HEAD FACILITIES - OPERATION & MAINTENANCE
OF CAMP

63.331 - Camp facilities @ RAIL HEAD

- Supply & INSTAL
60 man camp = \$ 600,000

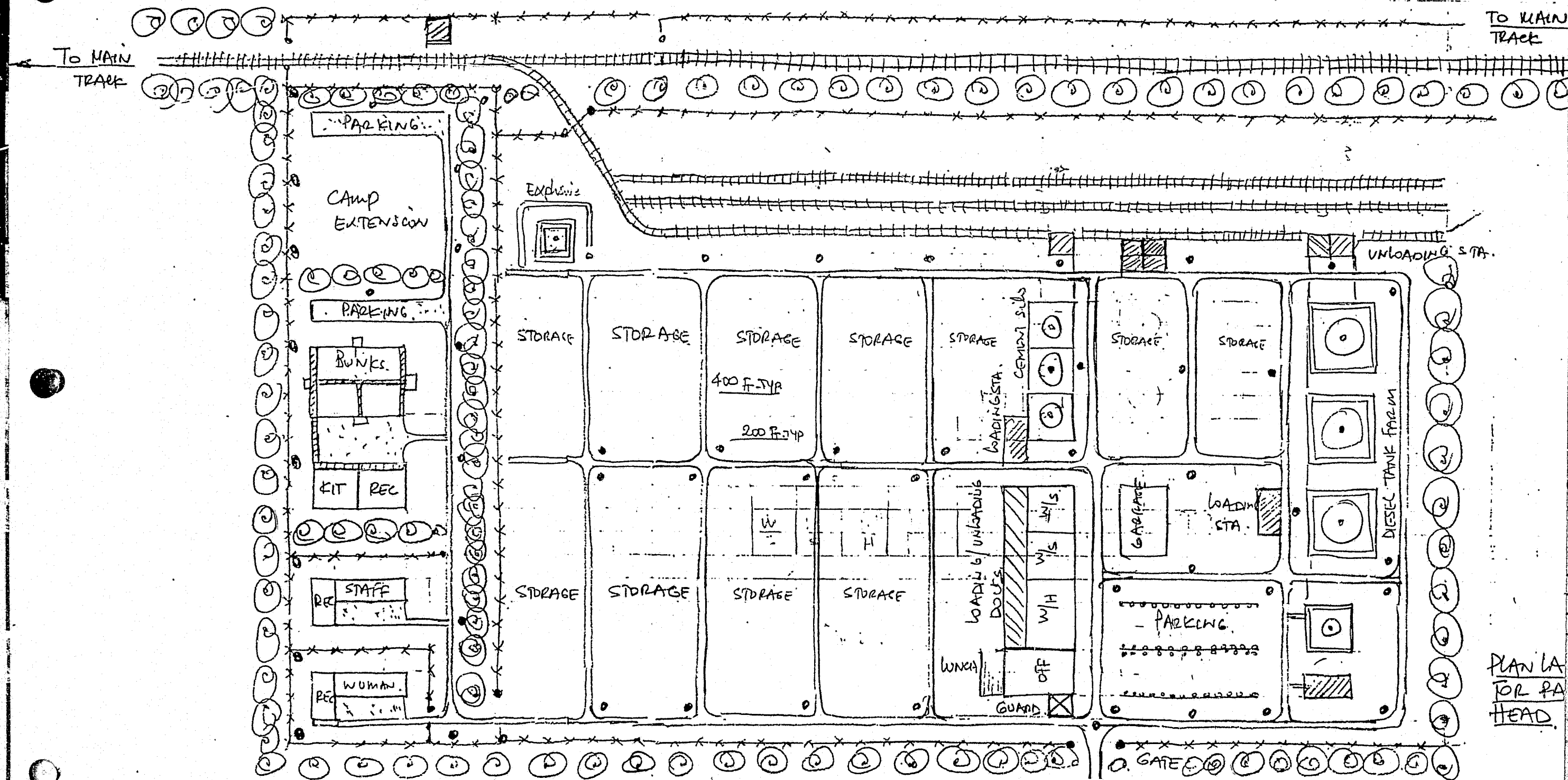
63.332 - Camp. OPERATION & MAINTENANCE @ RAIL HEAD

MAN DAYS $\downarrow$ (87,500 x 70) $\downarrow$ \$ $\downarrow$ FOOD COST

- Supply & STORAGE OF FOOD	= 6,125,000
- LABOUR	= 4,200,000
- JANITOR / LAUNDRY / BEDDING ETC	= 1,400,000
	<u>\$ 11,725,000</u>

UNIT COST = $\frac{\$ 12,325,000}{175,000} =$ \$ 70 / MAN.

$\uparrow$ NO OF MAN DAYS
TOTAL.



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SUMMARY SHEET FOR RAILHEAD FACILITIES @ CANTWELL

INSTALLATION OF FACILITIES

- GENERAL PREPARATION.	=	780,000
- PARKING LOT.	=	63,000
- 60 MAN CAMP.	=	514,000
- SITE OFFICES	=	217,000
- WAREHOUSE	=	412,000
- WORK SHOP	=	395,000
- POWER HOUSE	=	2,219,000
- TANK FARM.	=	2,171,000
- CEMENT STORAGE	=	1,207,000
- SITE ROADS	=	3,275,000
- MISC ITEMS.	=	250,000
		\$ 11,502,000

OPERATION OF FACILITIES

- STAFF & LABOUR CREWS

- MARSHALLING CREW.	=	2,100,000
- HANDLING CREW.	=	7,400,000
- FUEL & SILD CREW.	=	2,500,000
- REPAIR & MAINTANCE W/S CREW.	=	2,100,000
- WAREHOUSE STAFF	=	2,700,000
- OFFICE STAFF	=	2,300,000
- SECURITY FORCE	=	3,700,000
- CAMP OPERATING STAFF.	=	4,500,000
- SAFETY & PROTECTION STAFF	=	1,000,000
- REPAIR / MAINT. ETC / SNOW REMOVAL	=	3,000,000
		\$ = 31,200,000

- EQUIPMENT FOR OPERATING FACILITIES

- LOADING / UNLOADING / WAREHOUSE	=	4,000,000
- SNOW CLEARING / REMOVAL	=	2,500,000
- ROAD / YARD MAINTANCES	=	1,500,000
- MARSHALLING & SHUNTING	=	3,000,000
		\$ = 11,000,000

RAILHEAD SERVICE & STORAGE FACILITIES

1. CAMP. - 40 MAN.
2. OFFICES - 10 MAN.
3. STORAGE
 - DIESEL TANK FARM.
 - GAS TANK FARM.
 - FOR GENERATOR.

4. DIESEL POWER GENERATION.
5. WAREHOUSE
6. WORKSHOP
7. AREA LIGHTING
8. B-O FENCE.
9. STANDBY DIESEL POWER
10. DONKEY SHUNTING ENGINE
11. P/H BUILDING.

12. GARAGE FOR VEHICLES.
13. POWER DISTRIBUTION & SWITCH GEAR
14. Cement silo
3 NO. - 1000 TON
EACH.
15. GRAVEL STORAGE
AREA.

- 8
- PERIOD OF OPERATION 8 YEAR
 - CONSTRUCTION PERIOD ONE YEAR.

GENERAL UP KEEP OF FACILITIES.

- CEMENT STORAGE	=	80,000
- TANK FARM.	=	160,000
- REPAIR WORKSHOP	=	475,000
- WAREHOUSE	=	372,000
- SITE OFFICES.	=	150,000
- GARAGES	=	200,000
- POWER HOUSE	=	250,000
- PARKING LOT	=	150,000
- MISCELLANEOUS.	=	200,000
\$ =		1,987,000

POWER GENERATION

- OPERATING COST	=	12,970,000
- MISCELLANEOUS. COST.	=	-
\$ =		12,970,000.

