FPE 342

PROJECT #1

ROUTE SELECTION AND FIELD [illegible]

ST. EDWARDS PARK VICINITY

CONTENTS

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ROAD A

ROAD SECTION	% GRADE	LENGTH	# CURVES	RADIUS
1	0 %	150'	0	—
2	-5%	200'	0	—
3	0%	200'	1	60°
4	+10%	200'	0	—
5	0%	270'	1	60°
6	+10%	600'	1	150°
7	+5	200'	1	170°
8	+10%	450'	1	60°
9	+5	200'	0	—
10	+10%	100'	0	—
11	+5	410'	1	60°

PLEASE NOTE: I DROPPED GRADE ON THIS ROAD IN SEVERAL SPOTS TO AVOID EXCEEDING MAX 10% ADVERSE ON CURVES, THIS FORCED ME TO SHIFT BACK IN A "MARGINAL" SPOT. ✓ O.K.

TOTALS

SECTIONS		%	LENGTH	# CURVES	AVG. RADIUS	# CURVES/MI
W	2	-5	200	0	0	0
X	1, 3, & 5	0	620'	2	60°	17
Y	7, 9, 11	+5%	810'	2	115°	13
Z	4, 6, 8 & 10	+10%	1350'	2	155°	8

TOTAL 2980' = 0.56 MI.

AGAIN, ASSUMING A TRUCK OF 280 HP
LOADED WEIGHT = 78,000
EMPTY WEIGHT = 22,000
COMPACTED GRAVEL ROAD, SINGLE LANE W/ DITCH

$$B = \frac{(HP)(E)(1000)}{WEIGHT}$$ WHERE E = RATIO OF EFFECTIVE H.P = 0.74

B(LOADED) = 2.65
B(EMPTY) = 9.42

ROAD A CONTINUED.....

USING BNG HANDBOOK TO COMPUTE ROUND TRIP TRAVEL TIME

TIME PER MILE

SECTION	AS CONTROLLED BY GRADE		AS CONTROLLED BY ALIGNMENT	
	LOADED TRUCK	UNLOADED TRUCK	LOADED TRUCK	UNLOADED TRUCK
W (-5%)	* 2.0	* 2.0	1.5	1.2
X (0%)	1.8	1.2	* 5.8	* 5.2
Y (5%)	4.2	1.5	* 5.41	* 4.6
Z (10%)	* 7.2	2.1	4.5	* 3.7

* DENOTES GOVERNING TIME FOR SECTION.

SECTION	GOVERNING UNLOADED TIME X 1.162	TOTAL TIME PER ROUND TRIP MILE	DISTANCE (MI)	TIME PER SECTION
W	2.32	4.3	.038	0.16 MIN
X	6.0	11.8	.117	1.38 MIN
Y	5.3	10.7	.153	1.63 MN
Z	4.30	11.5	.256	2.94 MIN

0.56 MI IN 6.11 MIN ESTIMATED TRAVEL TIME

ROAD A CONTINUED | USING USFS CHART TO ESTIMATE EXCAVATION COSTS

(7) DIVIDING ROAD INTO SIDE SLOPE CLASSES FROM LANDING TO ROAD A

SECTION	SIDESLOPE CLASS	DISTANCE (FEET)
1	0-30%	440'
2	30-50%	150
3	0-30%	320
4	30-50%	1030'
5	0-30%	1040'

SIDESLOPE CLASS TOTALS

CLASS	DISTANCE (FT)	DISTANCE (MI)	MIDPOINT ON NOMOGRAPH
0-30%	1800'	.34	15%
30-50%	1180'	.22	40%
TOTAL	2980'	0.56 MI	

ROAD CONSTRUCTION COSTS =

(MILEAGE X # CY/MILE)(BASE UNIT RATE)(SLOPE ADJ. FACTOR)

SECTIONS 1, 3 & 5

(0.34 MI)(5000 CY/MI)(0.90)(1.0) = $1530.00

SECTIONS 2 & 4

(0.22 MI)(12.500 CY/MI X 0.90 X 1.2) = $2970.00

TOTAL EXCAVATION COST = $4500.00

CULVERTS = ($100 STA X 29.8 STA) = $2980.00

EXCAVATION + CULVERT COSTS = $7480.00

CULVERT COST WILL BE MORE AT STREAM CROSSINGS COST??

