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ABERFOYLE TIN N. L.

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A COST ESTIMATE OF UNDERGROUND EXPLORATION

FOR THE ROYAL GEORGE MINE.

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1. CONCLUSIONS AND SUMMARY.

The cost of undertaking a programme of underground exploration of the Royal George orebody will depend on the methods employed. Four alternatives are considered in this report and the relative cost and time for completion by a 2 man work force are summarised below.

Stage 1. Preparatory work. Cost £4,000. Time 11 weeks.

Stage 2. Underground work.

Plan A - Rehabilitate and deepen inclined shaft.

Cost to develop 3 level £10,000.

Time 45 weeks.

Cost to develop each additional level
£8,000.

Plan B - Rehabilitate inclined shaft, sink internal vertical shaft in the footwall.

Cost to develop 3 level £12,500.

Time 54 weeks.

Cost to develop each additional level
£8,500.

Plan C - Sink vertical shaft in footwall from surface.

Cost to develop 3 level £13,500.

Time 60 weeks.

Cost to develop each additional level
£8,500.

Plan D - Rehabilitate inclined shaft, sink winze in ore.

Cost to develop 3 level £10,000.

Time 41 weeks.

Cost to develop each additional level
£6,500.

It is recommended that Plan D be adopted for Stage 2. This would require an expenditure of £14,000 in 52 weeks to develop 3 level with 500 feet of driving.

Plan D will provide maximum information for smallest cost. It's main disadvantage is that it does not provide a production shaft. This will mean a later expenditure of say £15,000 for a 500ft. shaft. However by adopting Plan D it may be possible to save a considerable portion of this in the light of additional information it will yield, and the production shaft can be designed to mine a known orebody. On the other hand, in the event of failure to prove an economic tonnage, the information will be obtained at the cheapest cost.

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2. INTRODUCTION.

Present Knowledge of Orebody.

The orebody has been exposed in underground workings and in diamond drill holes as follows :

- (i) Underground workings of Royal George Tin Mining Co. on 2 level (depth 155 ft.) about 1920. The exposure is 600 ft. long, 8 ft. wide and average grade is 0.65% Sn.
- (ii) Diamond Drill Hole No.1, 1955 (Ringwood). This hole intersected veins totalling 17 ft. 6 ins. true width and averaging 0.82% Sn at a depth of 260 ft.
- (iii) Diamond Drill Holes Nos. 1, 2 and 3, 1957 (BHP). The true width of significant intersections in these holes were -

No.1. 3 ft. 8 ins. averaging 1.62% Sn.

No.3. 1 ft. 3 ins. averaging 0.97% Sn.

at a depth of 480 ft. Assuming continuity between these two intersections, they represent a strike length of 250 ft, width 2 ft. 6 ins. and average grade 1.45% Sn.

The above data shows that tin exists below the old Royal George workings in mineable grade and width provided that sufficient tonnage can be proved to make the operation economic.

The purpose of this report is to assess the cost of undertaking a programme of underground exploration of the Royal George orebody.

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3. OBJECTIVE.

Initially to expose and develop with 500 ft. of driving 3 level 70 ft. below 2 level. The work will be divided into 2 stages as follows :

Stage 1. Preparatory work.

Stage 2. Underground work.

4. Stage 1 - Preparatory Work.

This stage will include -

- A. Compressed air supply
- B. Power supply
- C. Water supply
- D. Exploration of existing workings

4.1 A. COMPRESSED AIR SUPPLY.

Compressed air consumption -

2 rockdrills - 110 cfm each.

1 airhoist - 100 cfm.

Compressed air capacity will need to be 250 cfm at 100 psi.

Cost of new compressor - Atlas Copco Model VTSFD £2,250
or hiring rate £36 per week for period over 3 months.

Time to write off new compressor at hire rate $\frac{2250}{36} = 62\frac{1}{2}$ weeks.

Minimum time to complete initial exploration

Shaft rehabilitation 25 shifts

Sinking @ 3ft./shift 25 shifts

Driving @ 4ft./shift 125 shifts

i.e. on one shift/day operation - 35 weeks

Compressor house - timber and galvanised corrugated iron
construction say £100

Total Cost £2,350.

4.2 B. POWER SUPPLY.

Electric power consumption : 2 x 5 H.P. pumps plus lighting.
Connection from H.E.C. power lines at Royal George township

Approximately 1/2 mile £ 300

Cash guarantee of power consumption
(deductible from first 12 months
power bill)

£ 175

£ 475

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4.3 C. WATER SUPPLY.

There are two alternatives :

1. Mine Water.

Recirculation of mine water may be sufficient during the exploratory stage.

Consumption: 2 Rockdrills @ 1 gpm each.

With both machines running 8 hours per day

Water required = 2 x 60 x 8 = 960 gallons.

Recirculation can be arranged as follows :

- (i) Settling tank- 500 gal. 7ft.4ins.dia, 2ft.0ins.High open £ 9.
 - (ii) Storage tank -2000 gal.10ft.0ins.dia, 4ft.0ins.High covered £20
 - (iii) Timber stands £15
 - (iv) Installation - 4 man shifts £17
 - (v) Pipe connections £ 9
- £70

2. Pump Water from St. Paul's River.

Distance to St. Paul's River approximately ¼ mile.

This scheme would involve the above installation plus

- (vi) Pump £200
 - (vii) Pipe - 2 in.dia. polythene 4000 ft.@ 4/- per ft. £800
 - (viii) Installation of pipe £ 50
- £1050

4.4 D. EXPLORATION OF EXISTING WORKINGS.

1. Cleaning out Shaft.

The shaft was inspected on September 1, 1961 and found to be blocked up with debris and rubbish in all three compartments. The depth to which this blockage extends could not be ascertained. Cleaning out the shaft then could take two men with a windlass from 1 day to 1 week or more depending on what is found as cleaning out progresses.

Cost: 2 men say 1 week - £42. Windlass and rope £10 £52

2. Dewatering the mine.

Indications from an open stope branching off the open cut are that the water level in the workings is at approximately adit floor level.

003 Details of the 2 level workings obtained from old plans and reports are as follows :

Main drive 621 ft. east, 100 ft. west.

Main vein from shaft crosscut to 408ft. averages 8ft.wide.

from 408ft. to 530ft. averages 34ft.wide.

from 530ft. to 621ft. averages 27ft.wide.

(No attempt has been made to open any parallel orebodies at the 2 level horizon).