TOTAL FOR RAILHEAD
INSTALLATION AND OPERATION
FOR PERIOD OF 8 YEARS.

\$ = 68,759,000

UNIT COST

=	8,595,000	PER YEAR	FOR 8 YEAR..
=	716,000	PER MONTH	FOR 12 MONTH/YR
=	166,800	PER WK.	FOR 4.3 WK/MONTH
=	24,000	PER DAY.	FOR 7 DAY /WK
=	1000	PER HR	FOR 24 HR / DAY



Calculations

SUBJECT: SUPPLY & INSTAL. PAUL HEAL FACILITIES CONTINUED - SUSITNA PROJECT.

JOB NUMBER P570059
FILE NUMBER _____
SHEET _____ OF _____
BY _____ DATE _____
APP _____ DATE _____

S.N.	WORK PACKAGE	DIRECT.	INDIRECT MARKUP	TOTAL	QUANTITIES	UNITS
1.	GENERAL SITE PREP.	600.000	1.30	780.000	45	ACRES.
2.	PARKING LOT.	50.000	1.25	62.500	2	ACRES.
3.	50 MAN CAMP	367.000	1.40	514.000	60	BEDS
4.	SITE OFFICES.	154.000	1.40	217.000	10,000	S.F.
5.	WAREHOUSE	317.000	1.30	412.000	60,000	S.F.
6.	WORKSHOP.	316.000	1.25	395.000	15,000	S.F.
7.	POWER HOUSE	1.200.000	1.40	1,680.000	1.0	MW
8.	DIESEL & GAS TANK FARM.	1,200.000	1.30	1,560.000	1.50	MILLION GALLONS
9.	CEMENT SIB.	965.000	1.25	1,207.000	2500	TONS.
10.	SITE ROADS	2,620.000	1.25	3,275.000	5.00	MILES
11.	MISC. ITEMS.	200.000	1.25	250.000	-	L.S.
		8,844.000	1.30	11,502.500	-	-

\$ 9,962,500

#1.

A GENERAL SITE PREPARATION.

- AREA CLEARING.	= 20,000
- STRIPPING	= 5,000
- UNCLASSIFIED EXCAVATION.	= 15,000
- ROCK EXCAVATION.	= 15,000
- DITCHES & AREA DRAINAGE.	= 15,000
- PIPE CULVERTS.	= 15,000
- SURFACE PREPARATION.	= 5,000
- SUPPLY & PLACE $1\frac{1}{2}$ " TO $\frac{3}{4}$ " STONE BASE	= 50,000
- GUARD HOUSE	1 No. = 5,000
- SECURITY FENCE & GATE	= 100,000
- AREA LIGHTING. (FLOOD LIGHTS)	= 300,000
- FIRE PROTECTION	= 10,000
- MISC.	= 50,000

\$ 600,000B PARKING LOT:

- AREA CLEARING	= 5,000
- STRIPPING.	= 5,000
- UNCL. EXCAVATION	= 5,000
- ROCK EXCAVATION	= 5,000
- AREA DRAINAGE & DITCHES.	= 10,000
- PIPE CULVERT	= 1,000
- SURFACE PREP	= 1,000
- SUPPLY & PLACE $1\frac{1}{2}$ " TO $\frac{3}{4}$ " STONE BASE	= 5,000
- ASPHALT BASE 2" TH.	= 5,000
- ASPHALT TOPPING. $\frac{1}{2}$ "	= 5,000
- GUARD RAILS	= 1,000
- SECURITY FENCE & GATE.	= -
- POWER OUTLET FOR CAR HEATERS	= 5,000
- MISC.	= 5,000

\$ 50,000

(C) 40 MAN - CAMP. INSTALLATION.

- AREA CLEARING	=	5,000
- STRIPPING	=	15,000
- UNCLASSIFIED EX.	=	10,000
- POLE EXCAVATION	=	5,000
- DITCHES & AREA DRAINAGE	=	8,000
- SURFACE PREPARATION	=	8,000
- SUPPLY 40 MAN CAMP UNITS.	=	-
10 MAN - KITCHEN.	=	10,000
10 MAN - WASH ROOM.	=	10,000
20 MAN - PLAY ROOM	=	12,000
- LAUNDRY ROOM & OFFICE	=	10,000
- FOOD STORAGE	=	10,000
- TV & RADIO	=	10,000
10 NO - WOMAN WITH W/R	=	12,000
10 NO - STAFF WITH W/R	=	12,000
STAFF - TV / REC	=	10,000
WOMAN - TV / REC	=	10,000
- TRANSPORT OF Bldg TO SITE	=	15,000
- CONNECTING WALKWAYS	=	20,000
- ERECTION & INSTALLATION OF Bldg	=	25,000
- FIRE PROTECTION SYSTEM.	=	10,000
- SEWERAGE PIPE LINE & PIPES	=	10,000
- SEWERAGE DISPOSAL PLANT	=	20,000
- WATER SUPPLY DEEP WELL	=	20,000
- WATER SUPPLY LINES & PIPES	=	15,000
- POWER DISTRIBUTION SYSTEM	=	10,000
- UTILDORS FOR PIPES	=	10,000
- ELECTRIC HEAT TRACING SYSTEM	=	5,000
- SUPPLY OF FURNITURE & FURNISHING	=	50,000

\$ 367,000⁹⁰

$$\text{Cost / MAN} = \frac{367,000}{60} = \underline{\underline{\$ 6,116.67 / \text{MAN}}}$$

(D) SITE OFFICE

- AREA CLEARING = 2000
- STRIPPING & EXCAVATION. = 2000
- DRAINAGE & DITCHES = 2000
- FOUNDATION PREP. = 1000
- Supply of Bldg
 - OFFICE (40x120) = 10,000
 - WASH ROOM. = 2,000
 - RADIUM ROOM. = 5,000
 - STORAGE = 10,000
 - MISC. = 2,000
- TRANSPORTATION OF Bldg TO SITE. = 8,000
- ERECTION & INSTALLATION OF Bldg = 8,000
- HEATING & VENTILATION. = 6,000
- WATER SUPPLY LINE = 3,000
- SEWAGE LINE = 3,000
- POWER DISTRIBUTION = 2,000
- UTILITIES FOR PIPES. = 2,000
- ELECTRICAL HEAT TRACING SYSTEM = 2,000
- FLOOD LIGHT. OUTSIDE = 1,000
 - FIRE PROTECTION SYSTEM = 2,000
 - LIGHTING = 2,000
 - TELEPHONE = 2,000
 - TELEX = 1,000
 - RADIO CONTROL ROOM = 1 NO. = 4,000
 - WALKIE TALKIE = 10 NO. = 20,000
 - RADIO TELEPHONE = 5,000
 - SITE OF DAM. = 5,000
 - RAILWAY OFFICE = 5,000
 - FAIRBANKS = 5,000
 - ANCHORAGE. = 5,000
- OFFICE
 - FURNITURE & ACCESSORIES = 4,000
 - SUPPLIES = 5,000
 - CONSUMABLES = 16,000
 - HOT DRINKS = 5,000
 - MISC. = 2,000

154,000.00

$$\text{Cost / S.F.} = \frac{154,000}{10,000} = \$15.40$$

WAREHOUSE

- AREA CLEARING	=	5,000	
- STRIPPING & EXCAVATION.	=	50,000	
- DRAINAGE & DITCHES	=	5,000	
- FOUNDATION PREP.	=	5,000	
- CONCRETE FOUNDATION.	=	20,000	
- SUPPLY OF PRE FAB. Bldg.	=	60,000	100' x 300' =
- OFFICE	=	5,000	
- WASH ROOM	=	5,000	
- MISC.	=	5,000	
- REPAIRS	=	10,000	
- TRANSPORTATION OF Bldg TO SITE.	=	15,000	
- ERECTION & INSTALLATION.	=	20,000	
- HEATING & VENTILATION.	=	10,000	
- OVERHEAD LIGHTING.	=	10,000	
- OVERHEAD DOORS.	=	4,000	
- WATER SUPPLY SYSTEM	=	5,000	
- SEWAGE SYSTEM.	=	5,000	
- FIRE PROTECTION SYSTEM.	=	20,000	
- LOADING & UNLOADING DOCKS.	=	10,000	
- HEATING OF DOCKS & RAMPS.	=	10,000	
- POWER DISTRIBUTION SYSTEMS.	=	5,000	
- TELEPHONE	=	1,000	
- TELEX.	=	500	
- TWO WAY RADIOS	=	2,000	
- FURNITURE FOR OFFICE.	=	6,000	
- MISC.	=	4,000	
- HANDLING EQUIPMENT	=	20,000	
TOTAL.		<u>\$ 317,500</u>	

$$\text{Cost/SF} = \frac{\$ 317,000}{30,000 \text{ SF}} = \$ 10.60/\text{SF}.$$

F WORK SHOP.