FOR ROAD B.

ROAD SEGMENT	% GRADE	LENGTH	CURVES	CURVE RADIUS
A	0	100'	0	
B	+ 10%	2000'	2	R = 150, 170
C	0	200'	0	

TOTAL DISTANCE = 2300' = 0.44 MI

USING BNG HANDBOOK TO ESTIMATE TRAVEL TIMES

ASSUMING A TRUCK OF 280 HP
LOADED WEIGHT = 78,000 LBS
UNLOADED WEIGHT = 22,000 LBS
COMPACTED GRAVEL ROAD, SINGLE LANE WITH DITCH

$$B(\text{LOADED}) = \frac{(HP)(E)(1000)}{\text{LOADED WEIGHT}} = \frac{(280)(0.74)(1000)}{78,000} = 2.65$$

$$B(\text{EMPTY}) = \frac{(HP)(E)(1000)}{\text{UNLOADED WEIGHT}} = \frac{(280)(0.74)(1000)}{22,000} = 9.42$$

WHERE E = RATIO OF EFFECTIVE HORSEPOWER = 0.74

SECTION	AVG. RADIUS	CURVES/MILE
A	0	0
B	160'	5 $\Rightarrow$ $\frac{2}{2000'}(5280) = 5$
C	0	0

	CONTROLLED BY GRADE		CONTROLLED BY ALIGNMENT	
SECTION	LOADED TRUCK	UNLOADED TRUCK	LOADED TRUCK	UNLOADED TRUCK
A	1.8 *	1.2	1.5	1.3 *
B	7.2 *	2.3	3.2	2.8 *
C	1.8 *	1.2	1.5	1.3 *

* DENOTES GOVERNING TIME

SECTION	*GOVERNING UNLOADED TIME x 1.162	TOTAL TIME PER ROUND TRIP MILE	DISTANCE (MI)	TIME PER SECTION
A	1.5	3.3	.02	0.1 MIN
B	3.3	10.5	.38	4.0 MIN
C	1.5	3.3	.04	0.1 MIN

ESTIMATED TRAVEL TIME

ROAD B CONTINUED: USING USFS CHART TO ESTIMATE EXCAVATION COSTS

⑦ DIVIDING ROAD INTO SIDESLOPE CLASSE:

SECTION	SIDE SLOPE CLASS	DISTANCE	TOTALS SIDE SLOPE	TOTALS DISTANCE	TOTALS MILES
1	0-30%	820'	0-30%	1020'	0.193
2	30-50%	110'	30-50%	360	0.068
3	50-70%	920'	50-70%	920	0.174
4	30-50%	250'	>70%	0	0
5	0-30%	200'			0.44/MI

ROAD CONSTRUCTION COSTS =

= (MILEAGE)(# CY/MI)(BASE UNIT RATE)(SLOPE ADJ. FACTOR)