A rough estimate of the volume of water in the workings is as follows :

$$\begin{aligned} \text{Vol.} &= (508 \times 8 \times 61) + (122 \times 34 \times 61) + (91 \times 27 \times 61) \\ &= 61 (4064 + 4148 + 2457) \text{ c.ft.} = 650809 \text{ c.ft.} \\ &= 4067562 \text{ gallons} \end{aligned}$$

say 4100000 gallons.

Pumping at 100 gpm continuously, time to dewater the mine would be approximately 28½ days, say 1 month (without taking into consideration time to lower the water table).

Shaft length, collar to sump, is 135 ft. inclined at 50°
∴ Vertical depth, collar to sump, is 103 ft.

Capacity of required pump for dewatering job -
100 gpm against 110 ft. head.

(in practice head will probably not exceed 100 ft.)

Recommend Flygt 3in. B80L electric pump with additional high lift impeller and accessories.

Cost £430

N.B. 2nd pump less accessories plus additional cable £450

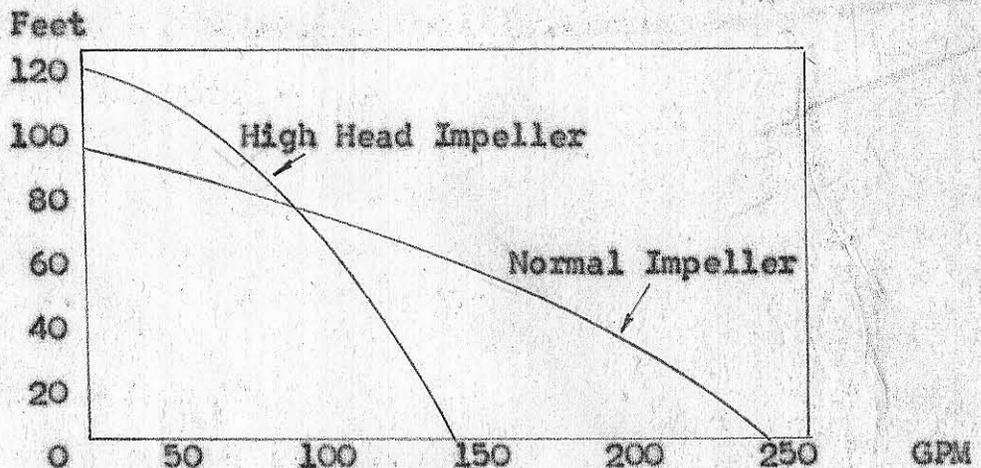


Fig. 1. - Characteristic Curves of Flygt B80L Pump.

The characteristic curves for this pump are shown in Fig.1. Flygt pumps have given satisfactory performance at Storeys Creek.

3. Sampling.

Before undertaking any sinking, a programme of sampling should be undertaken on 2 level at floor level. This will give some indication of the value of the ore below that horizon. This, combined with sampling at lower levels and in rises and winzes between them, will give a reasonably accurate estimate of the value of the deposit.

Samples should be taken from fresh faces to avoid contamination from fines which may have accumulated on the floor during stoping above 2 level. To take a sample then will involve cleaning off the floor and cutting a small trench, (minimum depth 6 in.) over the width of the drive, before cutting the sample from the floor of the trench.

Samples should be taken at not more than 20 ft. intervals. Minimum number of samples is $\frac{720}{20} = 36$.

At sampling rate of 6 samples per day, total time = 6 days.

Cost of sampling programme -

Cleaning up level 10 man shifts

Cutting samples 12 man shifts

22 man shifts @ 84/- say 293

4.5 SUMMARY - STAGE 1.

Item	Costs			Time (days) $\frac{1}{2}$	Remarks
	Material	Labour	Total		
A. Compressed Air	2300	50	2350	5	
B. Power Supply	475	-	475	-	Outside Contract
C. Water Supply					
1. Mine Water	50	20	70	2	
2. St. Paul's River Water ^x	1000	50	1050	-	Outside Contract
D. Exploration of existing workings					
1. Cleaning out Shaft	10	42	52	5	
2. Dewatering the Mine	430	-	430	30	Minimum pumping time.
3. Sampling	-	93	93	11	
TOTAL	3265	205	3470^x	53	

^x not included in first total

^{1/2} assumed work force - 2 men working 1 shift per day.

Total say	£3500
Contingencies	500
Total Cost	£4000

*If it is necessary to use St. Paul's River Water costs in addition to the above will be £1050 making a total cost of £5050.

Time required to complete Stage 1 53 days say 11 weeks.

5. COSTS.

Estimates of costs used throughout the report are based on the following unit costs.

Driving and Crosscutting (7ft. x 7 ft.)	per ft.	£ 9½	
(6ft. x 4 ft.)	" "	£ 6	
Rising (7ft. x 5 ft.)	" "	£10	
(5ft. x 4 ft.)	" "	£ 6½	
Winzing (7ft. x 5 ft.)	" "	£18	
Shaft Sinking (8ft. x 4½ft.)	" "	£18	
(10ft. x 5 ft.)	" "	£23	
(8ft. dia.)	" "	£25	
Station cutting	per fath. in situ.	£22	
Timber - sawn per 100 s.ft. (all sections)		83/-	
round 8in. dia. per ft.		1/3	
Steel sections per ton		£75	
Chutes		£19	
Chutes and gallery timber per ft. of drive		£ 8½	
Chutes and jump ups per ft. of drive		£ 7½	
Explosives - Semigel per 50 lb. case		£ 7	
AN60 1 in. dia.		£ 7½	
AN60 ¾ in. dia.		£ 8	
Wages (incl. leave and insurance) per week		£21	
Contract per week		£30	
Milling per ton		25/-	
Distribution of Costs (Development)		<u>Per Cent</u>	
Labour	Direct	57.0	
	Oncost	7.5	64.5
Materials	Explosives	11.0	
	Timber	1.2	
	Other	10.1	
	Drillsteels & Trucks	10.6	32.9
Power		2.6	2.6
			100.0

6. STAGE 2 - UNDERGROUND WORK.

At least four courses of action are available. These are set out as Plans A, B, C and D below. In each case the initial consideration is to develop 3 level with 500 ft. of driving.

PLAN A.

1. Rehabilitate incline shaft.
2. Deepen inclined shaft.
3. Crosscut to target lode.
4. Drive 500 ft.

PLAN B.

1. Rehabilitate inclined shaft.
2. Rehabilitate 2 level.
3. Crosscut into footwall to site for vertical internal shaft.
4. Sink vertical internal shaft.
5. Crosscut to target lode.
6. Drive 500 ft.

PLAN C.