- AREA CLEARING.	=	5,000.
- STRIPPING & EXCAVATION	=	10,000.
- DRAINAGE & DITCHES.	=	5,000
- FOUNDATION PRE.	=	5,000
- CONCRETE FOUNDATION	=	20,000
- SUPPLY OF PRE FAB Bldg. 200' x 60'	=	30,000.
- OFFICES.	=	10,000
- STORE ROOM	=	10,000
- WASH ROOM.	=	-
- FIRST AID ROOM	=	-
- MIS.	=	5,000
- TRANSPORTATION TO SITE (Bldg).	=	15,000
- ERECTION & INSTALLATION OF Bldg.	=	15,000.
- HEATING & VENTILATION.	=	15,000
- OVERHEAD LIGHTING.	=	6,000
- OVERHEAD DOOR	=	10,000
- WATER SUPPLY SYSTEM.	=	5,000
- SEWAGE SYSTEM.	=	5,000
- FIRE PROTECTION SYSTEM	=	6,000
- HEATING FOR FRAMPS.	=	4,000
- HIGH VOLTAGE POWER SUPPLY	=	10,000
- POWER DISTRIBUTION.	=	10,000
- MISC.	=	10,000
		<u>\$206,000</u> ¹²

- TELEPHONE	=	500
- TWO RADIO.	=	2,000
- FURNITURE & OFFICE ACCESSORIES	=	5,000
- MISC.	=	2,500
		<u>\$ 10,000</u>

EQUIPMENT

- ALCAP 1 TON	=	8,000
- MOBILE CRANE 1ST.	=	50,000
- HOISTS & WINCHES	=	10,000
- REPAIR PITTS.	=	10,000
- TOOLS.	=	20,000
		<u>\$ 98,000</u>

TOTAL
\$316,000

Power House

Civil Works

- AREA CLEARING	=	5000
- STRIPPING	=	10,000
- EXCAVATION	=	10,000
- DRAINAGE & DITCHES	=	4,000
- FOUNDATION PREPARATION	=	5,000
- CONCRETE WORKS FOR FOUNDATION	=	-
- FOR Bldg. 600 cyd.	=	60,000
- FOR GENERATING SET 200 cyd.	=	20,000
- SURFACE WORKS 200 cyd.	=	20,000
- Supply of PRE FAB Bldg. 30' x 100' x 20' =		60,000 @
- TRANSPORTATION OF Bldg TO SITE	=	10,000
- ERECTION & INSTALLATION OF Bldg.	=	20,000
		<u>\$ 224,000</u>

MECH. WORKS

GEN / PRIME MOVER

- Supply of 2NO - 150 MW DIESEL GENERATOR F.O.B. WEST COAST. U.S.A.	=	400,000
- TRANSPORTATION TO SITE	=	50,000
- INSTALLATION OF DIESEL GENERATOR	=	50,000
- TESTING & COMMISSIONING	=	50,000
- MISC WORKS	=	50,000
		<u>\$ 600,000</u>

FUEL STORAGE TANKS = 100,000 GAL CAP.

- CLEARING	=	5,000
- STRIPPING	=	8,000
- EXCAVATION	=	10,000
- FOUNDATION PREP.	=	2,000
- CONCRETE FOUNDATION FOR TANKS	=	20,000
- Supply of PRE-FAB TANK @ 40T	=	100,000
- TRANSPORTATION OF TANK TO SITE	=	20,000

#7

- ERECTION OF TANK @ SITE - 100,000 GALLON. = 60,000
- supply & install piping = 10,000
- supply & install & TEST OPERATING 6 Pump = 10,000
- PROTECTIVE DICE (200 FT x 4 x 3)
 - FOUNDATION PREP = 10,000
 - IMPERVIOUS FILL = 50,000
 - ROCK FILL. = 30,000.
 - SEEDING. = 5,000
 - MISC = 25,000

\$ 315,000

\$ 100,000

MECH / ELECT SERVICESMECH

- WATER supply SYSTEM. = 5,000
- FIRE PROTECTION. = 10,000
- SEWAGE TREATMENT = 5,000
- HEATING & VENTILATION. = 10,000
- HOIST & WINCHES. = 5,000
- WORK SHOPS & HALL ARE. = 20,000
- SPACE PARTS. = 10,000

\$ 65,000ELECT

- CONTROL panel. = 20,000
- BUS BAR = 20,000
- TRANSFORMER = 10,000
- POWER DISTRIBUTION. = 20,000
- SWITCH GEAR & BREAKER. = 40,000
- MISC. = 20,000

\$ 130,000TOTAL= \$ 1,585,000

\$ 1,200,000

(H) DIESEL & GAS TANK FARM = 3 NO. @ 400,000 GALL/EA

Civil Works.

- AREA CLEARANCE	<u>5 ACRES</u>	= 15,000.
- EXCAVATION.		= 60,000
- FOUNDATION PREPARATION.		= 20,000
- CONCRETE FOR		-
- UNLOADING STATION		= 10,000
- PIPE LAKE & SUPPORT		= 10,000
- LOADING STATION.		= 10,000
- FOOTING FOR TANK		= 20,000
- SLAB FOR TANK.		= 10,000
- MISC		= 10,000
- FOUNDATION PREPARATION FOR DIKES		= 30,000.
- IMPERVIOUS FILL DIKES.		= 60,000.
- ROCK FILL DIKES		= 80,000
- SEEDING THE DIKES		= 5,000
- DRAINAGE DITCHES		= 10,000
- MISC		= 20,000.

\$ 370,000.
250,000

MECH WORKS.

- SUPPLY OF FABRICATED STEEL TANKS	500 LBS	= 600,000
- TRANSPORTATION TO SITE		= 30,000
- ERECTION & INSTALLATION @ SITE		= 400,000 250,000
- TESTING & COMMISSIONING		= 20,000
- SUPPLY & INSTALL PIPING SYSTEM		= 20,000
- SUPPLY & INSTALL UNLOADING EQUIP		= 50,000
- SUPPLY & INSTALL LOADING EQUIP		= 50,000
- SUPPLY & INSTALL FIRE PROTECTION		= 20,000
- WATER SYSTEM.		= 5,000
- FOAM SYSTEM		= 5,000
- MISC		-

\$ 1,200,000
950,000

ELECTRICAL

- POWER SUPPLY & DISTRIBUTION SYSTEM		= \$ 20,000
- ELECTRIC HEAT TRACING SYSTEM		= \$ 15,000
- MISC		= \$ 10,000

ELECTRICAL WORKS.