SECTIONS 1 AND 5

(0.193 MI)(5000 CY/MI)($0.90)(1.0) = $ 869.00

SECTIONS 2 AND 4

(0.068 MI)(12,500 CY/MI)(0.90)(1.2) = $ 918.00

SECTION 3

(0.174 MI)(28,500 CY/MI)($1.80)(1.4) = $ 12,497.00

TOTAL EXCAVATION COSTS = $14,284.00

CULVERT = ($100 STA)(23 STA) = $ 2300.00

TOTAL CULVERT + EXCAVATION COSTS = $ 16,584.00 ✓

CALCULATION OF CURVE LENGTHS FOR BOTH ROADS

FOR ROAD A:
TOTAL OF 6 CURVES FROM LANDING TO ROAD A

1	$R = 60°$	$\Delta = 130°$	$D = 95.5$	$L = 136'$
	$R = 60°$	$\Delta = 110°$	$D = 95.5$	$L = 115$
	$R = 150°$	$\Delta = 45°$	$D = 38.2$	$L = 118'$
	$R = 60$	$\Delta = 145°$	$D = 95.5$	$L = 152'$
	$R = 170°$	$\Delta = 30°$	$D = 33.7$	$L = 90'$
	$R = 60°$	$\Delta = 105°$	$D = 95.5$	$L = 110'$

FOR ROAD B
TOTAL OF 2 CURVES FROM LANDING TO ROAD B

$R = 150°$	$\Delta = 40°$	$D = 38.2$	$L = 105'$
$R = 170°$	$\Delta = 30°$	$D = 33.7$	$L = 89$

$$D = \frac{5729.578}{R} \qquad L = \frac{\Delta 100}{D}$$

(8) CHOOSING ONE OF THE LOCATIONS AS "BEST TO BUILD."

BOTH OF THE ROADS HAVE ADVANTAGES & DISADVANTAGES.
** SELECTION OF LOCATION DEPENDS ON MANAGEMENT DIRECTION FOR AREA. **

(1) IF I WERE LOOKING AT IT PURELY FROM AN ECONOMICS VIEWPOINT I WOULD CHOOSE ROAD A' BECAUSE CONSTRUCTION COSTS ARE ≈ 1/2 THE AMOUNT OF ROAD "B".

(2) IF I WERE LOOKING AT IT FROM A "POLITICAL" OR "ENVIRONMENTAL" VIEW POINT, I WOULD BUILD ROAD B, BECAUSE IT IS SHORTER AND THERE ARE NO STREAM CROSSINGS.

ROAD A

ADVANTAGES	DISADVANTAGES
- NO STEEP GROUND (>50%)	- 2 STREAM CROSSINGS
- LOWER CONSTRUCTION COSTS.	- ROAD IS CLOSE TO HEADWATERS OF A 3rd STREAM ROAD SWITCHES BACK NEAR A 4th STREAM (4 STREAMS MAY BE AFFECTED)
	LONGER ROAD
	SEVERAL GRADE BREAKS
	SEVERAL SHARP TURNS - MINIMUM RADIUS
	- MORE TRAVEL TIME

ROAD B

ADVANTAGES	DISADVANTAGES
- NO STREAM CROSSINGS	- EXPENSIVE CONSTRUCTION COSTS
- SHORTER ROAD	REQUIRES FULL BENCH CONSTRUCTION
- FEW GRADEBREAKS	STEEP GROUND DIRECTLY UPSLOPE FROM STREAM
- NO SHARP TURNS	
- LESS TRAVEL TIME	

ASSUMING THAT WATER QUALITY IS A PRIORITY IN THIS AREA (AS IT USUALLY IS THESE DAYS) AND GIVEN THE LONG LIST OF DISADVANTAGES ASSOCIATED WITH "ROAD A", I WOULD BUILD ROAD B DESPITE THE EXTRA COSTS. (PROVIDED THE TIMBER VOLUME WAS WORTH IT). OF COURSE, WHEN LOCATING IN THE FIELD I WOULD TRY TO FIND A WAY TO AVOID SO MUCH STEEP GROUND.

BEARINGS AND DISTANCES FROM KNOWN POINT

FROM SOUTHWEST CORNER OF BUILDING
VEER ROAD & TO LANDING SITE.

BUILDING ⇒	S 70° W	FOR	240'
CORNER	S 20° W	FOR	430'
	S 40° W	FOR	485'
	N 80° W	FOR	400'
	N 70° W	FOR	300'
	N 45° W	FOR	1000' ⇒ LANDING SITE