1. Sink vertical shaft in footwall from surface.
2. Crosscut to target lode.
3. Drive 500 ft.

PLAN D.

1. Rehabilitate inclined shaft.
2. Rehabilitate 2 level.
3. Sink winze in ore.
4. Drive 500 ft.

Each of these plans will now be considered in turn.

6.1 PLAN A.

1. Rehabilitate inclined shaft.

This will involve consideration of

- (i) Shaft timber
- (ii) Track
- (iii) Idlers
- (iv) Skip
- (v) Ladderway
- (vi) Pipes
- (vii) Ore bin and automatic tip
- (viii) Headframe
- (ix) Chute on ore bin
- (x) Muck disposal
- (xi) Rope
- (xii) Winch
- (xiii) Winchhouse

(i) Shaft Timber.

Shaft depth collar to sum 135 ft.
collar to 2 level rails 115 ft.

Shaft size outside timber at collar 11ft. 8ins. x 3ft. 10ins. approx.
timber at collar is 2in. lagging.

The present dimensions of the shaft collar are shown in Drwg. R1001E.

At this stage it must be assumed that the shaft must be completely retimbered. A suitable timber set is shown in Drwg. R1001E. Cost of such a set is as follows :

Member	Length (ft.)	No.	Running Feet	Section	Super Feet
Cap	12	1	12	5" x 5"	25
Sill	12	1	12	5" x 5"	25
End Leg	4	2	8	5" x 5"	17
End Strut	6	4	24	5" x 5"	50
Centre leg	4	1	8	5" x 3"	10
Centre Strut	6	4	24	5" x 3"	30
Lagging	4	12	48	6" x 1 1/2"	36

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With sets spaced at 6ft. centres

Cost per set @ 83/- per 100 s.ft. 160/-
Timber cost per ft. of shaft = $\frac{160}{6} = 26.7$ say 27/-
Add cost of hanging bolts @ 1/- per ft. 28/-

Labour cost - say 1 set per shift - 2 men @ 84/-

Cost per ft. = $\frac{168}{6}$ = 28/- per ft.

Cost of timbering shaft = 56/- per ft.

Total cost - 120 ft. @ 56/- per ft. = £336 say £340.

(ii) Track.

With 30lb/yd. rail, weight per foot of track is 20lb.

Cost per ft. of track @ £75 per ton = $\frac{1500}{2400} \times 20 = 12.5$ /-

Runners 6" x 3"

2.5/-per ft

say 16/- per ft.

Labour cost at say 40ft./shift - 2 men

$\frac{2 \times 84}{40} = 4.2$ /- per ft. say 5/-

Cost of track 160ft. @ 21/- per ft. £168 say £170.

(iii) Idlers.

Idlers can be made up from 3in. dia. pipe

Cost of idlers 4 x 50/- £10.

(iv) Skip.

Approx. weight of skip = $\frac{1}{4}$ ton.

Skip will have 2 sets of wheels and bearings and attachment to rope.

Total cost say £50

Skip has not been designed in detail.

(v) Ladderway.

Cost of ladder 4/- per ft.

plus installation labour 3/- per ft. - 7/- per ft.

120 ft. @ 7/- per ft. = £42 say £45

(vi) Pipes.

(a) Rising main. 3in. dia. victaulic pipe @ 7/6 per ft.

Labour to fit same 2/6 per ft.

Total cost 10/- per ft.

Allow 130 ft. in shaft plus 50 ft. on surface

180 ft. @ 10/-per ft. £90

(b) Air main. 2in. dia. polythene pipe @ 4/- per ft.

Labour to fit same 6d. per ft.

Total cost 4/6 per ft.

Allow 120 ft. in shaft plus 30 ft. on surface

150 ft. @ 4/6. per ft. £33 $\frac{3}{4}$

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(c) Water main. 1½ in. dia. polythene pipe @ 2/- per ft.
 Labour to fit same 6d. per ft.
 Total cost 2/6d. per ft.
 Allow 120 ft. in shaft plus 50 ft. on surface
 170 ft. @ 2/6d. per ft. £ 21¼
 Total cost £145
 say £150

(vii) Ore Bin and Automatic Tip.

Skip will be self-tipping type
 Allow for arrangement of rails 2 men x 1 shift @ 84/- say £9.
 A diagram of the proposed ore bin is shown in isometric projection in Drwg. R1003E. The tipping point will be approx. 2 ft. above the centre of the bin.
 Storage capacity - filled to within 1ft. of top plus rill of dirt 3ft. high = $(9 \times 4\frac{1}{2} \times 10) + (\frac{50}{3} \times 3) = 405 + 50 = 455 \text{ c.ft.}$
 $\text{@ } 25 \text{ c.ft./ton} = \frac{455}{25} = 18 \text{ tons.}$
 This represents, for 6ft. x 4ft. opening (2 tons/ft.)
 9 ft. advance.
 for 7ft. x 7ft. opening (4 tons/ft.)
 4½ft. advance.
 and should therefore provide sufficient storage during the exploratory stages.

Supporting timber to be 8" x 8" section
 boards to be 6" x 2" section
 Timber required - 8" x 8" - 156 running ft.
 = 832 super ft. @ 83/- per 100 s.ft. = £34½
 Boards 500 running ft. = 500 s.ft. @ 83/- = £21
 Labour - 3 men x 2 days = 6 x 84/- = £26
 Total cost £90½ say £95

(viii) Headframe.

A simple headframe arrangement which will suitably accommodate the above storage and tipping facilities is shown in Drwg. R1004E. This can be constructed cheaply from round logs.

Preparation of site and foundations - 2 men x 2 days
 @ 84/- £17
 Timber 8 in. dia. round logs
 $(28 + 16 + 13 + 11) \times 2 + (3 + 8 + 12) \times 2$
 = 182ft. @ 1/3 per ft. = 228/- say £12
 Labour - 3 men x 3 days = 9 x 84/- = £38 say £40
TOTAL = £69 say £70

(ix) Chute on Ore Bin.

Materials & Labour say £10.

(x) Muck disposal.

Truck £30.

Track - allow for 50ft. @ 10/- per ft. £25.

(14 lb/yd. rail)

£55.

(xi) Rope.Specification: 1¼in. circ. 6 x 19 (9/9/1) Black
Best Plough Steel Wire Rope,
Sisal core.

Weight : 0.25 lb/ft.

Breaking Strain : 5.2 tons min.

Cost : 6¼d. per ft. - 220 ft. @ 6¼d/ft. £ 6.

(xii) Winch.

Rope breaking strain 5.2 tons.