- POWER DISTRIBUTION SYSTEM	= 10,000.
- TRANSFORMER & FUSES.	= 5,000.
- SWITCHGEAR & DISCONNECT SWITCH	= 10,000.
- LIGHTING SYSTEM.	= 20,000.
- GROUNDING.	= 5,000.
- MISC.	= 5,000.
	\$ 100,000.

TOTAL = \$1,670,000.

\$ 1,300,000

① Cement Storage Silos.

10

Civil Works.

- AREA CLEARING.	=	5,000.
- GRIPPING & EXCAVATION.	=	10,000.
- DRAINAGE & DITCHES.	=	5,000
- FOUNDATION PREP.	=	10,000
- CONCRETE WORK	=	-
- UNLOADING STATION	=	20,000
- Silo & Equip	=	30,000
- LOADING STATION	=	30,000
- Misc.	=	10,000

\$ 120,000.

MECH WORKS

- supply of CEMENT, Silo & All RELATER EQUIPMENT	=	\$575,000.
- TRANSPORTATION TO SITE	=	20,000
- ERECTION & INSTALLATION	=	100,000
- TESTING & COMMISSIONING	=	5,000
- supply & INSTAL UNLOADING STATION complete with Equip AND PIPING.	=	30,000
- supply & INSTAL LOADING & TRANSFER EQUIP	=	30,000
- CONTROL ROOM.	=	30,000

\$ 790,000

ELECTRICAL.

- POWER DISTRIBUTION	=	20,000
- TRANSFORMER STATION	=	10,000
- SWITCHGEAR & M.C.C.	=	10,000.
- LIGHTING.	=	5,000.
- CONTROL ROOM	=	5,000
- GROUNDING	=	5,000.

\$ 55,000.

TOTAL = \$ 965,000

⑤ SITE ROADS - 4 miles

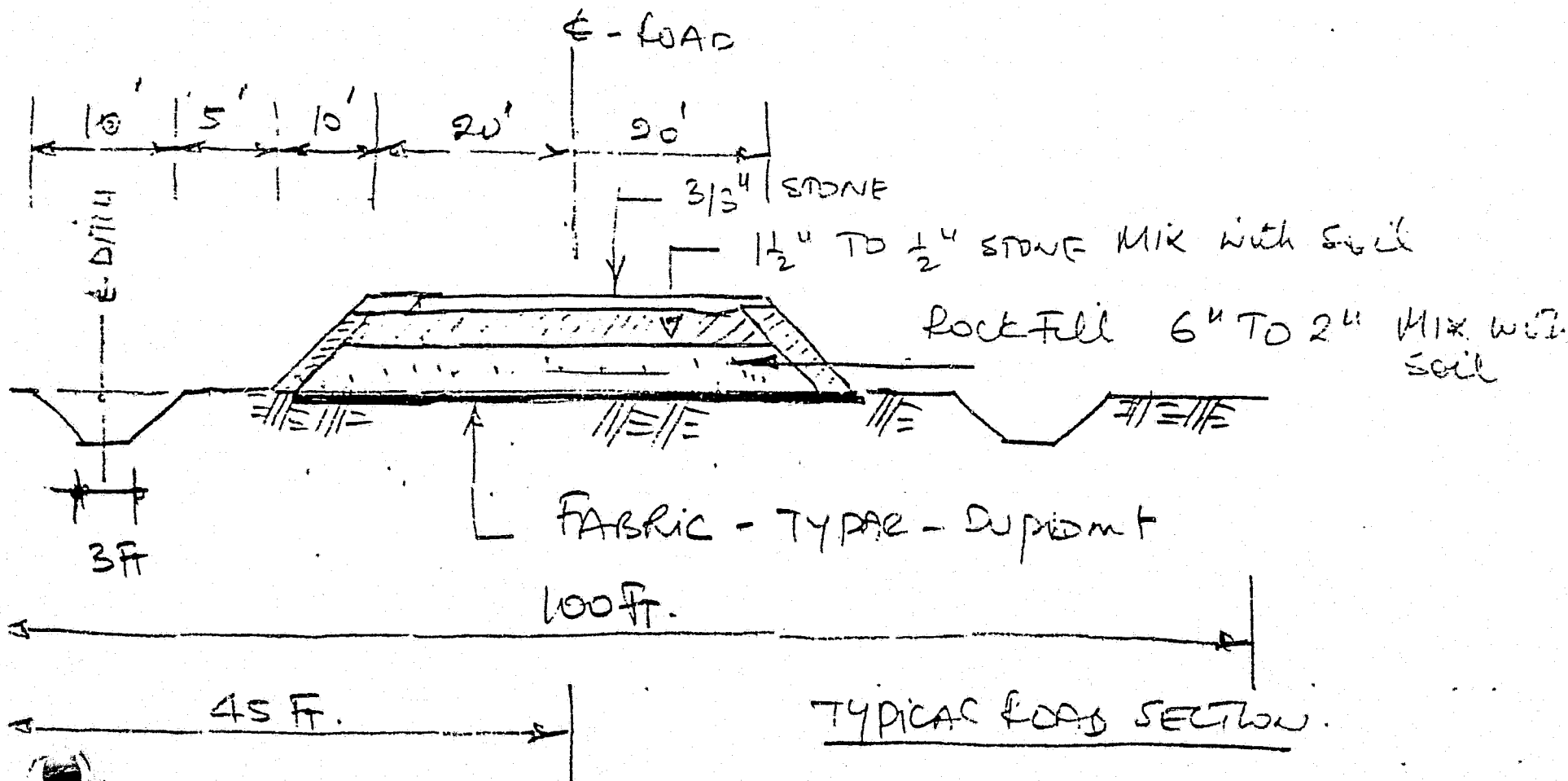
FILL MATERIALS

- BACKFILL - rock	= 500,000	50,000 cyd.
- soil	= 100,000	50,000 cyd.
- FABRIC LAYER	= 200,000	1000,000 SF.
- SOIL BACKFILL	= 300,000	150,000 cyd.
- ROCK / CRUSHED STONE		
- 3/4" - STONE TOPPING	= 400,000	40,000 cyd.
- MIS	=	-

EXCAVATIONS

- CLEARING	= 10,000	12 ACRES
- STRIPPING	= 360,000	180,000
- UNCLASSIFIED EXCAVATION	= 400,000	80,000
- ROCK EXC.	= 100,000	10,000
- AREA DRAINAGE DITCHES	= 75,000	25,000 L.F.
- MIS	= 25,000	-

\$ 970,000



#12

- PROTECTIVE GUARD RAIL	= 50,000
- PIPE CULVERTS	= 10,000
- STREET LIGHTS	= 10,000
- POWER DISTRIBUTION	= 50,000
- SWITCH GEAR & FUSES	= 30,000
	\$ 150,000

TOTAL = \$ 2,620,000

(F) Misc. ITEMS.

- TRANSPORTATION BR SECURITY	=	IN / OP.
- GARAGE FOR VEHICLES.	=	10,000
- GARAGE & REPAIR SHOP		
FOR STUNTING & MARSHALLING UNIT.	=	20,000
- CANTEN & COFFEE SHOP	=	50,000
- FIRST AID CENTER	=	10,000
- LUNCH ROOM	=	10,000
- CHANGE ROOM	=	10,000
- FIRE HALL & FIRE ENGINE	=	20,000
- TV - SIGNAL RECEIVER	=	10,000
- POWER OUTLET FOR CARS	=	20,000
- AMBULANCE VAN	=	20,000
- PICKUP TRUCKS	=	-
- Misc.		

 \$ 200,000

SUMMARY SHEET

FOR OPERATING COST OF RAILHEAD FACILITIES

- TOTAL COST = 31.64 Million Dollars.
- TOTAL Equip Cost -
RENTAL + OPERATING = 11.00 Million Dollars
 - TOTAL COST OF
OPERATING FACILITIES = 20.200 Millions Dollars
 - TOTAL FOOD COST
 $842 \times 200 \text{ D} \times \$50 \times 39 \text{ MAN} = 30200 \text{ Million Dollars}$
1 FOOD / OTHER OPERATING COST
 - TOTAL COST OF
POWER GENERATION = 12.97 Million Dollars

TOTAL = \$ 61.01 Million.

$$\begin{aligned} \text{AVE COST / YR} &= \frac{\$ 61.01}{842} = \$ 7.62 / \text{YR} \\ &= \$ 636,000 / \text{MONTH} \\ &= \$ 14800 / \text{WK} \\ &= \underline{\underline{\$ 1234 / \text{HR}}} \end{aligned}$$



Calculations

SUBJECT:

JOB NUMBER _____
FILE NUMBER _____
SHEET _____ OF _____
BY _____ DATE _____
APP _____ DATE _____

SNo	ITEM.	YR	1st				2nd				3rd				4th				5th				6th				7th				8th				TOTAL CREW Hr.	UNIT RATE	TOTAL Cost.	NO OF SHIFT	NO OF MAN.	TOTAL FLEET Hr.	TOTAL FLEET Cost.	NEW						
		DET.	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4																		
2	1 UNLOAD/LOAD CREW.		1500				1500				1500				1500				1500				1500				1000				500					11,500	1000	11,500	2	31	20	7.40	5.75					
1	2 SPECIAL EQUIP CREW		1500				1000				1500				1500				1500				1500				1000				500					9000	328	2,90	1	9	84	2.57	1.30					
1	3 WORKSHOP CREW.		1000				1000				1000				1500				1500				1500				1000				1000					9500	219	2,10	1	8	81	2.10	1.10					
1	4 WAREHOUSE CREW.		500				1000				1500				1500				1500				1500				1000				1800					9300	380	3,54	2	13	10	2.73	2.4					
1	5 OFFICE CREW.		2400				2400				2400				2400				2400				2400				2400				2,400					19,200	120	2,31	1	3	3	2.31	2.2					
3	6 SECURITY CREW.		2400				3600				3600				3600				3600				3600				2400				2,400					25,200	386	3,75	3	11	11	3.75	1.20					
	7 CAMP OPERATING CREW.		1200				2400				2400				2400				2400				2400				2400				1,200					16,800	503	8,45	3	18	10	4.68	4.20					
1	8 MARSHALLING CREW..		800				1200				1500				1500				1500				1500				1200				800					10,000	314	3,14	1	12	8	2.10	2.10					
1	9 MAIN & SNOW CLEARING CREW		800				1200				1500				1500				1500				1500				1200				800					10,000	482	4,82	1	13	84	3.00	2.40					
1	10 SAFETY/PROTECTION CREW..		400				1200				1200				1200				1200				1200				1200				1,200					8,800	215	1,89	1	7	43	1.00	1.00					
	11																																						49,24		125.92	31.64						
	12																																															
	13 UNLOADING/LOADING EQUIP		1000				1800				1800				1800				1800				1800				1000				500					11,500	350	4,000										
	14 SNOW CLEARING EQUIP		800				800				800				800				800				800				800				800					6,400	400	2,56										
	15 ROADS/AREA MAIN EQUIP		600				600				600				600				600				600				600				600					5,300	300	1,50										
	16 MARSHALLING/TRANSP. AREA																																				10,000	300	3,00									
	17																																															
	18 O/M - CEMENT SILO		200				200				200				200				200				200				200				200					1600	50	80,000										
	19 - FUEL TANKS		200				200				200				200				200				200				200				200					1600	100	160,000										
	20 - WORKSHOP.		1000				1000				1000				1500				1500				1500				1000				1000					9500	50	475,000										
	21 - WAREHOUSE		500				1000				1500				1500				1500				1500				1000				1800					9300	40	372,000										
	22 - OFFICE																																															
	23 - GARAGES																																															
	24 - POWERHOUSE EQUIP																																															
	25 - PARKING LOT																																															
	26 - MISCELLANEOUS																																															
	27 - REST OF FACILITY																																															
	28																																															
	29																																															
	30 POWER GENERATION																																															
	1.50 MW STATION.		8760				8760				8760				8760				8760				8760				8760				8760					70,080	185.00	12,97										
	1.00 MW STATION																																															

60.04.01 Form 148A

87

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OPERATION & MAINTENANCE1. UNLOADING & LOADING CREW

FORMAN	= 3 NO. x 38.06	= 114.18
LABOUR	= 12 NO. x 33.23	= 398.76
OPER	= 5 NO. x 34.63	= 208.00
DRIVER	= 6 NO. x 34.94	= 210.00
OPER	= 4 NO. x 35.40	= 142.00
	31 NO.	\$ 1073 / Hr

2. UNLOADING & LOADING EQUIPMENT

SOT. MOBILE CRANE	= 1 NO. x 150 ⁰⁰	= 150
ST BOX TRUCK	= 1 NO. x 30 ⁰⁰	30
15 TON MOBILE	= 1 NO. x 35 ⁰⁰	35
5 TON BOOM TR	= 2 NO. x 35 ⁰⁰	70
5 TON HYSTER	= 2 NO. x 25 ⁰⁰	50
5 TON FLAT BED	= 2 NO. x 25 ⁰⁰	50
10 TON FLAT BED	= 2 NO. x 25 ⁰⁰	50
TRACTOR/TRAILER	= 2 NO. x 42 ⁰⁰	84
SOT. CONTAINER CRANE	= 1 NO. x 80 ⁰⁰	80
	14 NO.	\$ 599 ⁰⁰ / Hr

3. SPECIAL CREW.

- FORMAN	= 1 NO. x 38.06	= 38.06
- SLO OPERATOR	= 2 NO. x 36.21	= 72.42
- FUEL TANK OPERATOR	= 2 NO. x 36.21	= 72.42
- P/H OPERATOR	= 4 NO. x 36.21	= 144.84
	9 NO.	= 328.00 / Hr

4. SERVICE CREW IN WORKSHOP

- FORMAN	= 1 NO. x 42.00	= 42.00
- MASTER MECH.	= 1 NO. x 39.17	= 39.17
- MECH.	= 2 NO. x 35.04	= 70.08
- WELDER	= 2 NO. x 37.42	= 74.84
- LABOUR	= 2 NO. x 33.23	= 66.46
	8 NO.	= 219.00 / Hr

5. SECURITY GUARD.

- OFFICER	=	1 NO.	x	36 ⁰⁰	=	36
- GATE GUARD	=	5 NO	x	35 ⁰⁰	=	175
- PATROL MANS.	=	5 NO	x	35 ⁰⁰	=	175
		11 NO.			=	\$ 386/Hr

6. WARE HOUSE CREW.

- MANAGER	=	1 NO.	x	32 ⁰⁰	=	32
- PURCHASING AGENT	=	2 NO	x	30 ⁰⁰	=	60
- TRAFFIC CO-ORDINATOR	=	2 NO.	x	30 ⁰⁰	=	60
- EXPEDITORS	=	2 NO	x	30 ⁰⁰	=	60
- STORE KEEPER	=	2 NO.	x	28 ⁰⁰	=	56
- CLERKS	=	2 NO	x	28 ⁰⁰	=	56
- STENO..	=	2 NO	x	25 ⁰⁰	=	50
		13 NO.			=	\$ 380/Hr

7. OFFICE CREW.

- GENERAL Supt.	=	1 NO	x	50 ⁰⁰	
- STENO	=	1 NO	x	30 ⁰⁰	
- ASSISTANT	=	1 NO.	x	40 ⁰⁰	
		3 NO.			\$ 120 ⁰⁰ /Hr

8. CAMP CREW.

- CAMP MANAGER	=	1 NO.	x	35 ⁰⁰	=	35 ⁰⁰
- COOK	=	6 NO.	x	30 ⁰⁰	=	180
- ASSIST COOK	=	6 NO.	x	25 ⁰⁰	=	150
- LAUNDRY MAN	=	3 NO.	x	25 ⁰⁰	=	75 ⁰⁰
- STORE KEEPER FOOD	=	1 NO.	x	28 ⁰⁰	=	28 ⁰⁰
- UTILITY MAN	=	1 NO.	x	35 ⁰⁰	=	35 ⁰⁰
		18 NO.			=	\$ 503 ⁰⁰ /Hr