Allowable load at f.s.8 = $\frac{5.2}{8} = 0.65$ tons = 1450 lbs.

For hoisting on 50° incline, component along incline=1450lbs.

Allowable load = $\frac{1450}{\sin 50^\circ} = 1890$ lbs.

Rope load = 30 lbs.

Skip plus pay load = 1860 lbs.

Skip capacity say 1200 lbs. fully loaded (practical
purposes ½ ton)

Weight of skip 660 lbs.

Specify winch loading 1500 lb.

Drum capacity 150 ft. of $\frac{13}{32}$ in. dia. rope.

Cost £400

Installation £ 10

£410

Additional drum capacity required if sinking
inclined shaft - 90 ft. per level.

Hoisting sheave specification :

Minimum sheave dia. = 20 in.

Groove dia. = $\frac{15}{32} \pm \frac{1}{32}$ in.

Depth of groove = 1½ in.

Width at rim = 1½ in.

(xiii) Winch house.

Material - timber and iron shed £50

Labour - 2 men x 5 shifts £42

£ 92.

SUMMARY - REHABILITATION OF INCLINED SHAFT.

Item	Costs			Time (days)*	Remarks
	Material	Labour	Total		
(i) Shaft timber	170	170	340	10	
(ii) Track	130	40	170	2	
(iii) Idlers	5	5	10	½	
(iv) Skip	50	-	50	-	
(v) Ladderway	25	20	45	2	
(vi) Pipes	120	30	150	4	
(vii) Ore bin & Automatic tip.	55	40	95	4	
(viii) Headframe	12	58	70	6½	
(ix) Chute on Ore bin	5	5	10	½	
(x) Muck disposal	45	10	55	1	
(xi) Rope	6	-	6	-	
(xii) Winch	400	10	410	1	
(xiii) Winch house	50	42	92	5	
	1073	430	1503	36½	

Contingencies £147

Total Cost £1650

Time required for completion 36½ days say 8 weeks.

*Assumed work force - 2 men working 1 shift per day.

2. Deepen inclined shaft.

Sinking 91 ft. @ £18 per ft. £1638

Station cutting 3 fath @ £22 66

Additional pump and cable 450

Shaft equipment (see Drwg. R1002E)

(i) Timber - cost per set.

Member	Length (ft.)	No.	Running Feet	Section	Super Feet
Cap	8	1	8	5" x 5"	16½
Sill	8	1	8	5" x 5"	16½
End Leg	4½	2	9	5" x 5"	18½
End Strut	6	4	24	5" x 5"	50
Centre leg	4½	1	4½	5" x 3"	6
Centre strut	6	2	12	5" x 3"	15
Lagging	4½	12	54	6" x 1½"	40½
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Set spacing - 6ft. centres.

	Cost per set @ 83/- per 100 s.ft.	135/-		
	Cost per ft. of shaft $\frac{135}{6} =$	22.6/-	say	23/-
	Hanging bolts @ 1/- per ft.			1/-
	Labour cost @ 28/- per ft.			28/-
				52/-
	Timber cost 91 ft. @ 52/- per ft.	£237	say	£ 240
(ii)	Track 91 ft. @ 21/- per ft.	£ 96	say	£ 100
(iii)	Idlers 2 @ 50/- each			£ 5
(iv)	Ladderway 91 ft. @ 7/- per ft.			£ 32
(v)	Pipes 91 ft. @ 17/- per ft.	£ 77½	say	£ 80
(vi)	Rope 91 ft. @ 6¼d. per ft.	£ 2½	say	£ 3
				£ 460
		£2614	say	£2620
		Contingencies	£ 180	
				£2800
3.	Crosscut to target lode 50ft. @ £9½			£ 475
4.	Drive 500 ft. @ £9½			£4750
		TOTAL - PLAN A		£9675
	Time for completion - 45 weeks		say	£10000

6.2

PLAN B.

1. Rehabilitate inclined shaft.
For details see Plan A. Sec. 1.

Cost	£1650
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2. Rehabilitate 2 level.

2 level will be cleaned up as part of the work in Stage 1.

Track - rail 14 lb./yd. Sleeper 6" x 3" x 3'0"

@ 3'0" centres.

Rail $\frac{28}{3}$ lb./ft. of track - cost $\frac{28}{3} \times \frac{1500}{2240} = 6¼/-$ per ft.

Sleeper $\frac{4.5}{3} \times 0.83 = 1¼/-$ per ft.

Labour - say 70ft. of track per shift $\frac{84 \times 2}{70} = 2½/-$ per ft.

Cost of track 10/- per ft.

500 ft. @ 10/-	£250
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Time 2 men - 12½ shifts.

Pipes - air 2in. dia. polythene @ 4/- per ft.

Water 1½in. dia. polythene @ 2/- per ft.

500 ft. @ 6/- per ft.	£150
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Installation 1½ shifts	say	£ 15
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£165

Storage at inclined shaft loading station	£200
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£615

3. Crosscut into footwall to site for vertical internal shaft.

110ft. @ £9½ £1045

4. Sink vertical internal shaft

Rise for shaft brace 10ft. @ £6½ £ 65

Erect brace and rig hoist £ 20

Cost of hoist £ 400

plus rope 75ft. @ 6¼d. per ft. say £ 2

Sinking 75 ft. @ £23 per ft. £1725

Shaft equipment:

(i) ladderway 75 ft. @ 7/- per ft. £ 26

(ii) Pipes 75 ft. @ 17/- per ft. £ 64

(iii) Additional pump and cable £ 450

(iv) Shaft Timber - see Drwg. R1002E

Member	Length (ft.)	No.	Running Feet	Section	Super Feet
End plate	10	2	20	5" x 5"	42
Wall plate	5	2	10	5" x 5"	21
Divider	5	1	5	5" x 3"	7
Leg	6	4	24	5" x 5"	50
Lagging	5	12	60	6" x 1½"	45
Centre leg	6	4	24	5" x 3"	18
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Set spacing 6ft. centres

Cost per set @ 83/- per 100 s.ft. 152/-

Cost per ft. of shaft $\frac{152}{6} = 25\frac{1}{4}$ /- say 26/-

Hanging bolts @ 1/- per ft. 1/-

Labour cost @ 28/- per ft. 28/-

55/-

Timbering cost 75ft. @ 55/- per ft. £207

Station cutting 3 fath @ £22 £ 66

£3025

5. Crosscut to target lode.

110ft. @ £9½ £1045

6. Drive 500 ft.

500ft. @ £9½ £4750

TOTAL - PLAN B £12130

say £12500

Time for completion 54 weeks.

6.3 PLAN C.

1.	Sink vertical shaft in footwall from surface.		
	Sinking 230 ft. @ £23 per ft.		£ 5290
	Shaft Equipment:		
	Timber 230ft. @ 55/- per ft.		633
	Ladderway 230ft. @ 7/- per ft.		81
	Pipes 230ft. @ 17/- per ft.		196
	Orebin and Headframe		165
	Chute and muck disposal		65
	Rope 230ft. @ 6½d. per ft.		7
	Winch		410
	Winchhouse		92
	Station cutting 3 fath. @ £22		66
			£ 7005
2.	Crosscut to target lode		
	110ft. @ £9½ per ft.		£ 1045
3.	Drive 500 ft.		
	500ft. @ £9½ per ft.		£ 4750
	Additional pump and cable		450
	Pump Station in shaft		
	3 fath. @ £22 per fath.		66
	<u>TOTAL - PLAN C</u>		£13316
	Say -		£13500

Time for completion - 60 weeks.

6.4 PLAN D.

1.	Rehabilitate inclined shaft		
	For details see Plan A Sec. 1.		
		Cost	£ 1650
2.	Rehabilitate 2 level		
	For details see Plan B. Sec. 2.		
		Cost	£ 615
3.	Sink Winze in ore		
	Rise for winze brace 10ft. @ £6½		£ 65
	Erect brace & rig hoist		£ 20
	Cost of Hoist		£ 400
	plus rope 75ft. @ 6½d. per ft.		£ 2
	Sinking 75ft. @ £18 per ft.		£ 1350
	Additional pump and cable		£ 450
	Ladderway & Pipes 75ft. @ 24/- per ft.		£ 90
			£ 2377
		Say	£ 2400

4.	Drive 500 ft.		
	500 ft. @ £9½ per ft.		£ 4,750
		<u>TOTAL - PLAN D</u>	£ 9,415
		say	£10,000

Time for completion 41 weeks.

6.5 SUMMARY - COMPARISON OF COSTS.

The cost to reach 3 level and develop it with 500 ft. of driving is estimated as follows -

Plan A	-	£10,000
Plan B	-	£12,500
Plan C	-	£13,500
Plan D	-	£10,000

7. ADDITIONAL EXPLORATION.

The cost to develop additional levels, each 70 ft. below the previous level and each with 500 ft. of driving will now be briefly considered.

7.1 PLAN A.

Deepen inclined shaft		£ 2,300	
Crosscut to target lode		£ 475	
Drive 500 ft.		£ 4,750	
		£ 7,525	say £8,000

7.2 PLAN B.

Sink vertical internal shaft		£ 2,600	
Crosscut to target lode		£ 1,045	
Drive 500 ft.		£ 4,750	
		£ 8,395	say £8,500

7.3 PLAN C.

Sink vertical shaft		£ 2,600	
Crosscut to target lode		£ 1,045	
Drive 500 ft.		£ 4,750	
		£ 8,395	say £8,500

7.4 PLAN D.

Sink winze in ore		£ 1,600	
Drive 500 ft.		£ 4,750	
		£ 6,350	say £6,500

7.5 Cost to develop each additional level

Plan A	-	£8,000
Plan B	-	£8,500
Plan C	-	£8,500
Plan D	-	£6,500

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8. OTHER CONSIDERATIONS.

A programme of exploration should have two basic aims which are partly in opposition to each other.

- (i) it should seek to obtain maximum information for minimum cost of development.
- (ii) it should attempt to locate exploration openings where they can be used for later operating.

Each of the four plans considered above have other advantages and disadvantages which must be considered in conjunction with their relative costs. These will be outlined below.

8.1 PLAN A.

- (i) The level interval for stoping must be decided on before any further information about the orebody becomes available.
- (ii) There is a high development cost both in sinking and crosscutting before ore is reached. The crosscutting will however, intersect any parallel orebodies which may be in the footwall between the shaft and the target orebody.
- (iii) The shaft can be used in production as the main shaft of the mine. With stripping to the size of the existing section, a substantial tonnage could be hoisted through it.
- (iv) The position of the main shaft is already fixed. As an operating shaft it will have a considerably higher operating and maintenance cost than would a vertical shaft.

8.2 PLAN B.

- (i) The level interval for stoping must be decided on before further information about the orebody becomes available.
- (ii) There is a high development cost both in sinking and crosscutting before ore is reached. The crosscutting will however, intersect any parallel orebodies which may be in the footwall between the shaft and the target orebody.
- (iii) The shaft can be broken through to the surface by rising and can then be used as the main shaft of the mine. The size is sufficient to accommodate a counterweight compartment.

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- (iv) The existing inclined shaft from the surface to 2 level will provide an additional opening to surface and will thus simplify ventilation.

8.3 PLAN C.

- (i) The level interval for stoping must be decided on before any further information about the orebody becomes available.
- (ii) There is a high development cost both in sinking and crosscutting before ore is reached. The crosscutting will however intersect any parallel orebodies which may be in the footwall between the shaft and the target orebody.
- (iii) The shaft can be used in production as the main shaft of the mine. It's size is sufficient to accommodate a counterweight compartment. However production rate may be limited by the size of the shaft.
- (iv) The existing inclined shaft from the surface to 2 level will provide an additional opening to surface and will thus simplify ventilation.

8.4 PLAN D.

- (i) Information is continuously available as to nature, grade and width of the orebody. This information can be used in deciding on a level interval for stoping and the decision can be made as sinking progresses. It is possible that substantial savings can be made, e.g. by increasing the level interval from 70ft. to 140ft. a saving of about £5,000 can be made. By any of the other methods there is no possibility of doing this.
- (ii) Development is in ore in the target orebody and no exploration of the walls is made. However this can follow at a later stage, even after production commences.
- (iii) A new main shaft will be required before commencing production. This can be better planned for size, location and equipment in the light of the information provided by the exploration openings. In the event of savings outlined in (i) above being made, these will partly or completely offset the cost of a new shaft.

9. GENERAL SUMMARY.

Stage 1. Preparatory Work, Cost £4,000.

Time for completion by a 2 man work force - 11 Weeks.

Stage 2.

Alternatives	Cost to develop 3 level	Cost to develop each additional level	Time to develop 3 level (2 men)
Plan A	£10,000	£8,000	45 Weeks.
Plan B	£12,500	£8,500	54 Weeks.
Plan C	£13,500	£8,500	60 Weeks.
Plan D	£10,000	£6,500	41 Weeks.