9. MARSHALLING CREW.

#16

CHIEF ENGINEER	= 1 NO. x 38.06	= 38.06
ENGINEER	= 3 NO. x 36.96	= 111.88
BRACKMAN	= 6 NO. x 33.53	= 201.18
SIGNALMAN	= 2 NO. x 31.25	= 62.50
	<u>12 NO.</u>	<u>\$ 314.62 / Hr</u>

10. MAINTENANCE & SNOW CLEARING CREW.

FORMAN	= 1 NO. x 38.06	= 38.06
OPERATOR	= 2 NO. x 36.96	= 74
MECH. / PIPE FITTER	= 2 NO. x 36.96	= 74
ELECTRICIAN	= 4 NO. x 40.23	= 160
DRIVER	= 2 NO. x 35.58	= 70
LABORER	= 2 NO. x 33.23	= 66
	<u>13 NO.</u>	<u>\$ 482 / Hr</u>

11. SAFETY & PROTECTION CREW.

FORMAN	= 1 NO. x 35.00	= 35
SAFETY INSPECTOR	= 2 NO. x 30.00	= 60
FIRST AID / NURSE	= 2 NO. x 30.00	= 60
FIRE MAN	= 2 NO. x 30.00	= 60
	<u>7 NO.</u>	<u>\$ 215 / Hr</u>

12. MARSHALLING / TRANSPORTATION / OTHER EQUIPMENT

- MARSHALLING ENGINE	= 2 NO. x 80.00	= 160.00
- Pickup 1/2 TO 4x4	= 20 NOS x 20.00	= 400.00
- AMBULANCE VAN	= 1 NO. x 5.00	= 5
- FIRE TRUCK	= 1 NO. x 5.00	= 5
- FOAM SPRAY TRUCK	= 1 NO. x 5.00	= 5
- 12 PASS. VAN	= 1 NO. x 10.00	= 10
	<u>24 NO.</u>	<u>\$ 585.00 / Hr</u>

13. SNOW CLEARING EQUIPMENT

- SNOW PLOW TRUCK.	=	1 NO. x 80 ⁰⁰	=	80
- SNOW BLOWER.	=	1 NO. x 95 ⁰⁰	=	95
- SNOW DUMP TRUCKS.	=	2 NO. x 70 ⁰⁰	=	140
- F.E.L. LOADER.	=	2 NO. x 110 ⁰⁰	=	220
- DOZER	=	1 NO. x 100 ⁰⁰	=	100
- STOW TRUCK WITH PLOW	=	1 NO. x 50 ⁰⁰	=	50
		<u>8 NO.</u>		<u>\$ 685⁰⁰/Hr</u>

14. ROAD & YARD MAINTENANCE EQUIPMENT

- GRADER - 140G.	=	1 NO. x 80 ⁰⁰	=	80
- F.E.L. STOMCH.	=	2 NO. x 110 ⁰⁰	=	220
- DUMP TRUCKS - 16 yd.	=	2 NO. x 114 ⁰⁰	=	228
- DOZER/D7-LGP.	=	1 NO. x 100 ⁰⁰	=	100
		<u>6 NO.</u>		<u>\$ 628⁰⁰/Hr</u>

15. - O/M - CEMENT SLO = \$ 5⁰⁰/Hr16. - O/M - DIESEL FUEL TANKS = \$ 5⁰⁰/Hr17. - O/M - GAS TANK = \$ 5⁰⁰/Hr18. - O/M - REPAIR - W/SHOP. = \$ 35⁰⁰/Hr19. - O/M - WAREHOUSE = \$ 15⁰⁰/Hr20. - O/M - PAU HEAD OFFICE = \$ 10⁰⁰/Hr21. - O/M - GARRAGE = \$ 10⁰⁰/Hr22. - O/M - POWER HOUSE = \$ 10⁰⁰/Hr23. - O/M - THE TOTAL FACILITY = \$ 50⁰⁰/Hr24. - O/M - MISCELLANEOUS = \$ 20⁰⁰/Hr

COST SUMMARY FOR 1.0 MW DIESEL GENERATOR

ESTIMATE LIFE OF THE UNIT = 17,800 HR = 2 YEARS.

OWNERSHIP COST	=	8.50	
TAXES	=	10.50	
OVERHAUL	=	3.00	
PARTS	=	3.50	
FIELD REPAIR LABOUR	=	6.50	
PARTS	=	3.50	
FUEL Consumption	=	90.00	@ 1.00 GAL/HR
LUBE & oil	=	10.00	@ 2 GAL/HR
TOTAL		\$ 135.50	U.S. /HR.

PRO RATING FOR 1.50 MW UNIT.

$$\text{OWNERSHIP COST} = \frac{450,000}{2} \times \frac{1}{17,800} = 12.65^{\text{00}}$$

TAXES	=	15.00	
OVERHAUL	=	4.00	✓
PARTS	=	4.00	✓
FIELD REPAIRS - LABOUR	=	8.50	✓
- PARTS	=	5.00	✓
FUEL Consumption DIESEL	=	150.00	✓
LUBE & oil	=	20.00	✓
TOTAL		\$ 220.00 /HR	
		\$ 185.00 /HR	

$$\begin{aligned} \text{COST OF P/H} &= 22.35 \\ \text{COST OF O/M OF P/H} &= 1.50 \\ \hline &= \$ 24.35 / \text{HR} \end{aligned}$$

$$\text{TOTAL} = \frac{244.35 \times 100}{1,500 \text{ KWH}} = 0.16 / \text{KWH}$$



Calculations

SUBJECT: *RAIL HEADING*
COST ESTIMATE

JOB NUMBER _____
FILE NUMBER _____
SHEET 1 OF _____
BY JRP DATE 10/14/82
APP _____ DATE _____

FOR FACILITIES ADDITIONAL TO THOSE COVERED BY REMU ESTIMATE

Camp Facility - Water/Power/Sewage Treatment

Workshop 100 x 50 450,000 ↑

Stores 100 x 50 450,000 ↓

Cement Storage 3X

Fuel Storage

a - Diesel 4 x 100,000 USG @ 45,000

b - Gasoline 1 x 25,000 " @ 20,000

Generator -

← " Bldg Gravel Storage Area @ 4.70/cy

Fencing 17.00/LF

General Lighting

Power Distribution

Donkey Engine to Shuttle Cars

Clearing @ 4500/Acre



Calculations

SUBJECT:

JOB NUMBER _____
FILE NUMBER _____
SHEET 2 OF _____
BY _____ DATE _____
APP _____ DATE _____

1- Gravel Storage Area

Clearing	Acres @ 4500/A	=
Ditching	LF @ 4.90/LF	=
Culverts	LF @ 30.00/LF	=
Stripping (In Clearing)		
Gravel	cy @ 4.70/cy	=

2- Camp Facility

Bachelor Dorms	-	
Dining Hall / Rec.	-	
Site Preparation	-	
Water Supply		40,000
Sewage Treatment (Septic Tank)		
Power		30,000

3- Services - General

Water Supply		100,000
Sewage Treatment		100,000
Fire Protection		
- System		100,000
- Truck		50,000
Electrical Services		
Bldg 20x20		20,000
Generators (2) x 250 @ 100,000	=	200,000
Distribution		50,000
Floodlighting 20 @ 750 -	=	15,000
Fuel Storage Tank	=	10,000
→ Radio / Telephone / Tlx		100,000



Calculations

SUBJECT:

JOB NUMBER _____

FILE NUMBER _____

SHEET 3 OF _____

BY _____ DATE _____

APP _____ DATE _____

4 - Workshops / Stores / Offices

Workshop	1 Bldg	100 x 50	500,000
Stores	1 "	100 x 50	400,000
Office	1 "	60 x 30	150,000

5 - Fuel Storage

Diesel Tanks	4 @ 45,000	=	180,000
Gasoline (25,000 G)	1 @ 20,000	=	20,000
Transfer Piping	500 LF @ 50	=	30,000
" Pumps / Controls etc			60,000

6 - Cement Storage

5-14-P-

1- Acc't 336.2 ← ?