10. RECOMMENDATION.

It is recommended that Plan D be adopted for Stage 2. This would require an expenditure of £14,000 in 52 weeks to develop 3 level with 500ft. of driving.

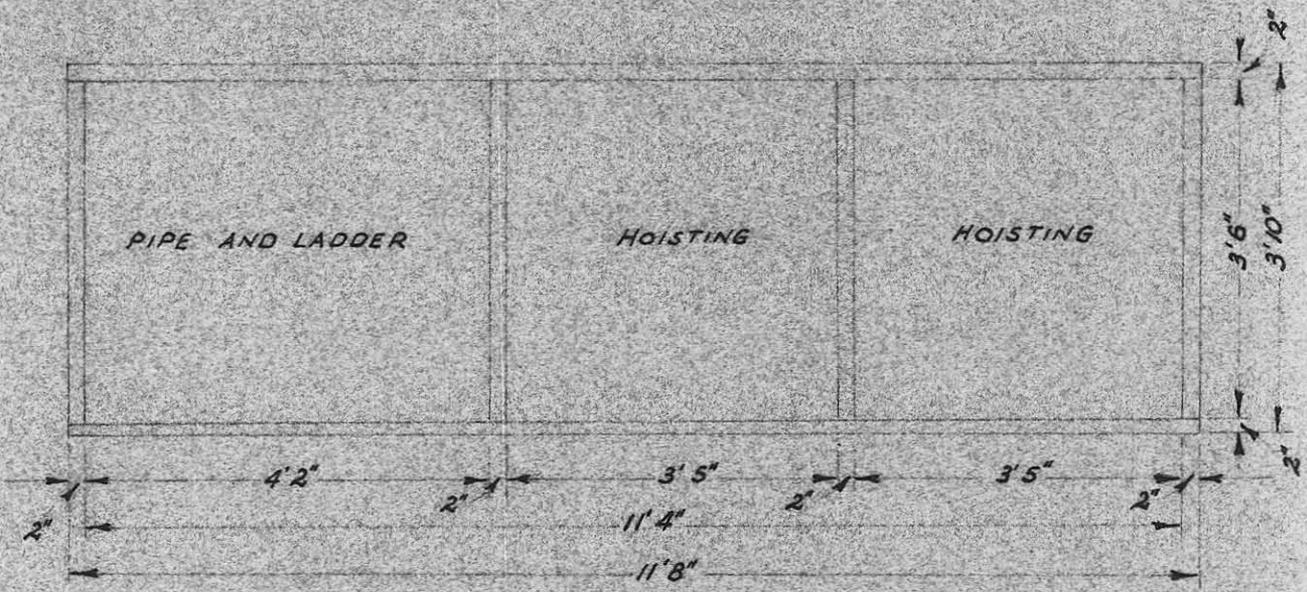
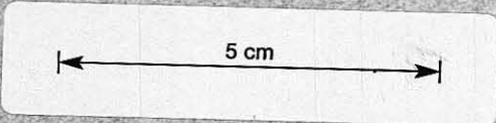
Plan D will provide maximum information for smallest cost. Its main disadvantage is that it does not provide a production shaft. This will mean a later expenditure of say £15,000 for a 500ft. shaft. However by adopting Plan D it may be possible to save a considerable portion of this in the light of additional information it will yield, and the production shaft can be designed to mine a known orebody. On the other hand, in the event of failure to prove an economic tonnage, the information will be obtained at the cheapest cost.

Brian J. Maher

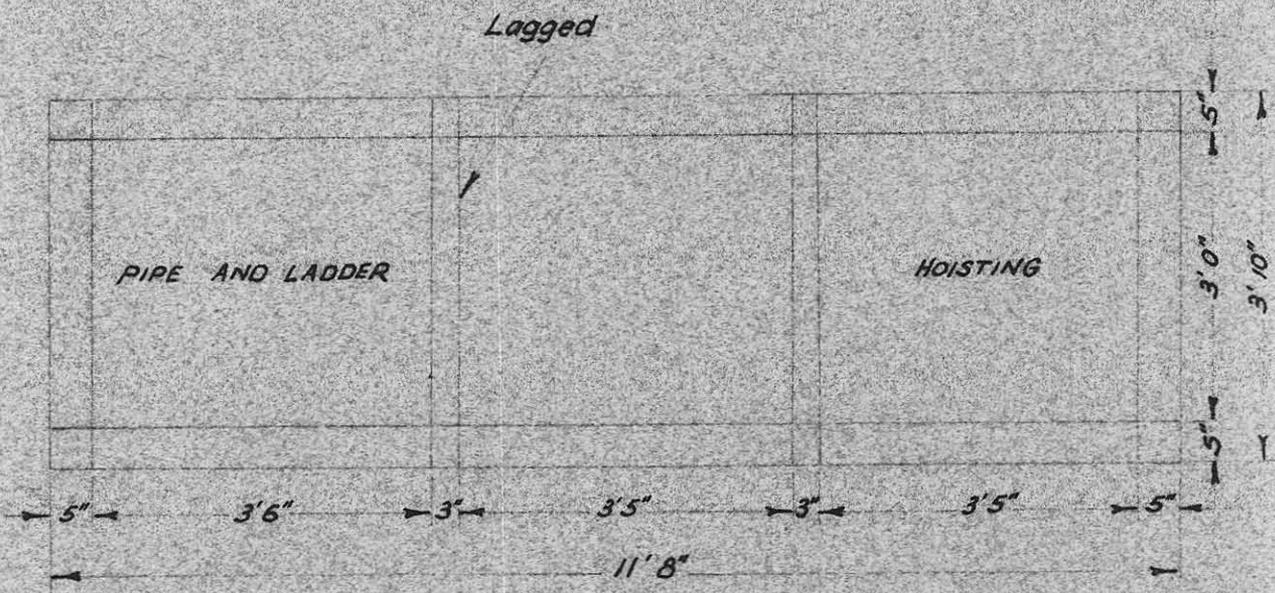
B.J. MAHER,
TECHNICAL ASSISTANT.

20.11.61.

021



EXISTING INCLINED SHAFT



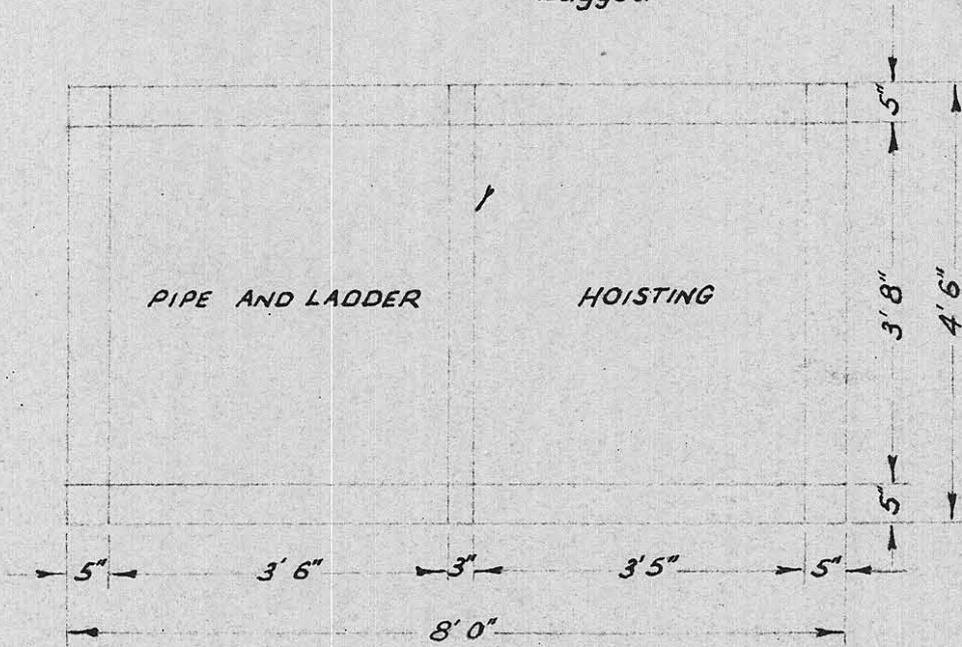
- | | | | |
|------------|---------|---------------|-------------|
| End Legs | 5" x 5" | Centre Legs | 5" x 3" |
| Cops | 5" x 5" | Centre Struts | 5" x 3" |
| Sills | 5" x 5" | Logging | 6" x 1 1/2" |
| End Struts | 5" x 5" | Battens | 3/4" x 3/4" |

PROPOSED REHABILITATION OF INCLINED SHAFT

301022

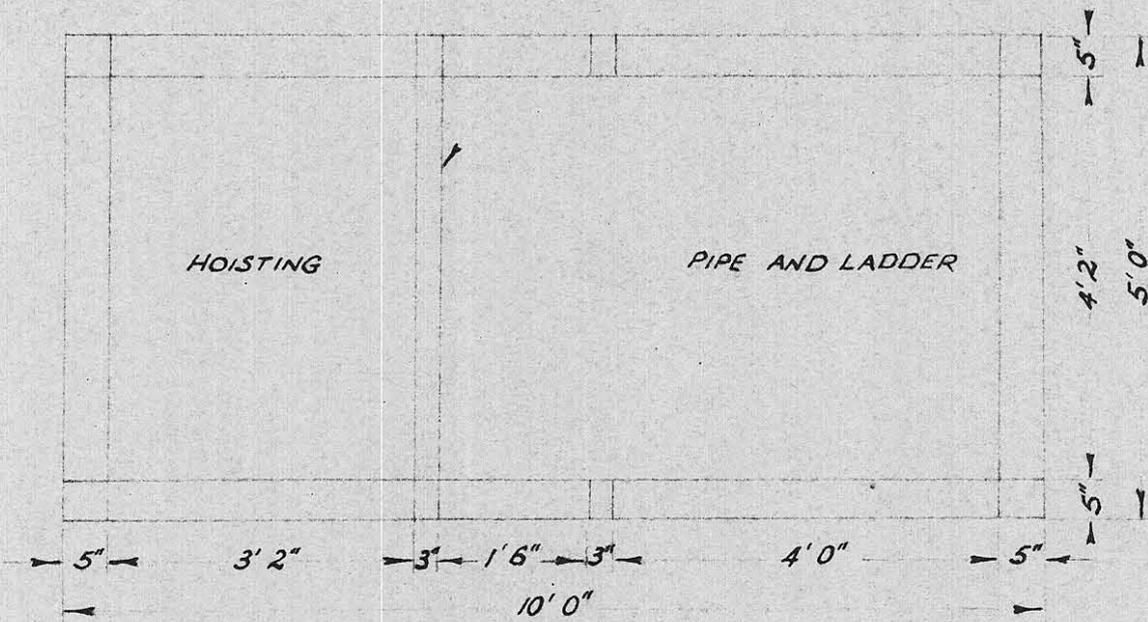
SCALE 1in = 2ft.	ROYAL GEORGE MINE	PROPOSED	R1001E
DRAWN BJM			
31.10.61	SHAFT TIMBERING		