Cement Storage — ?

336.3- Maintenance Cnts ?

2- Acc't 63.3

Man-darp

.31 Across Road (Bolt) \$4.00

.32 Railroad Cnts (P.S.) \$4.00

.33 Operation & Maintenance JRP of Railroad (?)

Camp

D. G.
Int-

7.6
97.3
105.0

—

105.0

Const

81.0

186.0

Village

Camp

55
75
130

130.0

Const

79.5

209 —

PH

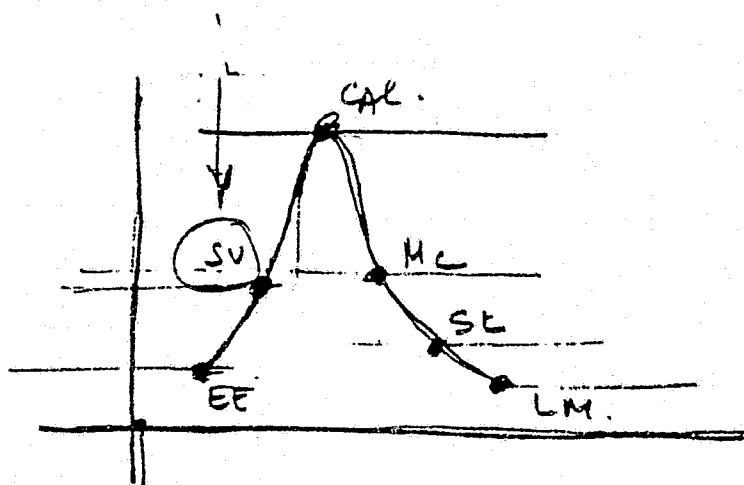
C-3 - N.S.D. Pay Item NO 312

DRILL & WASH GROUT FOR CORE.

\$ 42.50/m. COMPARE WITH ENGINEER'S ESTIMATE

VERY GOOD ROCK (WORKING UNDER IDEAL Conditions)

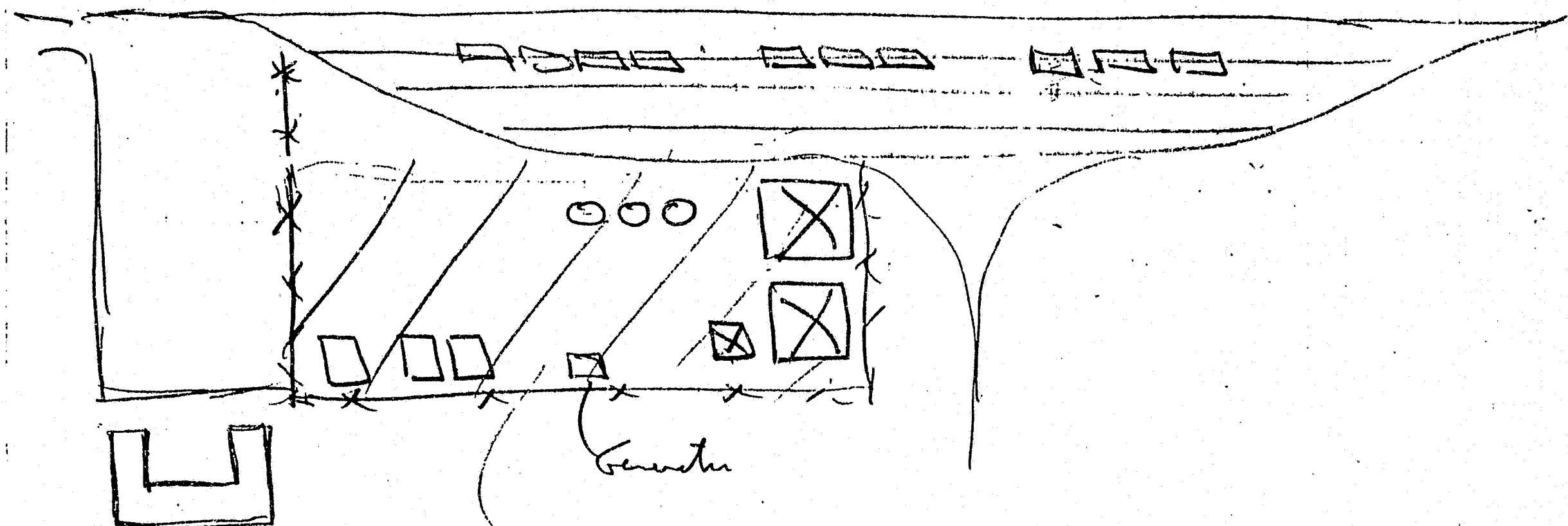
EE	SU	CAL.	MC.	ST. LAW.	LUND/MX.
18.00	42.50	100.00	50.00	32.41	17.50



= 4.5 cm. x 26 m. Rock = $16 \frac{m}{m}$ $34 \frac{m}{m}$

$24 \frac{m}{m}$

EE $21 \frac{m}{m}$



40 MAN/
MAA.
Camp

2-MAN/ROOM.
30-BED ROOM.
KIT/REC.

TABLE 1

SUSITNA HYDROELECTRIC PROJECT
CONSTRUCTION POWER REQUIREMENTS

<u>YEAR</u>	<u>ENERGY - kwh</u> <u>x1000</u>	<u>PEAK DEMAND - MW*</u> 2 - June
1985	4,800	3.0 --- 4 - June
1986	12,200	7.0 --- 6 -
1987	21,300	11.0 --- 8 -
1988	27,100	13.7 --- 10 -
1989	29,800	15.2
1990	31,300	16.0
1991	30,200	15.8
1992	23,800	13.2
1993	16,100	9.0
1994	<u>8,500</u>	3.5
TOTAL	205,100	

*During main construction period, approximately April thru October, approximately 50% of this peak will be required for November thru March.



Calculations SUSITNA HYDROELECTRIC PROJECT.

SUBJECT: ELECTRIC POWER REQUIREMENTS FOR CONSTRUCTION.

JOB NUMBER P5700.59
FILE NUMBER _____
SHEET 1 OF 1
BY A.J. DATE 8/6/82
APP _____ DATE _____

	CONSTRUCTION VILLAGE						CONSTRUCTION CAMP						CONST. SITE			TOTAL	
	DWELLINGS			SERVICE BLDGS.			DWELLINGS			SERVICE BLDGS.							
	No. Homes	Annual ^① kwh x 10 ³	Max ^② MW	% Use	Annual ^③ kwh x 10 ³	Max ^④ MW	No. Rooms	Annual ^⑤ kwh x 10 ³	Max ^⑥ MW	% Use	Annual ^⑦ kwh x 10 ³	Max ^⑧ MW	% Max	Annual ^⑨ kwh x 10 ³	Max MW	ANNUAL kwh x 10 ³	MAX MW
1984																	
1985							200	78	0.16	10	947	0.33	20	2516	0.88	2.516	0.88
1986	150	2407	1.83	50	1588	.55	800	314	0.64	30	2843	0.98	30	3774	2.52	4.799	3.01
1987	210	3369	2.56	85	2700	.94	1500	588	1.2	75	7107	2.46	40	5032	2.96	12.184	6.96
1988	260	4171	3.17	100	3176	1.1	2100	823	1.68	80	7581	2.62	60	7548	3.84	21.312	11.0
1989	280	4492	3.42	100	3176	1.1	2600	1019	2.08	90	8528	2.95	80	11.322	5.16	27.073	13.73
1990	310	4974	3.79	100	3176	1.1	2800	1098	2.24	90	8528	2.95	90	12.580	5.6	29.795	15.15
1991	310	4974	3.79	100	3176	1.1	3100	1215	2.48	100	9476	3.28	100	12.580	5.6	31.304	16.01
1992	250	4011	3.05	90	2858	0.99	3000	1176	2.4	100	9476	3.28	100	12.580	5.6	31.304	16.01
1993	100	1604	1.22	70	2223	.77	2300	902	1.84	80	7581	2.62	90	11.322	5.16	30.163	15.81
1994	-			60	1906	.66	800	314	0.64	40	3790	1.31	50	6.290	3.4	23.811	13.12
1995	-			50	1588	.55	200	78	0.16	10	947	0.33	50	6.290	3.4	23.811	13.12
													</				

- ① Based on Max Demand of 12.21 kW and load factor 0.15
② Based on maximum Demand of 12.21 kW/home
③ Based on max. Demand (1100 kW) x 0.33 x 24 hrs x 365 days 12 % Use x 3176 x 10³ kwh.
④ Based on maximum Demand of 1100 kW x % Use
⑤ Based on " Demand of 0.8 kW/Room x 0.1 load factor x 24 x 365 x No of Rooms x 0.56 Room utilization factor
⑥ " " " " " " " x No of Rooms
⑦ " " " " " " " 3278 kW x 0.33 load factor
⑧ " " " " " " " 3278 kW x % Use.
⑨ Base on Connected load of 7 MW, Demand factor 0.8 and load factor 0.4 over 9 months @ 26 days/month.
⑩ Based on (% Use x .8 x 5.5 MW) + (1.5 MW x .8)

P5700.59

Aug 4/82.

CONSTRUCTION Power.

	Connected
A. Contractors Workshops	2000 kw ✓
B. Underground Operation	1500 kw
C. Surface Operation	2000 kw
D. Concrete/Aggregate Plant	1500 kw
	7000 kw

Demand Factor - 0.8.

Load factor (daily) - 0.4

Peak Consumption :-

$$\begin{aligned} &= 7000 \text{ kw} \times 0.8 \times 0.4 \times 24 \text{ hrs} \times 26 \text{ days/month} \times 9 \text{ months/year} \\ &= 12,580,000 \text{ kwh/year.} \end{aligned}$$

Annual Consumption = 12580 Mwh $\times$ % of Peak for that particular year.

$$\begin{aligned} \text{Demand} &= [(A+B+C) \times \text{Dem. factor (0.8)} \times \% \text{ of Peak Year.}] + 0.8 \times D. \\ &= (4.1 \text{ mw} \times \% \text{ of Peak Year}) + 1.2 \text{ mw.} \end{aligned}$$



Calculations of el. load

SUBJECT: SUSITNA (Walamo) Constr. Village
Determination of composite demand of constr. village

JOB NUMBER P5700.02
FILE NUMBER _____
SHEET 2 OF 2
BY BME DATE 1/12/82
APP _____ DATE _____

diversity factor: 1.2

Consumer	Quantity	Hot water	LTG	Laundry equip	Kitchen equip	Sq. equip.	Misc.	Appl. equip	Refrigerator	Indiv. demand	Composite demand
Hous. Unit - Typ 101	16	72	57	133	274			536			
Hous. Unit - Typ 102	16	72	57	133	274			536			
Hous. Unit - Typ 103	16	72	67	133	274			526			
Hous. Unit - Typ 104	72	324	181	597	1231			2333			
Hous. Unit - Typ 105	200	900	504	1660	3420			6484			
Sub total:	320							10,425	0.3	3127	
Gymnasium	1	450	20			13	2	485	0.4	194	
Swimming Pool	1	240	20			3	2	265	0.4	106	
Recreation Center	1	10	12		55	21	2	100	0.4	40	
Shopping Center	1	10	32			11	3	56	0.4	22	
School	1	50	104			3	4	161	0.15	24	
General Illumination	-							60	1.0	60	
Wat. syst. pump hse	1							800	0.25	200	
Waste water: a) pump hse	1							70	0.25	17	
b) Booster	1							70	0.25	17	
Heat tracing: a) Wat. syst.								72	1.0	72	
b) Waste water								127	1.0	127	
Total:								12,691		4,006	

Composite Demand

$$= \frac{3127}{1.2} \times 1.5 = 3909 \text{ kW}$$

$$= 12.21 / \text{Unit.}$$

879 Ind. Demand

$$\frac{879}{1.2} \times 1.5 = 1099 \text{ kW}$$

Comp. Dem.

Conclusion: (2) x 2,500 kW gener. sets.



Calculations of el. load

SUBJECT: SUSITNA (Watana) Constr. camp
Determin. of composite demand of
Constr. camp.

JOB NUMBER P5720.02
FILE NUMBER _____
SHEET 1 OF 2
BY BME DATE 1/12/82
APP _____ DATE _____

diversity factor: 1.2

Consumer	Unit	Hot water	LTG	Laundry Equip	Kitchen Equip	Equip	Misc.	Appl. Load	Diversity Factor	Indiv. Demand	Composite Demand
Bachel. Dorm.	48	340	1008	2611			288	7507	0.45	3378	}
Bachel. Manag. Type A	10	150	65	68	23		40	346	0.45	155	
Bachel. Manag. Type B	10	210	77	95	32		42	457	0.45	205	
Guest Hse	3	75	21		21		6	123	0.45	55	
Manag. Club	1	10	8		17		1	37	0.3	11	}
Recreat. Halls	2	20	65			120	11	216	0.75	162	
Communic. Bldg.	1	2.5	2			60	2	66	0.8	52	
Fire Station	1	2.5	5				3	11	0.8	8	
Site secur. Bldg	1	2.5	5				1	8	0.8	6	
Store	1	4.5	3.5				3.5	12	0.45	5	
Hospital	1							200	0.25	170	
Comp. manag. office	3	7.5	7				6	20	0.15	3	
Ware Hse	1	2.5	5.5				3	11	0.3	3	
Bank	1	2.5	10.5			5		18	0.6	11	
General Illumin.	—							110	1.0	110	}
Soil and water. Lab	1	5	8			21		34	0.15	5	
Main. Bldg	1	5	13			88	29	135	0.15	20	
Dining Halls and food etc.	①							1200	0.8	160	
Laundry	1	30	2			68		100	0.8	80	
Hockey rink	1	252	45		11	265	5	578	0.4	231	
Gymnasium	1	242	61			16	4	323	0.4	130	
Swimming Pool	1	240	24				3	267	0.4	107	
Treat. plant a) water syst.	1							40	0.25	10	}
b) waste water	1							130	0.25	32	
Wast. water pump hse (recirc.)	1							115	0.25	28	
— (indus.)	1							100	0.25	25	
— (camp)	1							400	0.25	150	
Wast. water pump hse	1							75	0.25	180	
Heat tracing: cold water								165	1.0	115	
Heat tracing: hot water								49	1.0	49	
Total								12,053		6,506	

Individual Demand
= 13793

$\div 12 = 1149$

= 4583 kW

Composite Demand
= 0.8 kW/Rm.

2713 Indiv. Demand
= 3278 Composite Demand.

6,506 $\div 1.2 = 5,421$ kW $\times 1.45 = 7,861$ kW

Conclusion: (3) $\times$ 2,500 kW gener. sets.