Lagged

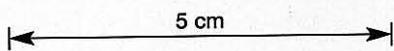


PROPOSED INCLINED SHAFT

Lagged

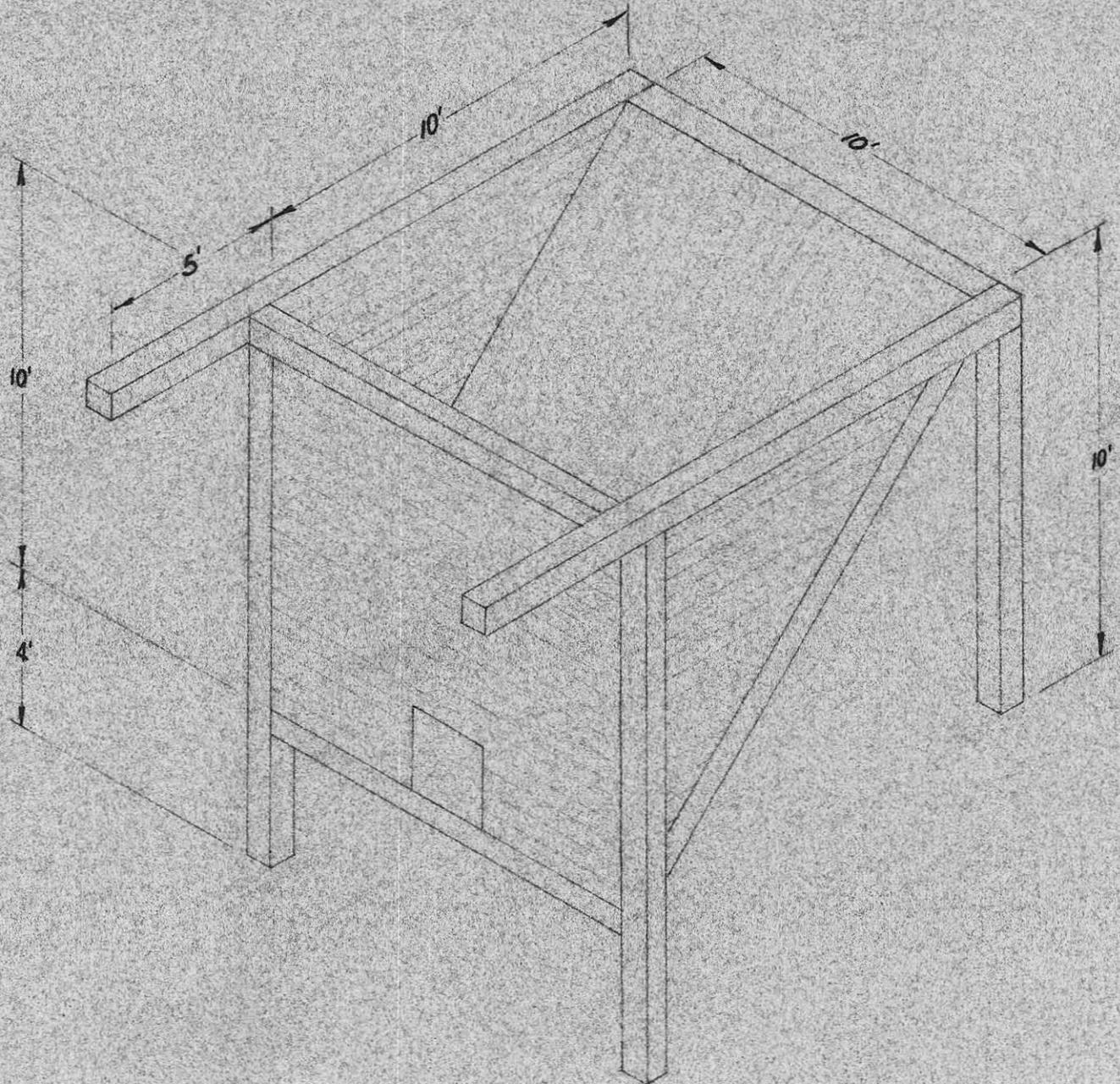


PROPOSED VERTICAL SHAFT



301023

SCALE 1 in. = 2 ft.	ROYAL GEORGE MINE	R1002 E
DRAWN BJM	PROPOSED	
31.10.61	SHAFT TIMBERING	



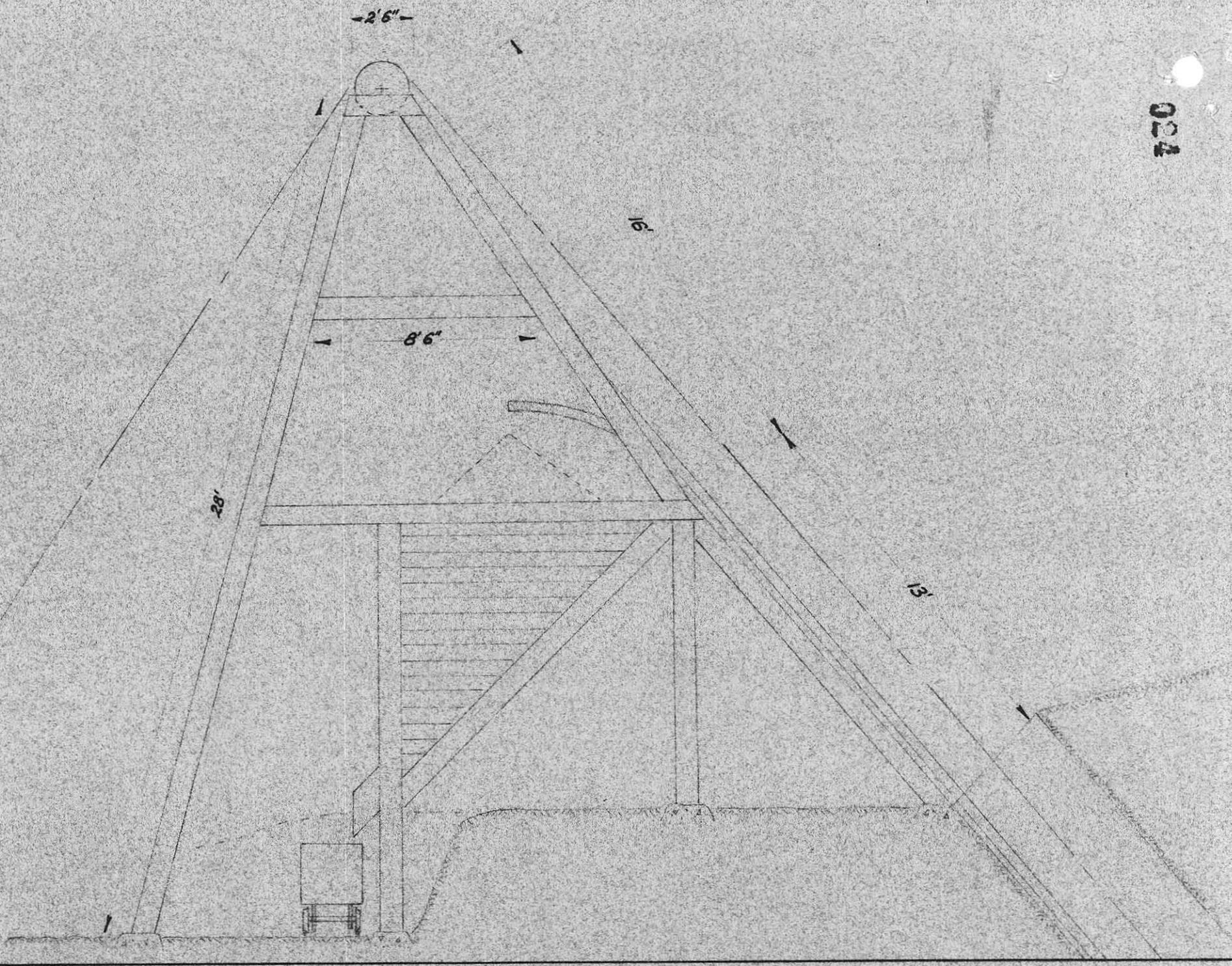
5 cm

301024

SCALE 1/4" = 4'
DRAWN BJM
1. 11. 61

ROYAL GEORGE MINE
PROPOSED
SURFACE ORE BIN

R1003 E



5 cm

301025

SCALE 1/4" = 4'-0"
DRAWN BJM
1.11.61

ROYAL GEORGE MINE
PROPOSED
HEADFRAME

R1004E